UNIVERSITY OF CAPE COAST

AUTOMATED DISCOVERY OF FALLACIES IN LEGISLATIVE PROCESSES

CALLISTUS IRENEOUS NAKPIH

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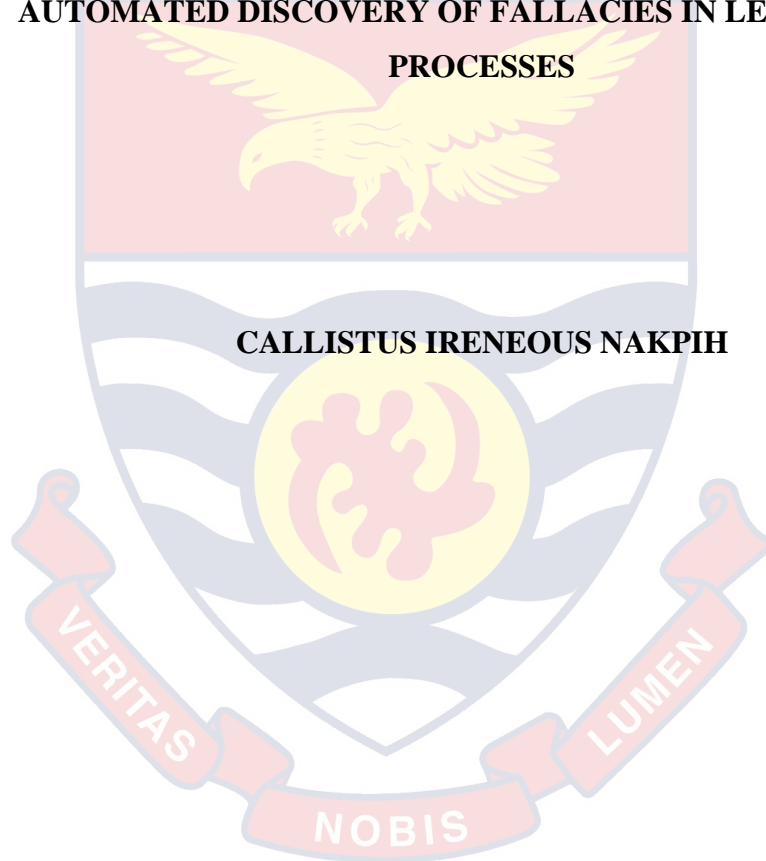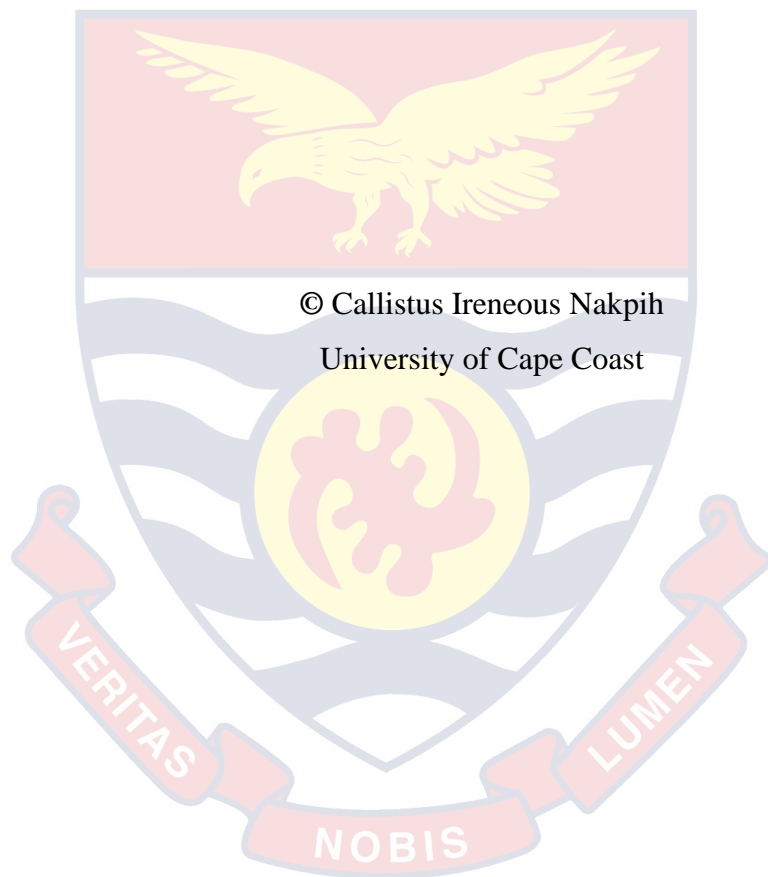
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AUTOMATED DISCOVERY OF FALLACIES IN LEGISLATIVE
PROCESSES

BY

CALLISTUS IRENEOUS NAKPIH

Thesis submitted to the Department of Computer Science and Information
Technology, School of Physical Sciences, College of Agriculture and Natural
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for the award of Doctor of Philosophy degree in Computer Science

February 2021

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:... Date:...........................

Name: Callistus Ireneous Nakpih

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature:................................... Date:........................

Name: Prof. Simone Santini

Co-Supervisor's Signature: .... Date:........................

Name: Prof. Nii Quaynor

ABSTRACT

This research or study presents a computational logic tool for automatic discovery of fallacies, which may be inherent, or, introduced intentionally or unintentionally in legal texts. Sound reasoning through legal text has always been a challenge in Natural Language Processing (NLP) in Artificial Intelligence (AI) since the fourth century, wich has received different computational approaches for solution. I have explored and presented logic techniques through the formalism of legal text from its natural form to First Order Logic (FOL) and Prolog programme, which results in the provision of clarity, comprehensibility and deductive reasoning of the text. This as well maintains sound reasoning through the text, which supports decision-making process that will always lead to the same conclusions. I formalised the Citizenship Act and the Fundamental Human Rights and Freedom of Ghana as the knowledge base of the system. I also formalised two Supreme Court cases as testbed to the system in FOL, and the formalised text was implemented in Prolog progrmme for the automated reasoning process of the sytem. This allows for the discovery of fallacies in a claim made against an opponent, facts established by the opponent, and the law employed for the legislation of the case in court. I have also presented an algorithmic framework here in pseudocode for the discovery of logical fallacies in the text. The ontology design of the philosophical research methodology was employed in the conduction of this research, which guided the techniques used for the formalism of the logic tool.

KEY WORDS

Ambiguity

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Deductive Reasoning

Formalism of Legal Text

Legal Argumentation

Logical Fallacy

Ontology

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I as well acknowledge the efforts of Lawyer Fafa Kpikpi, who helped me with materials on legal text and with the interpretation of the constitution of Ghana for my modelling. I am also grateful to Mr. Tony Ardy, a librarian of the Supreme Court of Ghana who assisted me with some court cases, which were necessary for my model.
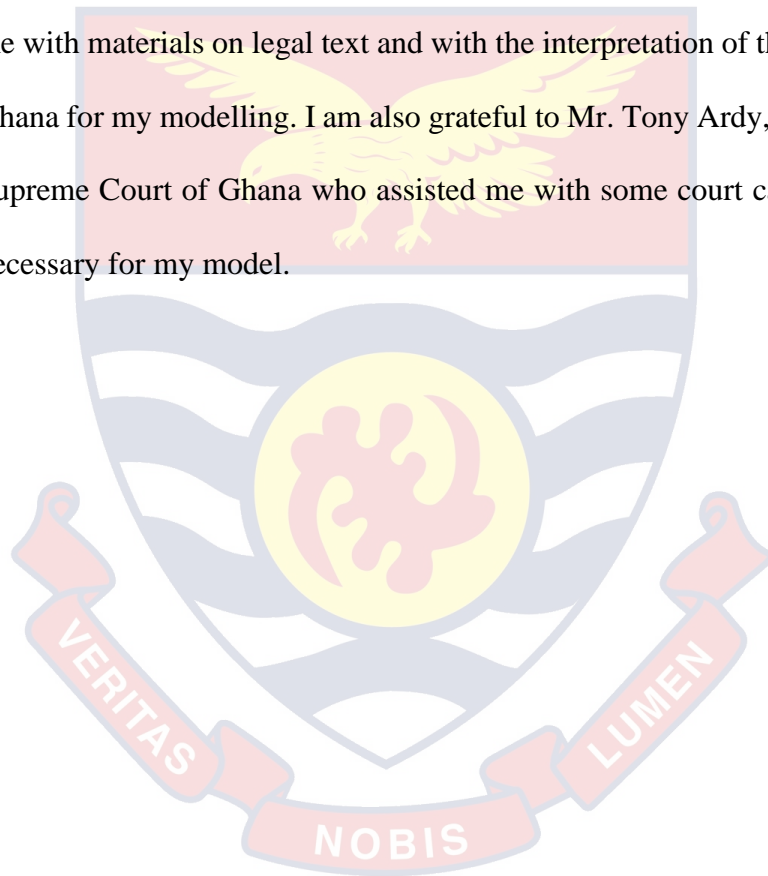
DEDICATION

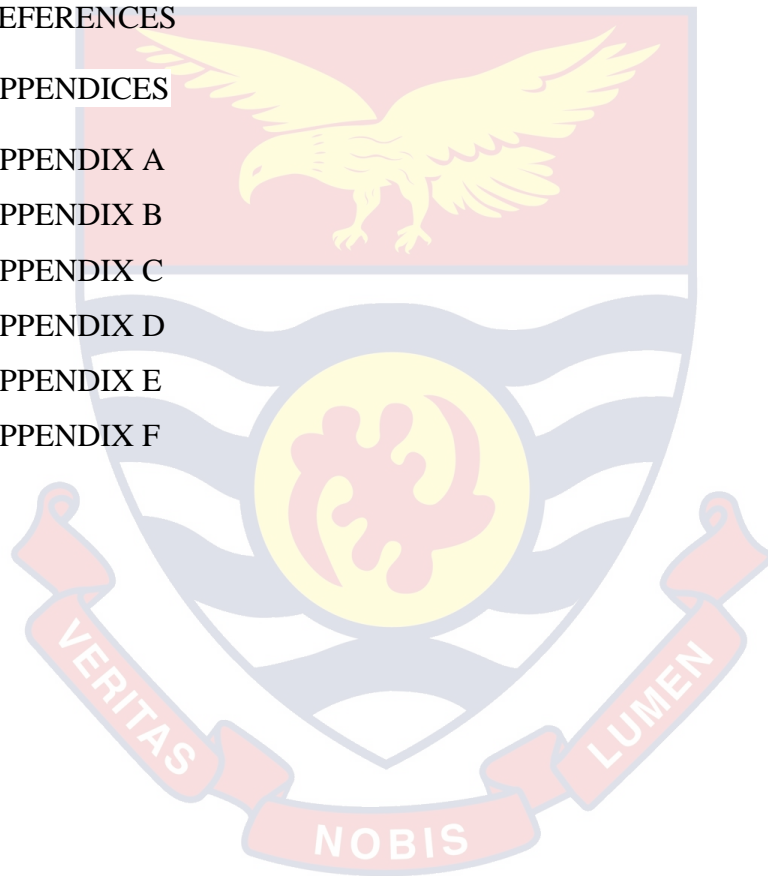To my mother Susana Sejoah and in memory of my father Ambrose B. A.

Nakpih.

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LIST OF ABBREVIATIONS

AI   Artificial Intelligence

DRT   Discourse Representation Theory

FOL   First Order Logic

NLP   Natural Language Processing

CHAPTER ONE

INTRODUCTION

Legal argumentation has been one domain of life that depends so much on the use and interpretation of text for processing decisions. This activity is so crucial that, it can determine the fate of person's life. The interpretation of text however is subject to the complexity of human expressions and reasoning. Natural expressions are done with different levels of ambiguities, which may lead to unsound reasoning as well as result in the introduction of fallacies in decisions that are taken through the process.

The discovery of fallacies however, is hardly noticed in the course of legal discourse or argumentation. This is because, the analysis of logical implication of natural expressions at the level of discourse is not robust enough to reveal unsound reasoning that lead to fallacies. I have explored and provided the use of logic tools for the process of reasoning through legal text for the discovery of fallacies. Even though some researchers have attempted to use computational means to support legal processes, they have not directly dealt with the problem of fallacies in legal text.

Background to the Study

The problem of semantics of natural language and information processing has always existed as a natural occurrence in every human communication system (Liu & Lieberman, 2005). The natural form of expression of human thought and presentation of information at the best of our reasoning happens with some variance in semantics. One statement could be

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expressed to have several meanings, while several statements could also be expressed to mean the same thing. This in essence reveals the beauty and creativity in natural language expression, and is not a challenge in human communications by itself. It is however challenging when other human activities depend `on the right intended meaning of expressed statements.

While several works of life —public and social communications— may be able to endure this challenge fairly , because it poses little threat to their functioning, the same challenge becomes extremely crucial for other domains, and requires utmost solution in this regard. One of such areas, which as well is the focus of this research, is the legal domain, where even human life may depend on the semantics of a statement and how they affect decision-making.

Much as semantics of natural language can be very tricky, legal expressions even presents a more difficult situation, not only in the way it is being expressed, but also in the semantics ascribed to every expression that is made. Legal statements as a matter of fact, are difficult to read, and also difficult to understand, and this is partly because legal statements are jargonised with words which are mostly not familiar in common language expressions, or words which are only known and understood by legal practitioners. Even practitioners in the domain sometimes allude different understanding to the same expressed statement in the legal field, and subject the statements to various argumentation to arrive at decisions. This does not however suggest that legal statements do not have definite meanings and are therefore open to all kinds of interpretations.

The rules that govern the interpretation of legal statement is quite clear in legal practice, what remains a challenge is the possibility of practitioners

implying different meaning to same statements in legal argumentation, which is either done deliberately by the practitioners or may appear as a genuine difficulty.

This difficulty in legal semantics is not a completely hopeless situation; It has rather had important attention of researchers over the centuries. One of the prominent research fields that has made efforts to deal with the problems of semantics, legal semantics for that matter, is AI in computer science.

Artificial Intelligence is a field in computer science where scientists seek to make machines *reason* like humans, by modelling the cognitive function of humans on the computer. The field encompasses logical reasoning and how things are perceived, particularly concerned with thought process and reasoning, and the representation of objects and concepts and how they relate (Russell & Noving, 2003). Knowledge representation (Luger & Stubblefield, 1993) in AI is the aspect that is particularly concerned with preserving information that is acquired through interrogation. The preserved information could be further queried to deduce new information from existing ones; this process is known as Automated Reasoning, where computers are programmed to reason automatically, which may include non-monotonic reasoning and uncertainties. The specific sub-field in AI that is dedicated to the understanding and processing of human language is NLP.

Natural Language Processing is an area in AI and computational linguistics that has sought to reconstruct language, using computing tools. The NLP discipline is a broad area that includes aspects as different as, automatic translation, or knowledge acquisition from written or spoken texts. Natural

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Language Understanding as a branch of NLP attempts to translate natural language into a precise mathematical formalism in a way that will capture this informational essence of a text freed from the ambiguity and imprecision of human languages.

Various types of logic, from Description Logic (Grau et al., 2008; Grosof, Harrocks, Volz & Decker, 2003) and Horn Logic (Horn, 1951) to First Order Logic (Andrews, 2002), Monadic Second Order (Andrew, 2002; Pandya, 2005) and various types of non-monotonic logics (Bidoit & Hull, 1989) have been used as the target language in automated translation process. When it comes to modelling the unconstrained human languages, all these approaches have had at best partial success in dealing with the problem of ambiguities and semantics.

Ambiguities are inherent in human or natural language, they are not an accident of language, they are rather essential for the way language works; a human language without ambiguity and imprecision would simply not work. This state of affairs leaves us with a great deal of difficulty to have a universal understanding to a piece of information.

Anjali and Babu (2014) define ambiguity as the case where a word, statement or piece of information is understood in more than one way. They have presented in their research the types of ambiguities which can occur at different levels in NLP, noting that, ambiguities could be lexical, semantic and syntactic. For instance, the phrase, *she cannot bear children*, is an ambiguous statement, which may either mean that she cannot tolerate children, or she cannot give birth to children. Another example is the phrase, *I am glad I am*

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done with the Ph. D programme, and so is Santini; this could mean that, Santini and I are both glad that I am done with the Ph. D programme. It could also mean that, I'm glad Santini and I are both done with the Ph. D. programme.

Ambiguities are not a problem in the normal day-to-day conversation; people are able to deal with them remarkably well, and only rarely do we see a serious miscommunication caused by ambiguity. One of the reasons is that, human communication always takes place in a context, and the context—— the social situation, the action that is taking place, the shared culture, and so forth— helps reduce the ambiguity of the communication. Things are different if we are trying to do logical reasoning on concepts expressed in natural language, as is done in the legal domain. In this case, ambiguities make us often deduce the wrong meaning from statements that are made by other people which were meant to be unambiguous and may lead to wrongly deduce conclusions from statements. These wrong conclusions are known as fallacies.

Several researchers have diverse definitions to what a fallacy is. Some consider a fallacy as error in reasoning (van Eemeren, Garssen & Meuffels 2009); others also consider a fallacy as untrue facts (Woods, 2004). A fallacy in the context of this research is an unsound reasoning in logic or an argument that is deductively incorrect, that is, an argument that is incorrect in its logical form, as well as one that is incorrect due to false premise. Here is an example of a fallacy, *all birds can fly, a penguin is a bird, therefore a penguin can fly*. The premise of the statement, which is a false premise, *all birds can fly*, informs the conclusion of the statement, which is a fallacious conclusion—and of course— if all birds can fly, then penguins which are birds should also fly following the

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premise made. But this is not the case, and it is also common knowledge that penguins do not fly.

Another example of a fallacy is; *I told a frog to jump and it did, then I cut off its legs and told it again to jump and it did not jump, therefore my conclusion is that the frog became deaf after its legs were cut off.* The frogs response to the command of jump is attributed to only its hearing function as indicated in the conclusion of the statement which is incomplete truth. The reasoning process is faulty, because the jump function of the frog is done by its legs after receiving the command, which the statement bypasses and alludes it to only the hearing ability of the frog. The frog for the second time heard the command but it did not have a leg to spring up or jump. This type of fallacy is a problem of causality, which is extensively elaborated in the discussion of this study.

Fallacies can happen accidentally or can be inserted in an argument intentionally, in order to deceive people (Bustamente & Dahlman, 2015). Note that in this context fallacies are defined for speeches in natural language, but they refer to logics for their definition.

The consequence of fallacies can be very grave, especially in instances where people's lives depend on the interpretation of some text. One of the most important areas in which these consequences can be especially serious is in legal discourse as done in law courts and senate houses, where legal texts are debated on in order to determine the fate of a situation that can affect masses of lives. Some of the words used in legal documents presents several levels of ambiguity, which results in parties engaged in legal argumentation to give different

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interpretations to the document (Levi, 1948). Words are given different meanings in different laws, and this brings about confusion in the minds of people as to what exactly the words mean (Schane, 2002).

In this work, I have presented a method for the formalisation of legal texts, and a model of reasoning oriented to the discovery of logical fallacies, inconsistencies and ambiguities in legal texts. The purpose of the reasoning tool is to help lawmakers, judges, and lawyers identify the areas in which the law is ambiguous, inconclusive, or self-contradictory.

Several language models have been developed by computer scientists and used in many NLP applications, but the facts still remain that we are almost presented with a despairing situation about ambiguity, fuzziness and indeterminacy inherent in natural language.

However, legal language, though a form of natural language, is structured to preserve, to some extent, a pattern of logic reasoning, precision in meaning and to be as unambiguous as possible. This makes legal language quite complicated and difficult to read as well, but it does presents an opportunity to use logic as a model of it, with the purpose of reducing as much as possible its residual ambiguity. Verheij, Hage and Arno (1997) assert that, there is a natural relation between logic and law, which has resulted into researchers focusing on the technical development of logic tools needed to model legal arguments adequately.

In this work, I have chosen as a testbed the Citizenship Act and the Fundamental Human Rights and Freedom of Ghana. The two legal documents —further explained in the ensuing chapters of the study— were chosen for the

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study because of their contrasting logical nature. The Citizenship Act deals with the right to be citizen, and how a person can lose his or her citizenship of Ghana. It is a very technical law of Ghana, with logically complex cases that strive to cover all possible situations in which a person can be considered as a citizen of Ghana.

One of the aspects of the citizenship law that makes it quite complex is because, the independence of Ghana dates back only to 1957, so there are still people alive who were in Ghana before the Republic was declared, and whose status can be uncertain per the provisions of the Act, which has no legal or logical criteria for a person to be citizen, beyond the date of the independence of Ghana. This and several other instances in the citizenship law presents complex examples of case-based reasoning.

The Chapter Five of the 1992 Constitution of Ghana is a much longer chapter that deals with the human rights and freedom of the people of Ghana. Its text is almost the opposite of that of the Citizenship Act; it collects some general principles —those of the universal declaration of human rights— and tries to transform them into applicable principles. In this case, the difficulties are not technical but semantic; the principles of human rights are quite general, and it is hard to transform them into a precise and unambiguous formulation. A law report or case is as well modelled as concrete example and a demonstration of deductive reason with the application of this law.

Every legal text passes through a sequence of processes to be accepted before it can be applied or used. In law making processes in Ghana, especially of legislative act, items of legislation called bills are presented to a legislative

body who debate on the bill in order to pass it into a law or otherwise (Friedrich Ebert-Stiftung Ghana, 2011). Legislators engage in legal argumentation to avoid creating laws which are in contravention with other existing laws. This gives legislators the responsibility of articulating facts of their arguments to other legal documents or existing laws.

Legislative instruments, such as existing laws form the basis for interpreting legal text to establish their true meaning and their application to other statements in decision-making processes. This research therefore presents a computational tool to augment the process for legal reasoning and decision-making in order to void the creation of fallacies as best as possible.

Statement of the Problem

The problem addressed by this research is the difficulty in identifying fallacies that occur in legal text during legal argumentation and legal reasoning. It is a major challenge that faces legal practitioners emanating from the complexity in the expression of legal language and the complex nature of fallacy itself.

Our legal world today is faced with two dimensions of this problem. On one hand they are faced with the ambiguous use of language and terminologies in legal text that makes it difficult for comprehension and sound reasoning during legal argumentation, which sometimes results in the making of fallacious statements which may occur in a claim made, facts established, arguments of lawyers and the decision of a judge (Endicott, 2016; Dickson, 2010). On the other hand, they are faced with the complex nature of fallacies that makes it

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very difficult to identify them when they occur, which for some reason may be genuine or deliberate (Krabbe, 2012), or simply elusive (Walton, 1995).

Even though other researchers in computer science— specifically in AI— have provided some tools to deal with the semantic problems in legal language, they are still generally seeking to provide improved versions of tools that exist, as well as new ones that can present legal language in crisp logical form that avoids confusion in the semantics of legal texts, as well as tools that can perform legal reasoning in legal argumentation for precision in decision-making (Al-AbdulKarim, Atkinso & Bench-Capon, 2016; Walton, Sartor & Macgagno, 2016; Zliobaite & Custers, 2016). All of these play into the fact that "…it is a necessary condition for a judicial condition to be legally justified that it coheres with some part of the established law" (Levenbook,1984).

Researchers are also interested in the provision of tools that can discover different forms of fallacies in natural language in general, while admitting that it is extremely challenging to have a robust system that deals with all kinds of fallacies by their general definition and classification (Gibson, Rowe & Reed, 2007).

Fallacies that occur in legal text are in specific context and may carry a form that can be defined and predicted by specific law, as well as a general form as known and classified by philosophers. This gives fallacies in legal text a unique nature and additional definition to what we may generally know. For instance, a fact that may be generally true may be fallacious by some specific applied law.

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It is therefore my interest, to provide a computational tool that addresses some semantic needs of legal text and the identification of fallacies in the legal domain. The limitations of previous works in this regard have been considered and forms part of the addressed issues in my discussions.

Purpose of the Study

The crux of this research is to provide a computational mechanism to discover fallacies in legal text and legal argumentation through deductive reasoning. The principal objectives of the research are as follows:

1. Formalise legal text as a knowledge base of a fallacy discovery system, thus, the Citizenship Act Ghana, and the Fundamental Human Rights of the 1992 Constitution of the Republic of Ghana.

2. Formalise excerpts of two court cases, thus, the 195-96 Ghana Law Report, a court case referencing the Citizenship Act of Ghana, and a Civil appeal referencing the Fundamental Human Rights and Freedom of Ghana. These are to serve as testbed to the system for sound and deductive reasoning and fallacy discovery.

3. Implement formalised text in Prolog programming for deductive reasoning and automated fallacy discovery.

Research Questions

The following research questions will be addressed by this study:

1. Can legal text be formalised as a First Order Logic program for clarity and comprehensibility to deal with the problem of ambiguity?

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2. Can there be a computational solution for sound and deductive reasoning through legal text and for discovery of fallacies?

3. Does Prolog offer the necessary capabilities to implement formalised legal text for automated fallacy discovery?

Significance of the Study

The findings of this research is practical for use by legal practitioners. The theoretical concepts I elaborated brings to bare the implications of forming legal text from the scratch in natural language. Doing so with the logical consequence in mind would guide careful choice, construction and use of words, phrases and statements in legal context, while the logic tool also provides technical methods for presenting and use of legal text in general.

I have in effect provided a handy tool for judges to be able check the consistency of facts made in cases presented in court with laws that apply to those facts. The model is able to reason through legal text and present conclusions to legal arguments. This reveals fallacious conclusions made based on unsound reasoning or the application of any legal rule wrongly.

This also becomes a tool for testing conclusions following all rules that are employed in the reasoning process. This makes it possible for contradictions to be revealed in particular instances of texts where legal rules are applied. The logic model is also a proof system for unit entities in statements, or, the truth-values of facts established about the entities, and the effects it has on the other entities. The model as a proof system has revealed some logical problems in parts of the existing laws. This important revelation is information for

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stakeholders of the law to take a second look at those aspects of the law for possible review.

Legal practitioners and institutions could use the system for guidance in the cause of court decision-making. Legal text is usually composed with technical terminologies which presents difficulties for interpretation or understanding in legal discourse. However, the logic model of every legal construction remains constant through the formalism of the text.

The findings of the study demonstrates another paradigm of generally handling the problem of ambiguities and fallacies in legal text. My results contributes to bridging part of the research gaps of dealing with fallacies, by the approach of modelling legal text for sound reasoning, and automating the process of discovering logical fallacies.

Delimitation

The research is conducted in the discipline of NLP which is a branch of AI. There are various varieties of natural languages or text where fallacies exist and require a way to deduce them. However, this research is focused on legal text, specifically the Citizenship Act of Ghana and the Fundamental Human Rights and Freedom of the 1992 Constitution of Ghana. Specific court cases are modelled as testbed for the reasoning process and the automatic discovery of fallacies.

The text of these legal documents are modelled in First Order Logic and implemented in Prolog programming language. The study is also focused on

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identifying logical fallacies —and not all types of fallacies— of *Non Sequitur* form only.

Limitations

One major limitation to this research is analytical difficulties on parts of legal texts that are presented with jargons and terminologies which do not have specific meaning as used in the law document.

Parts of the legal documents are overly expressive with a succession of meaning derived from other terms, and ends in a sentential structure which makes understanding of the intended meaning extremely difficult. This is the very problem of ambiguities in legal documentations.

The application of jurisprudence and case-based reasoning to decision-making by judges is also a challenge to this research. The system provided by this research reasons through a constructed structured language for decisions and for other computations. Areas of decisions made base on other cases would require that such cases are also modelled as part of the knowledge base of the system, which in its self is not a problem to this study, however the cases presented in the judgement are sometimes done by analogy and *Common Sense* which is a practical challenge for modelling and computation in general. Cause and effects of consequences is at the determination of human reasoning. Some acceptable legal cause and effect of a situation may not be logical. In effect, it is a general challenge to robustly handle *causality* in legal argumentation, since what makes sense at some points of discourse is within the power of the law-makers and not necessary what is logically true.

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Laws are subject to interpretation of the lawmakers, and new decisions taken overwrites old ones, this presents a dynamic implication for the knowledge base, which must change when old laws are overwritten by new ones.

Definition of Terms

The terms below are defined in the perspective of this research for the conceptual understanding of this work.

Formalise – "give definite structure or shape to, or restate the rules or implied rules of grammar in symbolic form".

Jurisprudence – "the theory or philosophy of law".

Legal argumentation – "A form of expression consisting of coherent set of reasons presenting or supporting a point of view".

Legal reasoning – "a method of argument used for applying legal rules".

Non Sequitur – "a conclusion or a statement that does not logically follow from the previous argument or statement".

Organisation of the Study

The general presentation of this research is done according to a general outline of a five-chapter thesis format. The first chapter of this thesis elaborates on an introduction of the research, giving the background of the specific area in which the study is undertaken, the problem that is identified, the purpose for which this study is undertaken, expounding on how the research outcome will have an effect in the area researched. The scope of the research is also defined

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in this chapter, noting the important issues that presents some level of limitation to the study.

In the second chapter, I have reviewed related research literature, chronologically, beginning with classical works done in ancient time that reviews important aspects of the logics which leads to what is interesting to current researchers on the same problem. I have stated my opinion, and stand with the ideas other researchers have bought to bare. I have in my arguments, in the review of other people's work, agreed largely with researchers who establish that computational tools can be useful in the process of law, as much as I have disagreed with researchers who think that computational tools cannot play any role in the process of law.

I have elaborated the standard procedures and methodology employed to achieve the results of the study in the third chapter. I have extensively described the study area, and the appropriate techniques as provided by the research design for this type of study.

The results of the study are presented in the fourth chapter with detailed explanation. The results are further discussed in the same chapter with research findings well established in the discussion.

I finally summarised the research in the fifth chapter, stating the conclusion of the study, the implication of the results that have been found by the study, what should be of interest to concerned stakeholders, as well as areas other researchers could further explore.

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CHAPTER TWO

LITERATURE REVIEW
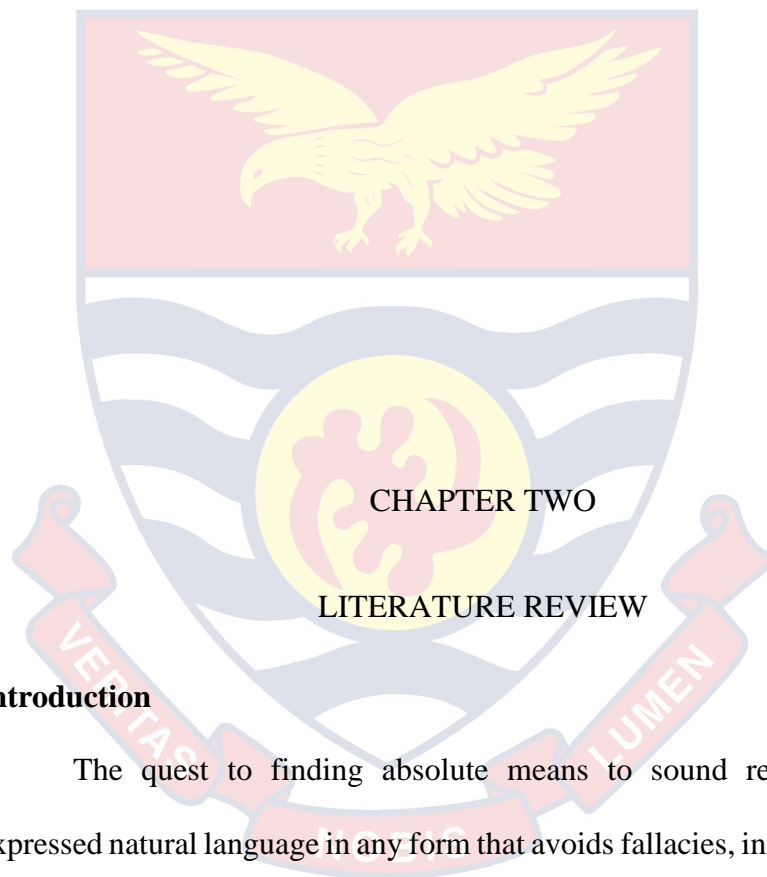
Introduction

The quest to finding absolute means to sound reasoning through expressed natural language in any form that avoids fallacies, in order to establish lucid semantics of information, is not unique to this research. This research evolved around questions logicians, argumentation theorist, linguistics, natural language processors, computer scientist and legal practitioners have asked over centuries up to date. Every domain of discipline has always sought some form of precision and clarity on how information is understood, presented and shared, with less effort. But the complexity of human language comes with this natural

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problem of ambiguity, which leaves researchers in a position of how to bridge the semantic gap.

This research makes experimental efforts focusing on legal language to contribute to the huge ancient quest of dealing with fallacies, which are resultants of ambiguities in natural language.

Conceptual Base of the Study

Plato, an ancient philosopher in classical Greece, was the first to outline examples of bad reasoning which formed the primary basis for classifying and naming fallacies. He presented a dialogue form of fallacious arguments, some of which were referred to later by Aristotle for naming his types of fallacies (Curtis, 2001).

The first formal logician to codify rules governing correct reasoning was Aristotle who was a student of Plato. Aristotle was the first to name the types of logical errors and classified them under various categories (Curtis, 2001).

Many other major contributions were made to the study of fallacies over the centuries by other philosophers, logicians and computer scientists such as Locke (as cited in Hansen, 2015) and Hamblin (as cited in Hansen, 2015) among others. Hamblin draws on the knowledge of Aristotle's system of logic and many others to elaborate the concept of argument and formal fallacies, and thus presenting a form of sound reasoning to argumentation.

Sound reasoning becomes the basis for well-grounded logic which leads to irrefutable conclusions. Sound reasoning puts us in the position of critically analysing and logically evaluating the adequacy of information as evidence to

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conclusions that are stated. Conversely, unsound reasoning leads us to inaccurate and fallacious conclusion. Plato and Aristotle's naming and classification of bad reasoning in the fourth century plunges us one step into dealing with the challenge of fallacies.

The naming and classification of logical errors and fallacies is a non-trivial approach which underlines the epistemological essence of emphasising on the evidence of knowledge presentation, and drawing specific meaning from generic ones. Therefore, at the ancient century of Plato and Aristotle, the structure and form of fallacies were already known, which in itself forms part of the solutions we offer today as part of our quest for clarity and precision in knowledge representation. However, how these fallacies were discovered in natural language required much effort in the age of Plato and Aristotle and the ages following. It is an analytical effort, which could not be employed in real-time processing of decisions and documents. This problem of effortless discovery of fallacies remains up to date.

This has led to modern researchers discussing and assessing various approaches to the discovery of various forms of fallacies in argumentation (van Eemeren, Garssen & Meuffels 2009; Massey, 1981), which is the very interest of this research; and offers some contribution to the solution, in the domain of legal argumentation, by offering a computational and automated approaches to the discovery of fallacies.

The idea to automate legal text and the use of computational tools in the law practice dates back to the 1940s. Kelso (1946) in his article *Does the Law need a Technological revolution?*, conceived and expressed the idea of an

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automated information system for legal practice through artificial intelligence research. Kelso (1946) indicated that, the correctness of justice and judgment depends on the mastery of facts and law, the challenge however remains in the quantity of legislative constructions, statutes, rulings, customs and practices, economic background and cases that may apply to facts of clients posed to lawyers engaged in a litigation. Kelso (1946) also advanced his ideas to propose an automated legal research system called Lawdex, which was created based on punch card technology. The proposition of Lawdex was to be designed as an information retrieval system that leverages efforts to find laws needed for particular purposes.

Having access to the right law when you need it is a good thing, but understanding it is another. Leovinger (1949) made an assertion of the problem of the language of law which is difficult to understand by lay people, —the very people the law is made for— because of its form of expressions and the use of jargons which are only familiar to legal practitioners. Leovinger (1949) summarises the problem by stating that "daily the law becomes more complex, citizens become more confused, and society becomes less cohesive". In lieu of this, he presented in his research, an application of computational and electronic methods to law, to resolve ambiguities in legal text.

Buchanan and Headrick (1970) further speculated several benefits of modelling legal reasoning by use of computers, for the study of problems in legal systems and for advancing the knowledge of the problem solving capabilities of computers, which will enhance the understanding of the processes undertaken by lawyers to do their work.

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Thus far, all these ideas shared by researchers from the 1940s to early 1970 did not yield a real system, until in the late 1970s where computer scientists begun implementing some of these ideas. Bing (1978) discussed several legal information retrieval systems that were created and being used at the time, most of which use Boolean operators and ranking function techniques for the design of the system. These systems were found very beneficial, but were quite challenging for users to operate, largely because the retrieval strategies were not simple enough for easy use. Bing (1978) therefore, proposed and introduced a much simpler retrieval system which required no advanced skill of users as required by the other systems.

Much efforts continued in investigating ways to make old systems better and generating new ones. Currently there exist several standardised systems created by experts for various forms of legal computations. Some of these systems include CEN Metalex, OASIS Legal XML, PACER among others. Most of these systems focus on presenting legal text in electronic form, finding and retrieving legal information and serving as database repositories for legal information. That notwithstanding, researchers in NLP continue to require some form of solution to make legal language much simpler for understanding and not just for retrieval purposes.

Some researchers are of the opinion that, applying logic-based techniques and rule-based reasoning to law, could be a lot more helpful in the development of electronic system in the legal domain (Love & Genesereth, 2005). Logic-based techniques are by far one of the promising ways to deal with ambiguities in legal text. Anjali and Babu (2014) discussed the various types of

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ambiguities that occur in natural language and the need for computational tools to resolve them, acknowledging that this is one of the ways we can have clarity in the presentation of natural language. Agreeably, research converges to the provision of logical tools for modelling legal language as the niche to the success of bridging the semantic gap in legal language, these ideas have been tested and a lot more tools have been built proving some level of success.

Even though computer scientists have proven to a great extent the use of logical tools for processing legal language, it still remains a very big debate among legal scholars as to whether logics exactly fits into legal reasoning and whether the role it plays has primary importance as stipulated by logicians and computer scientists. Some of these arguments lead researchers to present a formal model of legal argumentation (Sartor, 1994) focusing on the reconciliation of symbolic logics and argumentation theories by reconstructing the fundamental pattern of legal reasoning and further implemented in Prolog programming language. Sartor's model advanced the argument that one important necessity for the analysis and evaluation of legal arguments is formalism, which offers the possibilities of supporting them with some computing techniques. Real arguments could go through such evaluation to have its analysed results extended and checked by syntactic computation.

Legal formalism is a description of how legal decisions are supposed to be taken, drawing from logical structures to undisputable principles applied to facts. Formalism is noted to be a primary philosophy in decision-making processes in the legal domain, and yet remains to be a controversial issue among argumentation theorists, lawyers and researchers (Sartor, 1994; Posner, 1986).

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Posner (1986) is one of the researchers in law who claim that formalism is not useful when it comes to interpreting laws, even though he associates his thoughts with the fact that formalism is useful in common law reasoning. Posner (1986) including other argumentation theorists are of the strong opinion that aspects of legal and moral reasoning cannot be captured by symbolic logics, this follows the classical popular statement that "the life of law has not been logic; it has been experience" (Holmes, 2009). This emphasises the fact that, cases of common law are judged based on intuition by judges.

I agree to some extent, the position of the legal scholars' argument on the difference between human reasoning and that of computers; reasoning by intuition and analogy as done by humans, and step by step algorithmic processes as done by computers are completely distinct. Computers at their best can perform some case-based reasoning as supervised or unsupervised learning which is nowhere close to the power and complexity of intuitive reasoning by the human brain. However, we may not also be able to throw overboard, the idea of using computational tools to achieve better results in the process of decision-making in legal argumentation. Even though I find the debate by legal scholars very healthy, I believe that the formalism legal language should not be the point for contention, instead, the divergent ideas by legal scholars and logicians should be converged, and as a matter of fact, the two positions of opinion augment each other. The weakness of logic for legal reasoning presents the opportunities for assessing the structure of legal language and constructing it to a form that allows for the use of logical tools, bringing us back to formalism

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and modelling of legal argumentation (Sator, 1994) which is able to capture isomorphism to clarify the structure of legal reasoning.

Sartor (1994) points out an important concept of inference rules with the form, *A if B*, which allows unconditional deduction of *A*, where *B* is a premise and *A* is a resultant conclusion of *B*. This concept at syntax level results into conclusions that are deduced based on premises provided, which is an essential structure for formal proofs. This concept particularly forms part of my study for developing all valid arguments presented by the constitutional laws of Ghana and the testbed cases I presented. Building valid arguments makes it possible to test the truth state of a conclusion. The general rule of arguments with the form *A if B*, with *B_1, B_2, B_3,……, B_n*, as a set of premises and a consequential *A* as a conclusion, becomes a valid argument if and only if *$(B_1 \wedge B_2 \wedge B_3...B_n) \rightarrow$ A*. This concept is not only useful to test the validity of an argument in my research; it is an important concept I have considered in my efforts to automate the discovery of fallacies in legal text. The concept becomes particularly useful because, legal argumentation is presented with claims as premise to some conclusions and appropriate legal instruments employed to establish the validity of the argument, which largely takes the same form as presented by the logical argument form.

The concept is applied in my research with some care, considering the fact that, proofs of arguments done at human level is informal. In this form of proofs, the same inference rules may apply, but may not particularly capture every step of the proofs and some basic accepted facts that play part of the proofing of the argument. This is converse to formal proof systems as done by

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computational tools, where all details that form part of the proofs needs to be captured without which the system fails. In other words, the system should be able to capture all premises that forms part of the deduction of the conclusion, which will not change even when there are new set of premises introduced. This emphasises monotonicity in reasoning. For instance, as A is deduced from B_1, B_2, B_3,……, B_n, it should be possible to deduce A from another set of premise C_1, C_2, C_3,……, C_n, where B_n is a subset of C_n. Sartor (1994) considers a non-monotonic reasoning approach for his system which may not be desirable for fallacy discovery in the case of my study.

One of the important rules for establishing a fallacy is the occurrence of incomplete premise in an argument. A set of premises may lead to a conclusion which may be fallacious if it is not able to capture all premises necessary. Discovering fallacies in legal text should go through a form of deductive reasoning system which explores all available claims and allows for deducing conclusions from subsets of premises as well as their supersets of premises, which is the very property of monotonic reasoning.

We may argue that legal systems themselves allows for non-monotonic reasoning, which is true; legal argumentation is defeasible, but in the specific case of ascertaining the citizenship, or human rights of a person, as it is in the case of my study, conclusions are established by constitutional instruments and will not change based on provision of new legal instruments. For instance, if a person attains citizenship before the coming into force of the constitution of Ghana, his or her citizenship is not going to be annulled because there have been new provisions for citizenship after the coming into force of the constitution.

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The new provision gives us new premises to being citizen but does not affect the previous definition for being citizen. Again, the constitution allows persons to claim their citizenship through other person who are already citizens of Ghana, and such citizenship would have to be deduced from a larger subset of premise provided by the constitution. The semantics of some constitutional clauses become axioms, and other clauses may be built upon them. This gives us a deductive approach of reasoning through these clauses to establish and to maintain their original intent and semantics as may be applied to any argumentation.

Prakken (2012) offered a framework for formally reconstructing a legal opinion for argumentation-based inference, modelled by defeasible inference rules, making use of characterising semantics with labelling. Prakken(2012) uses similar model approach as Sartor(1994), to aggregate reason made in favour of or against proposals. As much as defeasible reasoning works well for the two researches, it may not be desirable for dealing with fallacies in legal text especially dealing with citizenship laws of Ghana. This is because defeasible reasoning is based more on rationality of a situation than its logical validity. New ideas introduced in arguments may change what has been conclusively true. The generation of fallacies cannot depend on the rational state of a situation. There has to be precise logic concepts that can be assessed by several means with their semantics maintained through all processes.

I am not going to plunge into the debate as to whether legal argumentation is defeasible or deductive reasoning, which has already been extensively discussed by other researchers. But my opinion on the matter is that,

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especially drawing from the analysis of Bayon (2001) on legal reasoning, some aspects of legal argumentation is defeasible, which is against the position of other opinions which states legal argumentation as completely defeasible reasoning.

Aspects of legal reasoning such as citizenship may require more definite clauses and inferential rules for proofs, as being citizen demands states of basic and definite truth states of axioms, as opposed to states which are subject to perspective. I am therefore emphasising that modelling pieces of law should take a non-defeasible approach which again emphasises monotonicity in reasoning.

Defeasible reasoning to some extent contributes to the problem of fallacies in legal argumentation. This is because statements which are open to more than one meaning and may hold true based on perspective, may as well present some level of ambiguities; ambiguities are grounds for the occurrence of fallacies. In my opinion, systems built for processing legal text, especially for the discovery of fallacies should not be based on defeasible reasoning, which will not be able to deal with the problem of ambiguities or fallacies, but should however be deductive and monotonic.

Sergot et al (1986) formalised the citizenship of the British Nationality Act as a computational tool to resolve several levels of ambiguities that are presented in the Act. The research highlighted several phrases in the Act which appears not to have crisp defined meaning, and as a result presented some controversies at the time it was enacted. Sergot's formalism of the British Nationality Act intended to bring clarity in the semantics of these controversies

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that were inherent in the Act. In their approach, they translated the Act to Prolog programming language in order to be able to mechanically determine the consequence of the Act. They have also tested in their research, the appropriateness of Prolog for legal reasoning and found the language quite robust to handle the fundamental reasoning indicators through the British Nationality Act.

Their modelling approach presents the whole Act as logic programme which makes it possible to test specific case with the Act to assert the citizenship state of an individual. This is an important concept that draws from the very principle of automated theorem proving, a proofs system that requires established axioms, inferential rules and the facts of the case under determination. The underlying principle is central to every deductive system, which as well is a primary approach adopted in my study. Sergot's research however only presented their results as logical concepts of the Prolog programme. It does not give us the real model data as a real application that can be tested for practical analysis. Even though the contribution is very valid and useful, it is not robust enough to assert the practical challenges of having a piece of law as a piece of programme. I have therefore in a step further, in this research, presented a model not only for theoretical analysis but also for practical use.

Many researchers have also demonstrated to a great extent the feasibility of bridging the semantic gap in legal reasoning by use of computational tools with different approaches and concepts. Govindarajulu, Bringsjord and Licato (2013) outlined current approaches to formalising natural language, which are

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all based on two major frameworks, that is, Montagovian framework and Discourse Representation Theory (DRT). They further provide a new approach which according to them functions better than Montagovian and DRT. These modern legal tools are developed to have direct connection with legal argumentation, built from the direct correlation of law and logic to deal with argumentation as a process (Hage, Leenes & Loder, 1994; Verheij, 1996).

Every attempt and effort made by research in this regard brings us closer to the solutions we seek to offer to make legal language more comprehensible. The collective progress so far renders modern logical tools —for modelling legal argumentation— able to deal with the following (a)burden of proof, (b) undercutters, (c) weighing information, (d) reasoning about weighing information, (e) reasoning about rules, (f) procedural rules, and commitment rules (Verheij, Hage and Loder, 1997).

However, one of the areas in legal argumentation that is yet to receive full attention is the discovery of fallacies by use of logical tools. This is therefore the focus of this research. I have explored the means to render legal text to formal language, and performed deductive reasoning on the text for revealing fallacies as a form of contribution to the many questions researcher are faced with.

Chapter Summary

I have essentially built on the various approaches that have been explored already by several research scholars, but uniquely provides a direct mechanism for dealing with ambiguities which are inherent in legal text as well

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as providing a good mechanism for discovering fallacies and proofing of legal text in general. This research is not in any way suggesting that tools that exist already are not useful enough to deal with the semantic problem in legal text; it rather captures aspects of the legal reasoning where little attention has been given by use of computational tools. Fallacies in legal text has by far received minimum attention largely because of their tricky nature and their complexities in legal text.

CHAPTER THREE

RESEARCH METHODS

Introduction

This research focused on the modelling of a computational logic tool that is able to deduce fallacies from legal text automatically. I have discussed in this chapter the approaches available for processing natural language and for legal reasoning. I have also elaborated the research method suitable for the purpose of this study and I have explained in specific terms, how the results of the study are achieved.

Research Design

Computer science inherits its research design from two major disciplines, that is, mathematics and engineering. Proofs, modelling, axioms and postulates are the methods in the discipline of mathematics, while approaches in the engineering field seek to measure, quantify and compare objects (Demeyer, 2011). This presents varied and wide methodology employed for research in computer science with very challenging instances of properly situating a research in a single and appropriate methodology paradigm.

Amidst the numerous research designs that exist, the design that offers the best processes and approaches to the focus of this study is the Philosophical Research design.

This research design offers argumentation tools, which are used to explore logic, and assumptions that are sometimes not flexible; this includes the

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analysis of arguments on fundamental issues. These argumentation tools are mostly derived from models, theories, concepts and philosophical traditions. The philosophical design uses analytical tools such as ontology, axiology and epistemology (Eugine & Lynn, 2016).

Axiological designs explore values held by individuals and how they relate. It establishes the difference between a matter of fact and a matter of value. Epistemology examines the nature of knowledge by consolidating individual ideas through conducted research in a field of study (Carnaghan, 2013). Epistemology in general studies how we know what we know (Creswell, 2014).

Ontologies in practice are logical models which encompasses information architecture, management, access, retrieval, and data modelling. Ontologies defines relationships that exist between entities, their types and properties, and as to whether such entities are real or they exist fundamentally. It categorises the needed entities with their relationships for a set of computation. (Gruber, 1993).

The use of ontologies as an analytical approach to the philosophical research design makes it a very effective and a more desirable approach to this study, since this study models a world of legal entities, their relationships and functions. Ontologies as well presents to this research, NLP techniques that define, organise, formalise and implement information.

The philosophical research design has its key strengths as an empirical tool for ethical decision-making process. It offers clarity to practical and

theoretical use of terms and concepts and their definitions. Unreflective modes of thoughts and discourse are invoked by these refined concepts and theories (Eugine & Lynn, 2016).

However, the design can be limited in the areas of analytical progression from philosophy to advocacy and between abstract thought and how it is applied to phenomenal world. There can be challenges in philosophical analysis due to usage of jargons and excessive documentation as well (Eugine & Lynn, 2016).

I have adopted the ontological techniques of formalism of the philosophical research design as a general approach to this study; the first step is the formalisation of the Citizenship Act 2000 and the Fundamental Human Rights and Freedom of Ghana. These two constitutional laws are modelled to serve as the knowledge base of the modelled system.

Second, the formalisation of excerpts of the *1995-1996 Ghana Law Report*, specifically on the Bilson versus Rawlings and Another court case. This court case presents a situation where a person contended the Ghanaian citizenship of another, which has direct implications of contesting in presidential elections of Ghana. This is modelled as test to the knowledge base to check the reasoning ability of the system, and also to check the consistency of the decision of the system with the reasoning of the judges and their decisions made in the court.

Third, the formalisation of a civil appeal to the supreme court of Ghana, *Gladys versus Mensah*. This is modelled as a testbed to the knowledge base to

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check the reasoning of the system and its consistency with judges' decisions taken.

Forth, programing the modelled text in Prolog programming language. This presented the possibility to query the system for information based on the modelled text. Through this process, the system is able to show statements that contradict each other, and those that are fallacious.

Study Area

The domain of the study is in Natural Language Processing in Artificial Intelligence, focusing on the processing of legal text to formal language for the purpose of identifying logical fallacies from arguments made based on the text. The choice to model legal text comes from the fact that it maintains a structure that can be modelled for computational reasoning.

I have particularly used the Citizenship Act 2000, and the Fundamental Human Rights and Freedom of the 1992 Constitutions of Ghana as the knowledge base for the development of the system. Two court cases are further modelled and used as testbed, for the reasoning of the system and discovery of fallacies of the constitutional texts and legal argumentation based on these laws.

The Structure and Format of the Ghanaian Constitution

The generic language of the constitution of Ghana like any other legal text, is difficult to read and to understand as asserted by the Friedrich Ebert-Stiftung Ghana (2011), due to the writing style used to compose it. However, it is formatted to establish logical statements or clauses as facts, which are mostly interdependent; this is done, generally, to have minimal ambiguity in the clauses

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or statements of the constitution. The statements are presented in a *logical form* [emphasis added] for the core purpose of clarity and interpretation. The logical form of a sentence is the abstraction of content terms from the subject matter (Audi, 1999).

The Citizenship and the human rights laws of Ghana, which are the two areas of focus of this study, takes a cue from the rules of composition from the general format of the Constitution.

In legal discourse in the practice of law, and for the purposes of establishing legal truth that is framed on the citizenship and the fundamental human rights and freedom of Ghana laws, references to these laws are made and presented as logical arguments by legal practitioners in court or by senators at the parliament house. Some interpretations are usually required on the clauses of laws in order to deduce what they mean as applied to other legal text, or, as they stand alone in logical arguments.

Logical arguments is described by Macoubrie (2003) as arguments derived from the form of their constituents, as in the case of ordered set of sentences. The logical form of an argument is also known as argument form. The argument form of the statements or clauses of the laws presents the possibility to model them into a formal language for further computation and deductions.

Citizenship of Ghana

There are several provisions by Ghanaian law that give people access and outlines procedures needed to acquire citizenship of Ghana. However,

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"along with the Constitution of Ghana, the Citizenship Act 2000 is the exhaustive law relating to citizenship in Ghana." ("Ghanaian Nationality Law," 2012).

The 1992 Constitution of the Republic of Ghana in its chapter three or article six defines the various kinds of citizenship of Ghana a person can have and how to acquire it. This nationality law was amended and enacted by The Parliament of Ghana and assented to, in 2000 as the Citizenship Act 2000 (ACT 591). The essence of the Act consolidated amendments of other related laws of Ghanaian Citizenship, and provides for the determination and acquisition of Citizenship of Ghana, ("Ghanaian Nationality Law," 2012).

There are other relevant laws in addition to the nationality law which have effect on the access to Ghanaian nationality: (a) Registration of Births and Deaths Act, 1965; (b) National Identity Register Act, 2008; (c) Immigration Act 2003; (d) the Ghana Refugee Law, 1992. All these laws have established in detail, how, when and where to attain different types of Ghanaian Citizenship (United Nations High Commissioner for Refugees [UNHCR], 2016).

The Citizenship Act consolidates and categorises the various types of Ghanaian citizenship into four parts. The first part describes existing citizenship by birth. The citizenship by birth has been described by different constitutions of Ghana at different periods of times or dates, which are not in contraventions of each other. They are all put together in the citizenship Act to establish all the conditions that are valid to ascertain citizenship of Ghana depending on the time period a person was born. This means that, a person can be citizen of Ghana by

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birth only if he or she satisfies at least one of the conditions stated in the Part One of the Act.

The second part defines the acquisition of Ghanaian Citizenship other than by birth. The laws of Ghana allows person of other nationalities to register to be citizen of Ghana or naturalise as Ghanaians. The Act provides the various conditions a person has to satisfy to obtain this type of citizenship of Ghana.

The third part presents three sections, that is, dual citizenship, renunciation of citizenship and deprivation of citizenship. The last part outlines miscellaneous provisions of the citizenship law. This provides for all types of persons under different legal and natural condition to be able to have access to Ghanaian citizenship.

The access to Ghanaian citizenship or nationality, and the proof of nationality are enforced by institutions such as the Ministry of the Interior, Ghana Immigration Service, Ghana Refugee Board Ministry of Foreign Affairs and Rational Integration, National Identification Authority, Births and Deaths Registry, and the Ministry of Local Government and Rural Development, (UNHCR, 2016).

The Fundamental Human Rights and Freedom of Ghana

The Fundamental Human Rights and Freedom of Ghana are the laws that provides for the rights and freedom for all natural and legal persons within the territorial boundaries of the country. The exercise of rights and freedom of a person is however observed with respect for the rights and freedom of other individuals and the interest of the public. This also implies that the rights of

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persons may vary depending on their legal and natural state as persons within the country (The Constitutions of Ghana, art. 12, 1992).

The rights and freedom of citizens of Ghana dates back to the colonial age of the country. These laws existed in different forms through the ages with very little effect or power of the citizens to exercise them because of colonialism. Eventually, the 1992 Constitution of Ghana captured the comprehensive rights and freedom of persons in the country, which gives people additional power to exercise the law (Human Rights Advocacy Center [HRAC], 2012).

The Chapter Five of the 1992 Constitution of the Republic of Ghana, is fully dedicated and specifies all the rights and freedom that is entitled to every person in the country. Even though every person within the country is entitled to the human rights and freedom laws, only Citizens of Ghana can amend the law by voting at a referendum with a minimum of forty per cent of registered voters to vote. However, the amendment can only be effected when 75% of the votes is in favour of the amendments (Otinkorang, 2011).

Formalism of the Legal Text

The underlying approach to achieving the research goal is the formalism of the Citizenship Act 2000, and the Fundamental Human Rights and Freedom Laws of Ghana, as well as the two Supreme Court cases ruled in reference to the two laws.

The formalism of textual information of various fields of disciplines have been attempted or explored extensively for the same reasons reconnoitred

by this research. The quest to deduce logical fallacies in legal text requires that the text should be converted from its structure of legal expression or writing to an *argument form* [emphasis added]. This requires annotating fragments of the sentences with symbols and presenting the sentences in their logical form.

Allen and Hand (2001) describes an argument in sentential logic as a set of sentences that has premises and a conclusion that could be either true or false. For an argument to be valid, if all its premises are true then its conclusion must be true. A sound argument is therefore one which is valid and all its premises are true. This will be the primary guide to every formalism and reasoning process in this research.

The presentation of argument form of sentences are done by use of formal languages such us Event calculus, First Order Logic, Predicate Logic, and Propositional Logic for mapping formal systems and natural language. I will however use First Order Logic to model the various text that are used for the system presented here.

First Order Logic

First Order Logic is a formal language that operates on systems of abstract thoughts based on mathematical models. It allows the use of variables in sentences or quantified variables over non-logical objects. (Hodgson, 1995).

First Order Logic is made of a syntax which determines the use of symbols for making acceptable expressions, as well as semantics which determines the meaning of expressions made. The logic language follows a pattern of Natural Language expression by adopting a world of objects,

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functions and relations. Objects are named as constants. For example, cal, simone, dr.1, cake. Constants can be mapped from one to another by use of functions, such as, *studentOf*, *supervisor-of*, *fatherOf*, *livesIn*, *CitizenOf* and so forth. This provides the ability to form atomic sentences which could be either true or false. Example, *student(boabeng, ucc),*this is an FOL expression to mean that, Boabeng is a student of UCC. Another example is, *supervisor(lamariel, student(boabeng, ucc))*. This also means that, Lamariel is the supervisor of Boabeng who is a student of UCC.

In the atomic sentences illustrated above, we notice that the term *boabeng* which is the object of the statement is given the property *student*, and the object *lamariel* is given the property *supervisor*. These properties are what we term as predicate symbols applied to objects which may return a true or false value. The objects may however be represented by use of variables such as *X,Y,Z* and so forth, which allows for the free use quantifiers such as, *for all*, *such that* and *there exists*. This allows for the presentation of statements in the form, *for all Y, there exist Y such that Y is Ford and Y is a Car*. This expression is a representation of the proposition *Ford is a Car* (Hodgson, 1995). The expressions of statements by use of quantifiers such as, *for all* and *there exists* can be represented by the use of the universal and existential quantifier symbols ∀ and ∃ respectively. FOL also gives the power of relating predicates by use of logical operators *AND, OR, IMPLIES, NOT*, by use of the logical symbols ∧, ∨, →, ¬ respectively. The statement *for all Y, there exist Y such that Y is Ford and Y is a Car* could be expressed as; ∀ Y ∃ Y ford(Y) ∧ car(Y).

The preference of First Order Logic over the other languages for this research is because, FOL by ontological provision goes beyond stating facts to expressing objects with their properties and relations. The structure of First Order Logic uses variables and quantifiers as noted in its definition. This allows for interpretation of more complex and long relations between objects other than presentation of truth tables. It also allows for forward and backwards unification for theorem proving (weld, 2012).

Prolog

Prolog is a declarative programming language designed for natural language processing as well as theorem proving which is built on First Order Logic (Stickel, 1992). It is an efficient language for describing objects and their relationships. Programming models in Prolog makes it possible to query the programmed data for truth values of sentences, for checking consistencies in reasoning and identifying contradictions, which is generally very convenient for symbolic computation. Prolog even becomes more convenient for defining objects and how they relate to each other, these relations in Prolog are usually defined by facts (Clockskin, 2003).

For instance, the phrase, *Adania lives in Navrongo*, can be defined in Prolog terms as *livesin(Adania, Navrongo)*. In this instance, we have two objects *Adania* and *Navrongo* which are related by the term *livesin*. In Prolog terms *livesin*, which is the relation of the objects is called the functor, and is placed directly before the parenthesis. The functor may take one or more arguments that are usually the objects of the statements. The functor may as

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well not take any argument at all. In this example, *Adania* and *Navrongo* are the objects of the statements and as well arguments of the functor *livesin*. These arguments are placed in the parenthesis of the Prolog statement. The number of arguments that a functor has is known as its arity, therefore, the arity of the statement in the example used here is two, hence *livesin/2*, since *livesin* takes two arguments.

Prolog statements could get very complex, depending on the literal statements they are coded after. Sometimes simple statements are nested into one another making them a little more complex. But that is not a problem if Prolog is able to keep track with the logical structure and intended semantics of the statement. This form of coding statements though mostly inevitable needs to be done with utmost care. The following is simple form of nested statement, that is, *callistus is a student and santini is his advisor*. Translating this into a simple Prolog statement, we have, *student(callistus)* as one factual statement and *advisor(santini, callistus)* as another. This could simply be nested as one statement, thus, *advisor(santini, student(callistus))*. This still gives us an arity of two of the functor *advisor*, thus *advisor/2*. This is because, even though *student(callistus)* is a full statement on its own and has one arity, *student/1*, it is being used as an argument by the functor *advisor*.

It is important to note that, arguments that are taken by functors could either be an atom, a number or a variable. Atoms in Prolog are words with established or generally known meaning not derived from another word. They are generally composed beginning with small letters or an underscore.

Arguments or functors which takes the form of atoms are non-deductive Prolog terms. For example, *red, 2, santini and x* are all types of Prolog atoms. Prolog variables on the other hand, are generally composed beginning capital letters. We can think of variables as placeholders which can be bound to a specific term or placeholders which can hold any term.

The overview of Prolog has the same structure as FOL, the only difference in their use is the differences in their syntax, and more importantly, the fact that Prolog implements FOL. Prolog thus far, clarifies the form and structure that is used to define facts of situations. Facts in the sense of non-equivocal statements made in the context of its domain and semantics, facts in the sense of accepted meaning by all in the context of the domain of the statement.

Facts however would not be useful as stand-alone statements until they form part of an integral semantic system of some statements. Facts together form a knowledge base to a system, where everything connects to make meaning that is more general. The knowledge base becomes a pool of information where other related statements could have their meaning deduced appropriately.

Prolog presents us with other forms of clauses apart from facts, which is known as rules. Rules are of the form *head: - body*. The symbol between the head and the body is an implication symbol, which is the same as $\rightarrow$, as found in FOL, which means that the head of the clause implies the body of the clause.

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In other words, the truth value of the head depends on the truth value of the body. If we have a simple statement for instance, which states that *A: -b*, means that *A* is true if *b* is true, or otherwise. The body of the rule could be a number of facts conjunctively or disjunctively combined.

Conjunctions (AND) in Prolog are declared using the coma sign, which is same as ∧ in FOL, whiles disjunctions (OR) are declared using the semi-colon sign, which is the same ∨ in FOL. There are other complex symbols that are used in Prolog code depending on the complexity of statement and the processes involved.

Chapter Summary

This research follows the structure of breaking down clauses of legal texts into their unit facts and rules as made available by constitutional provision, whiles holding them together as knowledge base for deductive reasoning. The knowledgebase of the system in this research, against which litigated issues are queried for the right semantics follows the rules and regulations of the reasoning mechanisms of the courts of Ghana, and only the syntax or logical sequence of the formal language used.

CHAPTER FOUR

RESULTS AND DISCUSSION
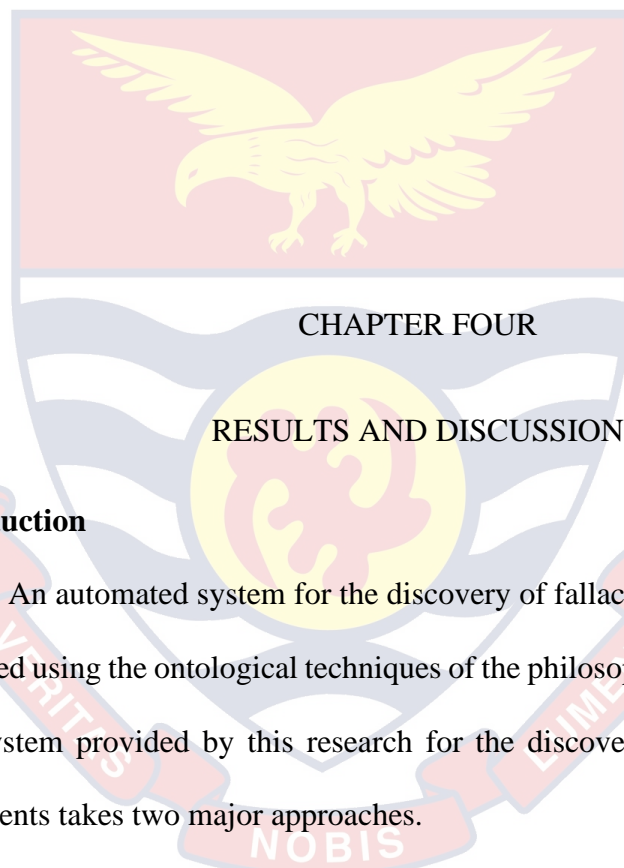
Introduction

An automated system for the discovery of fallacies in legal texts can be achieved using the ontological techniques of the philosophical research method. The system provided by this research for the discovery of fallacies in legal documents takes two major approaches.

First, I have modelled some piece of law as a knowledge base to the system. Established laws holds the essential facts that determine the truth state of legal cases. The laws essentially provides all assumptions and rules necessary to take prudent legal decisions, this by default makes established laws a knowledge base for legal practitioners, and hence, the reason for which it is modelled as knowledge base for the system presented by this research. Another

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important essence for modelling the laws, is to present them in forms that minimises ambiguities. Two major laws of Ghana were modelled, thus, the Citizenship Act and the Fundamental Human Rights and Freedom law of Ghana.

Second, I modelled two cases relative to the two knowledge base as testbed for the reasoning of the system. The texts was modelled in First Order Logic and implemented in Prolog for the automatic discovery process.

Results

The results presented here are formalised text in First Order Logic and Prolog programme of aspects of the Citizenship Act 2000, and a Supreme Court case which relied on aspects of this Act for judgement by the court.

The Fundamental Human Rights and Freedom Law of the 1992 Constitution as well as a Supreme Court case which also relied on this law for judgement by the court is also modelled and implemented in Prolog programme.

The implementation of Prolog uses Horn logic (Dantsin, Eiter, Gottlob & Voronkov 2001; Sterling & Shapiro, 1994). It is an expressive subset that uses a syntax which employs different symbolism but maintains the same structure as the FOL (Lloyd, 1987). The formalised Citizenship Act is presented both in FOL and Prolog language for logical proofing and semantic analysis, which reveals the word-based implication at the natural level of the text against the logical form of the same text.

The Fundamental Human Rights and Freedom law of Ghana is however presented in only Prolog programme syntax, since the concept of semantics analysis is adequately presented in the model of the Citizenship Act.

Formalised Text in First Order Logic: Citizenship Act 2000 (Act 591) of the Republic of Ghana

Section 1- Continuation of Existing Citizenship

byBirth; coded by birth and used as a property or type of Citizen

Legal; legal by the laws of Ghana

Ctz; coded for Citizen

time; property for date or a defined time period which takes the format of day month, and year; *dd.mm.yy*

Cont; coded for Continuous

gh; a constant defined for the country Ghana

x; A variable defined for all persons

T_eoc; coded for the time of the enforcement of the constitution of Ghana

lw; coded for law

$\exists$ lw, gh, T_eoc law(lw) $\wedge$ country(gh) $\wedge$ time(T_eoc) $\wedge$ at(by(existing(Ctz(x, gh)), lw), T_eoc)

$\forall$ x cont(Ctz(x, gh)) $\leftrightarrow$ at(by(existing(Ctz(x, gh)), lw), T_eoc)

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Section 2 – Ascertainment of the Law Applicable to Citizenship by Birth

This section only makes emphasis on the applicable provisions that are made for citizenship of Ghana by birth to be ascertained with ease, and therefore does not form part of the formalised text.

Section 3 – Persons Born before 6/3/57

$\exists t,x$ time(t) $\land$ person (x) $\land$ time(t)=03.06.57 $\land$

born(x, before(t))

father(p, x) $\lor$ mother(p, x)

parent(p, x) $\rightarrow$ father(p, x) $\lor$ mother(p, x)

grandparent(gp, x) $\rightarrow$ parent(p, x) $\land$ parent(gp, p)

$\exists$p,gp parent(p, x) $\land$ born(p, in(gh)) $\land$ grandparent(gp, x) $\land$ born(gp, in(gh))

$\forall$ x byBirth(Ctz(x, gh)) $\rightarrow$ $\exists$t, p, gp time(t) $=$ 03.06.57 $\land$ born(x, in(gh)) $\land$ born(x, before(t)) $\land$ parent(p, x) $\land$ grandparent(gp, x) $\land$ [born(p, in(gh)) $\lor$ born(gp, in(gh))]

$\exists$p, parent(p, x) $\land \neg$ born(x, in(gh))

$\land$ born(p, in(gh)) $\rightarrow$ byBirth(Ctz(x, gh))

Section 4- Persons Born on or after 6/3/57

$\exists$t1, t2 time(t1)=03.06.57 $\land$ time(t2)=22.08.69

$\forall$x byBirth(Ctz(x, gh)) $\land$ [born(x, on(t1) $\lor$ born(x, after(t1))] $\land$ born(x, before(t2))

Persons born in Ghana:

father(p, x) $\oplus$ mother(p, x)

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parent(p, x) → father(p, x) ∨ mother(p, x)

grandparent(gp, x) → parent(p, x) ∧ parent(gp, p)

greatgrandparent (ggp, x) → grandparent(gp, x) ∧ parent(ggp, gp)

∃x,p, gp, ggp

parent(p, x)

∧ grandparent(gp, x)

∧ greatgparent(ggp, x)

∧ born(x, in(gh))

∧ born([father(p, x) ∨ mother(p, x)] , in(gh))

∧ [born(gp, in(gh)) ∨ born(ggp, in(gh))]

Persons born outside Ghana:

∃x,p, gp, ggp

parent(p, x)

∧ grandparent(gp, x)

∧ greatgparent(ggp, x)

∧ ¬ born(x, in(gh))

∧ born(p, in(gh))

∧ [born(gp, in(gh)) ∨ born(ggp, in(gh))]

Therefore;

∀x [born(x, in(gh)) ⊕ ¬ born(x, in(gh))] ∧ [born(x, on(t1) ⊕ born(x, after(t1))] ∧ born(x, before(t2))] → ∃p, gp, ggp [father(p, x) ⊕ mother(p, x)] ∧ grandparent(gp, x) ∧ greatgparent(ggp, x)   ∧

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born([father(p, x) ∨ mother(p, x)] , in(gh)) ∧ [born(gp, in(gh))   ∨

born(ggp, in(gh))] → byBirth(Ctz(x, gh))

Section 4(1)(b)

∀x,∃p, gp born(x, in(gh))

∧ parent(p, x)

∧ ¬ born(p, in(gh))

∧ grandparent(gp, x)

∧ born(gp, in(gh))

→ byBirth(Ctz(x, gh))

Section 4(2)

∃p, gp, ggp

parent(p, x)

∧ grandparent(gp, x)

∧ greatgparent(ggp, x)

∧ [claimedThrough(Ctz(x, gh), p) ∨ claimedThrough(Ctz(x, gh), gp) ∨

claimedThrough(Ctz(x, gh), ggp)]

∧ [at(¬ Ctz(p, gh), birth(x)) ∧ at(¬ Ctz(gp, gh), birth(x)) ∧ at(¬

Ctz(ggp, gh), birth(x))]

→ ¬ Ctz(x, gh)

Section 4(3)(a)

∃t1,t2 time(t1) ∧ time(t)=03.06.57 ∧ time(t2) ∧ time(t2)=22.08.69

∀x born(x, in(gh)) ∧ [born(x, on(t1) ⊕ born(x, after(t1))] ∧ born(x,

before(t2))] →

∃p father(p, x) ∨ mother(p, x)

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∧ by(at([Ctz(father(p,x)) ∨ Ctz(mother(p,x))], birth(x)), registration) ⊕

by(at([Ctz(father(p, x)) ∨ Ctz(mother(p,x))], birth(x)), naturalization) →

byBirth(Ctz(x, gh))

Section 4(3)(b)

∃t1,t2 time(t1) ∧ time(t)=03.06.57 ∧ time(t2) ∧ time(t2)=22.08.69

∀x born(x, in(gh)) ∧ [born(x, on(t1) ∨ born(x, after(t1))] ∧ born(x,

before(t2))] →

∃p father(p, x) ⊕ mother(p, x)

∧ by(at([Ctz(father(p,x)) ∧ Ctz(mother(p,x))], birth(x)), registration) ⊕

by(at([Ctz(father(p, x)) ∧ Ctz(mother(p,x))], birth(x)), naturalization)

 → byBirth(Ctz(x, gh))

Section 5- Persons Born on or after 22/8/69

∃t3 time(t3) =24.09.79

∀x [born(x, in(gh)) ⊕ ¬ born(x, in(gh))] ∧ [born(x, on(t2) ⊕ born(x,

after(t2))] ∧ born(x, before(t3))] →

∃p parent(p, x)

∧ [at(Ctz(p, gh), birth(x))]

→ byBirth(Ctz(x, gh))

Section 6(a)- Persons Born on or after 24/9/79

∃x,t4,p,gp born(x, in(gh))   ∧ time(t4)=07.01.93∧ [born(x, on(t3)) ⊕

born(x, after(t3))] ∧ born(x, before(t4))]

∧ [father(p, x)), birth(x)) ⊕ mother(p, x)]

∧ grandparent(gp, x)

∧ [at(Ctz(father(p, x)), birth(x)) ∨ at(Ctz(mother(p, x)), birth(x))]

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∨ Ctz(grandparent(gp, x)), birth(x))

→byBirth(Ctz(x, gh))

Section 6(b)

∃x,t4,p,gp ¬ born(x, in(gh)) ∧ time(t4)=07.01.93

∧ [born(x, on(t3)) ⊕ born(x, after(t3))] ∧ born(x, before(t4))]

∧ parent(p, x)

∧ [at(Ctz(father(p, x)), birth(x)) ∨ at(Ctz(mother(p, x)), birth(x))]

→byBirth(Ctz(x, gh))

Section 7-Persons Born on or after 7/1/93

∃t4 time(5)=07.01.93

∀x born(x, in(gh)) ⊕ ¬born(x, in(gh))]

→ ∃t4, p, gp born(x, on(t4) ∨ born(x, after(t4))]

∧ [father(p, x)) ⊕ mother(p, x)]

∧ grandparent(gp, x)

∧ [at([Ctz(father(p, x)) ∨ Ctz(mother(p, x))], birth(x)) ∨ at(Ctz(gp, gh),

birth(x))]

→ byBirth(Ctz(x, gh))

Section 8- Foundling

∀x child(x) → ∃p, parent(p, x) ∧ age(x) < 8 ∧ found(x, in(gh)) ∧ ¬

known(p) → byBirht(Ctz(x, gh))

Section 9- Adopted Children

∃p,y ∀ x, [child(x) ∧ age(x)<17 ∧ parent(p, x) ∧ ¬ Ctz(p, gh) ∧ Ctz(y,

gh) ∧ adopts(y, x)] → Ctz(x, gh)

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Section 10(1) – Citizenship by Registration

∃x,c Ctz(x, approved(country(c))) ∧ ofAge(x, of(c)) ∧ ofCapacity(x, of(c)) ∧ approved(applied(x), by(president)) ∧ has(x, good(character))

∧ ordinarily(resident(x, gh))

∃pr1 period(pr1)=5 ∧ resident(x, through(pr1))

∃L indigenous(language (L), gh) ∧ speaks(x, L)

∃x,c Ctz(x, approved(country(c))) ∧ ofAge(x, of(c)) ∧ ofCapacity(x, of(c)) ∧ approved(applied(x), by(president)) ∧ has(x, good(character))

∧ ordinarily(resident(x, gh)) ∧ [∃pr1 period(pr)=5 ∧ resident(x, through(pr1))] ∧ [∃L indigenous(language (L), gh) ∧ speaks(x, L)] → byRegistration(Ctz(x, gh))

Section 10(2)

∃x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [married(x, y) ⊕ at(was(married(x, y)), death(y))] ∧ applied(x)] → byRegistration(Ctz(x, gh))

Section 10(3)

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [married(x, y) ⊕ at(was(married(x, y)), death(x))] ∧ applied(x)] → byRegistration(Ctz(x, gh))

Section 10(4)

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ dissolved (married(x, y)) ∧ applied(x)] → cont(byRegistration(Ctz(x, gh)))

Section 10(5)

∃x ¬ Ctz(x, gh) ∧ [∃y Ctz(y, gh) ∧ [married(x, y) ⊕ at(was(married(x, y))] ∧ applied(x)] → byRegistration(Ctz(x, gh))

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$\exists z$ child(z, byRegistration(Ctz(x, gh))) $\rightarrow$ Ctz(z, gh)

Section 10(6)

$\exists x \neg$ Ctz(x, gh)   [$\exists y$ Ctz(y, gh) $\wedge$ [in(married(x, y), good(faith)) $\oplus$ in(was(married(x, y)), good(faith))] $\wedge \neg$ primarily(married(x, y), for(registration)) $\wedge$ applied(x)] $\rightarrow$ byRegistration(Ctz(x, gh))

Section 10(7)

$\exists x$ [man(x) $\wedge \neg$ Ctz(x, gh) $\wedge$ seeking(x, registration) $\wedge$ permanently(resident(x, gh))]

Section 10(8)

$\forall x$ person(x) [as($\neg$ registered(x) , Ctz(gh))] $\rightarrow \neg$ taken(x, of(oath, allegiance))

$\forall x$ byRegistration(Ctz(x, gh)) $\rightarrow$ take(x, of(oath, allegiance))

Section 11

$\exists x, m$ child(x) $\wedge$ minister(m) $\wedge$ as(register(m, x), Ctz(gh)) $\rightarrow \exists y$ person(y) $\wedge$ [parent(y, x) $\vee$ guardian(y, x)] $\wedge$ [byRegistration((Ctz(y, gh)) $\vee$ byNaturalisation(Ctz(y, gh))] $\wedge$ applies(y)

Section 12(1)

For persons registered under section 10;

$\exists x, c$ Ctz(x, approved(country(c))) $\wedge$ ofAge(x, of(c)) $\wedge$ ofCapacity(x, of(c)) $\wedge$ approved(applied(x), by(president)) $\wedge$ has(x, good(character)) $\wedge$ ordinarily(resident(x, gh)) $\wedge$ [$\exists pr1$ period(pr)=5 $\wedge$ resident(x, through(pr1))] $\wedge$ [$\exists L$ indiginous(language (L[ ]), gh) $\wedge$ speaks(x, L[ ])] $\rightarrow$ byRegistration(Ctz(x, gh)) $\wedge$ [$\exists Tc$ date(Tc) $\wedge$ date(Tc, of(certificate, registration)) $\wedge$ from(byRegistration(Ctz(x, gh)), Tc)]

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∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [married(x, y) ∨ was(married(x, y))]

∧ applied(x)] → byRegistration(Ctz(x, gh)) ∧ [∃Tc date(Tc) ∧ date(Tc,

of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [married(x, y) ∨ at(was(married(x, y)),

death(x))] ∧ applied(x)] → byRegistration(Ctz(x, gh)) ∧ [∃Tc date(Tc)

∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x,

gh)), Tc)]

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ dissolved (married(x, y)) ∧ applied(x)]

→ cont(byRegistration(Ctz(x, gh))) ∧ [∃Tc date(Tc) ∧ date(Tc,

of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

∃x, y person(x) ∧ child(y) ∧ of(child(x), of(marriage, x)) ∧

byRegistration(Ctz(x, gh))) → cont(Ctz(y, gh)) ∧ [∃Tc date(Tc) ∧

date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)),

Tc)]

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [in(married(x, y), good(faith)) ∨

in(was(married(x, y)), good(faith))] ∧ ¬ primarily(married(x, y),

for(registration)) ∧ applied(x)] → byRegistration(Ctz(x, gh)) ∧ [∃Tc

date(Tc)   ∧   date(Tc,   of(certificate,   registration))   ∧

from(byRegistration(Ctz(x, gh)), Tc)]

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∀ x [man(x) ∧ ¬ Ctz(x, gh) ∧ seeking(x, registration) ∧ permanently(resident(x, gh))]

[∃y Ctz(y, gh) ∧ [married(x, y) ∨ was(married(x, y))] ∧ applied(x)] → byRegistration(Ctz(x, gh)) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

For persons registered under section 11;

Tc; coded for date (time) stated on certificate of registration

∃x, m child(x) ∧ minister(m) ∧ as(register(m, x), Ctz(gh)) → ∃y person(y) ∧ [parent(y, x) ∨ guardian(y, x)] ∧ [byRegistration((Ctz(y, gh)) ∨ byNaturalisation(Ctz(y, gh))] ∧ applies(y) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

Section 12(2)

Toa; date of taking of oath of allegiance

∃Ta; date(Toa) ∧ date(Toa) = date (Tc) ∧ on(taken(x, of(oath, allegiance)), Toa)

Section 14(1)(a)

Ta; date (time) of application

pr2; period of time in years

∃x, person (x) ∧ qualifies(x, naturalisation) ∧ resident(x, gh)

∧ on(applied(x), time(ta))

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∃pr2, ta period(pr2)=1 ∧ timeofApp(ta) ∧ resident(x, through(pr2)) ∧

immediatelypreceding (resident(x, through(pr2)), on(applied(x),

time(ta)))

∃x, pr2, ta person(x) ∧ resident(x, gh) ∧ period(pr2)=1 ∧ timeofApp(ta)

∧ resident(x, through(pr)) ∧ immediatlypreceding (resident(x,

through(pr2)), on(applied(x), time(ta))) → qualifies(x, naturalisation)

Section 14(1)(b)

∃x, pr3, pr4, pr5 person(x) ∧ period(pr3)=7 ∧ period(pr4)=1 ∧ period

(pr5)

∧ resident(x, gh) ∧ immediatlypreceding (pr3, pr4)

∧ resident(x, during (immediatlypreceding (pr3, pr4))> 4

→ qualifies(x, naturalisation)

Section 14(1)(c)

∃np, lwr, spo notriesPublic(np) ∧ lawyer(lwr) ∧

seniorPublicOfficer(spo) ∧

Ctz(np, gh) ∧ Ctz(lwr, gh) ∧ Ctz(spo, gh) ∧

∃ x, person(x)

∧ attest([np ∧ lwr], has(x, good(character)))

∨ attest([lwr ∧ spo], has(x, good(character)))

∨ attest([np ∧ np], has(x, good(character)))

∨ attest([lwr ∧ lwr], has(x, good(character)))

∨ attest([spo ∧ spo], has(x, good(character)))

→ qualifies(x, naturalisation)

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Section 14(1)(d)

∃x, lw, ofn, pr person(x) ∧ law(lw)∧ of(lw, gh) ∧ ofence(ofn)

∧ period(pr)

∧ recognisedby(ofn, lw)

∧ [for(¬ in(sentenced(x, of(pr, imprisonment)) , gh), recognisedby(ofn,

lw))∨for(¬in(sentenced(x,of(pr,imprisonment)),¬gh),

recognisedby(ofn, lw))]

→ qualifies(x, naturalisation)

Section 14(1)(e)

∃L indigenous(language(L[ ]), gh) ∧ speaks(x, L[ ])

∃L indigenous(language (L[ ]), gh) ∧ speaks(x, L[ ])

→ qualifies(x, naturalisation)

Section 14(1)(f)

∃x,cnt persom(x) ∧ contribution(cnt) ∧ ¬ Ctz(x, gh)

∧ [to(made(x, substantial(cnt)), national(progress)) ∨ to(Of(capable(x)

, making(substantial(cnt))), national(progress)))]

→ qualifies(x, naturalisation)

Section 14(1)(g)

∃gl,x ghanaianLife(gl)

∧ person(x)

∧ assimilated(x, gl)

∨ canBeEasily(assimilated(x, gl))

→ qualifies(x, naturalisation)

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Section 14(1)(h)(i)

∃x, person(x)

∧ permanently(reside(Intends(x), gh))

∧ granted(x, certificate)

∧ [∃ pmt,ta permit(pmt) ∧ timeofApp(ta) ∧ valid(resident (pmt)) ∧

on(possessed(x, pmt), ta)]

→ qualifies(x, naturalisation)

Section 14(2)(a)(b)

∃ x, pr6,ta,1a,sect14 theMinister(x) ∧ period (pr6)=1 ∧ timeofApp(ta) ∧

subsect(1a) ∧   section(sect14) ∧ of(1a, sect14) ∧ mayAllow(x,

before(ending(continuous(pr6)))=< 0.5 , ta)) ∧ asThough(for(reckoned

(pr) , purposesOf(1a)) , immediately(preceding , ta))

∃ c, 1b,r approved(country(c)) ∧   subSect(1b) ∧ of(1b , sect14) ∧

residence (r) ∧   in(r , c) ∧ asThough(reckoned(mayAllow(x , r),

for(purposesOf(1b)) , in(r, gh))

Testbed of Formalised Text of Supreme Court Case in First Order Logic:

[1995-1996] Ghana Law Report

Claim by Plaintiff

∃f_d, person(f_d) [at(Ctz(f_d, gh), age(21))

∧ at(Ctz(f_d, ¬ gh), age(21))

∧ ¬ renounce(f_d, Ctz(f_d, ¬ gh))]

→ ¬ Ctz(f_d, gh)

¬ Ctz(f_d, gh) ↔ ¬ qualified(f_d, of(office, pog))

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Referenced Legislative Instruments by Plaintiff

Section 8 (1) of Act (361) 1971

∀x [at(Ctz(x, gh), age(21))

∧ at(Ctz(x, ¬ gh), age(21))

∧ ¬ renounce(x, Ctz(x, ¬ gh))]

↔ upon(¬ Ctz(x, gh), sdate(T))

Therefore;

∀x [at(Ctz(x, gh), age(21))

∧ at(Ctz(x, ¬ gh), age(21))

∧ renounce(x, Ctz(x, ¬ gh))]

→   Ctz(x, gh)

∀x [at(Ctz(x, gh), age(21))

∧ ¬ bornIn(x, gh)

∧ at(Ctz(x, ¬ gh), age(21))

∧ ¬ renounce(x, Ctz(x, ¬ gh))

∧ ¬ with(registered(x, doi(in(reside, gh))), minister)]

↔ upon(¬ Ctz(x, gh), sdate(T))

Therefore;

∀x [at(Ctz(x, gh), age(21))

∧ ¬ bornIn(x, gh)

∧ at(Ctz(x, ¬ gh), age(21))

∧ ¬ renounce(x, Ctz(x, ¬ gh))

∧ with(registered(x, doi(in(reside, gh))), minister)]

→ Ctz(x, gh)

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Section 8 (2) a, b, c

at(cont(Ctz(x, gh), age(21)))

∧ at(Ctz(x, ¬ gh), T_eoc)

∧ ¬ renounce (x, Ctz(x, ¬ gh))

∧ ¬ taken(x, of(oath, allegiance))

↔ upon(¬ Ctz(x, gh), sdate(T))

Therefore;

at(cont(Ctz(x, gh), age(21)))

∧ at(Ctz(x, ¬ gh), T_eoc)

∧ renounce (x, Ctz(x, ¬ gh))

∧ taken(x, of(oath, allegiance))

→ Ctz(x, gh)

Formalised Text of Court Decision

∃f_d, person(f_d) [at(Ctz(f_d, gh), age(21))

∧ ∅

∧ ∅

↔ ¬ Ctz(f_d, gh)

at(Ctz(f_d, gh), age(21))

∧ at(Ctz(f_d, ¬ gh), age(21))

∧ ¬ renounce(f_d, Ctz(f_d, ¬ gh))

↔ ¬ Ctz(f_d, gh)

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Implemented Formalised Text of the Citizenship Act 2000 (Act 591) of the

Republic of Ghana as a Prolog Programme

Section 1 - Continuation of Existing Citizenship

T_edc@<T_eoc.

was_Ctz(X, gh):- T_edc@<T_eoc.

existing(isCtz(X)):- was_Ctz(X, gh).

t_CAEoC (T_edc, T_eoc):- T_edc @>= T_eoc.

cont(isCtz(X)):- existing(isCtz(X)), t_CAEoC(T_edc, T_eoc).

Section 3(a) – Persons born before 6/3/57

t_B6357(T_dob,T_doi):-T_dob@<T_doi.

bornAt (X, t_B6357(T_dob, T_doi)).

byBirth(isCtz(X, gh)).

bornIn(P, gh):-bornIn(parent(Z,X), gh).

bornIn(GP, gh):-bornIn(gparent(G,X), gh).

bornIn(GG,gh):-bornIn(g_gparent(GG,X),gh).

byBirth(isCtz(X,gh)):-

bornAt(X,t_B6357(T_dob,T_doi)),bornIn(X,gh),bornIn(P,gh);

bornIn(GP,gh).

Model 3(b) follows the same pattern;

byBirth(isCtz(X,gh)):-bornAt(X,t_B6357(T_dob,T_doi)),

bornOut(X,gh),bornIn(P,gh).

Section 3(b)

byBirth(isCtz(X,gh)):-bornAt(X,t_B6357(T_dob,T_doi)),

bornOut(X,gh),bornIn(P,gh).

Section 4 – Persons Born on or after 6/3/57 but 22/8/69

t_OA57B69   (T_dob,T_doi,T_69c):-T_dob@>=T_doi,

T_dob@<T_69c.

bornAt(X, t_OA57B69 (T_dob,T_doi,T_69c)).

Section 4(1)(a)

byBirth(isCtz(X,gh)):-bornAt(X,t_OA57B69(T_dob,

T_doi,T_69c)),bornIn(X,   gh);bornOut(X,   gh),   bornIn(GP,

gh);bornIn(GG, gh).

Section 4(1)(b)

byBirth(isCtz(X,gh)):-bornAt(X,t_OA57B69(T_dob,T_doi,T_69c)),

bornIn(X,gh),not(bornIn(P,gh)), bornIn(GP,gh).

Section 4(2)

stripped(isCtz(gparent(G,X),gh,T_dob)).

stripped(isCtz(g_gparent(GG,X),gh,T_dob)).

not(byBirth(isCtz(X,gh,T_dob))):-bornAt(X,t_OA57B69

(T_dob,T_doi,T_69c)) , stripped(isCtz(parent(Z,X),gh,T_dob));

stripped(isCtz(gparent(G,X),gh,T_dob));

stripped(isCtz(g_gparent(GG,X),gh,T_dob)).

Section(4)(3)(a)

byBirth(isCtz(X,gh,T_dob)):-

bornAt(X, t_OA57B69 (T_dob,T_doi,T_69c)),

bornIn(X,gh);bornOut(X,gh),

byReg(isCtz(parent(Z,X),gh,T_dob));

byNat(isCtz(parent(Z,X),gh,T_dob)).

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Section 5 - Persons Born on or after 22/8/69—Constitution 1969

bornAt(X, t_OA69B79 (T_dob,T_69c,T_79c)).

wasCtz(parent(Z, X),gh, T_dob).

byBirth(isCtz(X,gh,T_dob)):-

bornAt(X,t_OA69B79(T_dob,T_69c,T_79c)),

bornIn(X,gh);

bornOut(X,gh),

wasCtz(parent(Z,X),gh, T_dob).

Section 6 - Persons Born on or after 24/9/79—Constitution 1979

t_OA79B93   (T_dob,   T_79c,T_93c):-

T_dob@>=T_79c,T_dob@<T_93c.

bornAt(X, t_OA79B93 (T_dob,T_79c,T_93c)).

wasCtz(gparent(G,X).

byBirth(isCtz(X,gh,T_dob)):-

bornAt(X,t_OA79B93(T_dob,T_79c,T_93c)), bornIn(X,gh);

bornOut(X,gh),

wasCtz(parent(Z,X),gh,T_dob);

wasCtz(gparent(G,X),gh,T_dob).

Section 7 - Persons Born on or after 7/1/93—Constitution 1992

t_OA93 (T_dob,T_93c):-T_dob@>=T_93c.

bornAt(X, t_OA93 (T_dob,T_93c)).

byBirth(isCtz(X,gh,T_dob)):-

bornAt(X,t_OA93(T_dob,T_93c)), bornIn(X,gh);

64

bornOut(X,gh),

wasCtz(parent(Z,X),gh,X,T_dob);

wasCtz(gparent(G,X),gh,T_dob).

Section 8 - Foundlings

foundling(X).

child(X).

age(A, child(X)).

age(A, child(X)):- A@<=7.

foundling(X):-child(X), age(A, child(X)).

found(child(X),gh).

parents([father, mother]).

of(parents([father, mother])), child(X)).

known(of(parents([father, mother])), child(X))).

not(known(of(parents([father, mother])), child(X)))).

byBirth(isCtz(child(X),gh)):-

foundling(X),

found(child(X),gh),

not(known(of(parents([father, mother])),

child(X)))).

Part II-Acquisition of Ghanaian Citizenship Otherwise than by Birth

Section 9- Adopted Children

child(X).

less(17).

age(child(X), less(17)).

65

father(F, child(X)).

mother(M, child(X)).

Parent(Z,child(X)):-father(F, child(X)); mother(M, child(X)).

not(isCtz(Parent(Z, child(X)))).

adopted(child(X)).

isCtz(X,gh).

by(adopted(child(X)),isCtz(X,gh)).

byAdoption(isCtz(child(X),gh)):-

        age(child(X), less(17)),

        not(isCtz(Parent(Z, child(X)))),

        by(adopted(child(X)),isCtz(X,gh)).

Section 10(1)- Citizenship by Registration

        age(X).

        capacity(X).

        country(C).

        approved(country(C)).

        isCtz(X,approved(country(C))).

        isOf(isCtz(X,approved(country(C))),age(X)).

        isOf(isCtz(X,approved(country(C))),capacity(X))

        by(president).

        of(application, X).

        approved(of(application, X),by(president))

        good(X,character)

66

residentIn(X,gh).

odinarily(residentIn(X,gh))

indiginous(lang).

of(indiginous(lang),gh).

speaks(X,of(indiginous(lang),gh)).

byRegistration(isCtz(X,gh)):-

isOf(isCtz(X,approved(country(C))),age(X)),

isOf(isCtz(X,approved(country(C))),capacity(X)),

approved(of(application, X),by(president)),

good(X,character),

odinarily(residentIn(X,gh)),

speaks(X,of(indiginous(lang),gh)).

Section 10 (2)

not(isCtz(X,gh)).

married(not(isCtz(X,gh)).

to(married(not(isCtz(X,gh)), isCtz(X,gh)))

registered(X).

prescribed(manner).

of(application, X).

inThe(of(application, X),prescribed(manner)).

as(registered(X), isCtz(X,gh)):-

to(married(not(isCtz(X,gh)), isCtz(X,gh))),

was(to(married(not(isCtz(X,gh)), isCtz(X,gh)))),

inThe(of(application, X),prescribed(manner)).

67

byRegistration(isCtz(X,gh)):- as(registered(X), isCtz(X,gh)).

Section 10(3)

byRegistration(isCtz(X,gh)):-

as(registered(X), isCtz(X,gh)),

at(to(married(not(isCtz(X,gh)),isCtz(X,gh)),

timeOf(deathOf(isCtz(X,gh)))))).

Section 10(4)

cont(byRegistration(isCtz(X,gh))):-

as(registered(X), isCtz(X,gh)),

disovled(to(married(not(isCtz(X,gh)),   isCtz(X,gh)))),

byRegistration(isCtz(X,gh)),

not(renounced(X,byRegistration(isCtz(X,gh)))).

Section 10(5)

cont(isCtz(child(X),gh)):-

of(child(X),marriageOf(as(registered(X), isCtz(X,gh)))),

isCtz(child(X),gh),

not(renounced(isCtz(child(X),gh))).

Section 10(7)

byRegistration(isCtz(X,gh)):-man(X),

isOf(isCtz(X,approved(country(C))),age(X)),

isOf(isCtz(X,approved(country(C))),capacity(X)),

approved(of(application, X),by(president)),

good(X,character),

permanently(residentIn(X,gh)),

68

speaks(X,of(indiginous(lang),gh)).

Section 10(8)

as(registered(X), isCtz(X,gh)):- taken(X, of(oath, allegiance)).

Section 11

byNaturalisation(isCtz(parent(Z, child(X)),gh)).

of(child(X), byNaturalisation(isCtz(parent(Z, child(X)),gh))).

application(parent(Z, child(X))).

of(child(X), byRegistration(isCtz(parent(Z, child(X)),gh))).

as(registered(child(X)),isCtz(X,gh)):-

    of(child(X), byRegistration(isCtz(parent(Z, child(X)),gh)));

    of(child(X), byNaturalisation(isCtz(parent(Z, child(X)),gh))),

    application(parent(Z, child(X))).

Section 12(1)

of(registration).

certificate(of(registration)).

date(T).

of(byRegistration(isCtz(X,gh))).

effective(date(T), of(byRegistration(isCtz(X,gh)))):-

stated(date(T), certificate(of(registration)).

Section 12(2)

date(T).

of(oath, allegiance).

taken(X, of(oath, allegiance)).

of(date(T), taken(X, of(oath, allegiance))).

69

stated(date(T), certificate(of(registration)):-

of(date(T), taken(X, of(oath, allegiance))).

Section 14(1)(a)

date(T).

month(12).

resided(X, in(gh)).

preceding(of(date(T), application)).

through(resided(X, in(gh)), month(12)).

immediately(through(resided(X,   in(gh)),   month(12)),

preceding(of(date(T), application))).

qualifies(X, naturalisation):-

immediately(through(resided(X, in(gh)), month(12)),

preceding(of(date(T), application))).

Section 14(1)(b)

years(5).

less(years(5)).

not(less(years(5))).

years(7).

during(years(7)).

month(12).

period(month(12)).

during(years(7)).

immediately(during(years(7)), preceding(period(month(12)))).

resided(X, in(gh)).

70

period(resided(X, in(gh)), not(less(years(5)))).

qualifies(X,naturalisation):-

period(resided(X, in(gh)), not(less(years(5)))),

immediately(during(years(7)), preceding(period(month(12)))).

Section 14(1)(c)

good(X,character).

in(writting).

being([notariesPublic,lawyer,publicOfficer]).

two(isCtz(X, gh), being([notariesPublic,lawyer,publicOfficer]).

by(attestedTo(good(X,character),   in(writting)),   two(isCtz(X,   gh),

being([notariesPublic,lawyer,publicOfficer]))).

attestedTo(good(X,character), in(writting)).

qualifies(X, naturalisation):-

by(attestedTo(good(X,character),   in(writting)),   two(isCtz(X,

gh), being([notariesPublic,lawyer,publicOfficer]))).

Section 14(1)(d)

in(imprisonment, gh).

in(imprisonment, not(gh)).

sentenced(X, in(imprisonment, gh)).

sentenced(X, in(imprisonment, not(gh))).

recognised(offence, in(byLaw, gh)).

for(sentenced(X,in(imprisonment, gh)), recognised(offence, in(byLaw,

gh))).

for(sentenced(X, in(imprisonment, not(gh))) , recognised(offence,

71

in(byLaw, gh))).

qualifies(X, naturalisation):-

for(sentenced(X, in(imprisonment, gh)) , recognised(offence,

in(byLaw, gh)));

for(sentenced(X,in(imprisonment,not(gh))), ecognised(offence,

in(byLaw, gh))).

Section 14(1)(e)

speak(X, indigenous(GHLang)).

qualifies(X, naturalisation):-speak(X, inginous(GHLang)).

Section 14(1)(f)

made(X, substantial(contribution)).

ofMaking(capable(X),substantial(contribution)).

of(progress, national(Activity)).

to(made(X, substantial(contribution)), of(progress,

national(Activity))).

to(ofMaking(capable(X),substantial(contribution)),of(progress,national

(Activity))).

qualifies(X,naturalisation):-

to(made(X,substantial(contribution)),of(progress,

national(Activity)));

to(ofMaking(capable(X),substantial(contribution)),of(progress,

national(Activity))).

Section 14(1)(g)

wayOf(gh, Life).

72

into(assimilated(X), wayOf(gh, Life)).

canBe(into(assimilated(X), wayOf(gh, Life))).

wayOf(gh, Life).

into(assimilated(X), wayOf(gh, Life)).

canBe(into(assimilated(X), wayOf(gh, Life))).

qualifies(X, naturalisation):-

into(assimilated(X), wayOf(gh, Life));

canBe(into(assimilated(X), wayOf(gh, Life))).

Section 14(1)(h) & (i)

in(gh).

granted(X, certificate).

intends(X).

permanently(reside, in(gh)).

to(intends(X), permanently(reside, in(gh))).

resident(permit).

valid(resident(permit)).

possessed(X,valid(resident(permit))).

to(intends(X),permanently(reside,in(gh))):-granted(X,certificate),

possessed(X,valid(resident(permit))).

qualifies(X, naturalisation):- to(intends(X), permanently(reside,

in(gh))).

Section 14(2)(a)

month(6).

date(T).

73

moreThan(month(6)).

not(moreThan(month(6))).

of(date(T), application).

before(not(moreThan(month(6))), of(date(T), application)).

month(12).

ending(month(12)).

period(ending(month(12))).

continuous(period(ending(month(12)))).

allow(continuous(period(ending(month(12))))),

before(not(moreThan(month(6))), of(date(T), application))).

theMinister(X).

may(theMinister(X),allow(continuous(period(ending(month(12))))),

before(not(moreThan(month(6))), of(date(T), application)))).

subSect(1a).

purposeOf(subSect(1a)).

for(purposeOf(subSect(1a))).

reckoned(may(theMinister(X),allow(continuous(period(ending(month(

12)))),

before(not(moreThan(month(6))),of(date(T),application))))),for(purpos

eOf(subSect(1a)))).

immediately(preceded(of(date(T) , application))).

asThough(reckoned(may(theMinister(X),

allow(continuous(period(ending(month(12))))),

before(not(moreThan(month(6))),of(date(T),application)))),

74

for(purposeOf(subSect(1a)))),immediately(preceded(of(date(T),

application)))).

Section 14(2)(b)

approved(country(C)).

residence(in(approved(country(C)))).

allow(residence(in(approved(country(C))))).

may(theMinister(X) , allow(residence(in(approved(country(C)))))).

reckoned(may(theMinister(X),

allow(residence(in(approved(country(C))))))),   for(

purposeOf(subSect(1a)))).

asThough(reckoned(may(theMinister(X),

allow(residence(in(approved(country(C))))))),

for(purposeOf(subSect(1a)))), residence(in(gh))).

%and

year(7).

residence(period(year(7))).

lessThan(residence(period(year(7)))).

before(lessThan(residence(period(year(7)))), of(date(T), application)).

allow(before(lessThan(residence(period(year(7)))),of(date(T),

application))).

may(theMinister(X) , allow(

before(lessThan(residence(period(year(7)))), of(date(T), application))).

period(month(12)).

75

aggregate(period(month(12))).

in(computing(aggregate(period(month(12))))).

reckoned(may(theMinister(X),

allow(before(lessThan(residence(period(year(7)))),of(date(T),

application)))), in(computing(aggregate(period(month(12)))))).

Implemented Testbed of Formalised Text of Supreme Court Case as a

Prolog Programme: [1995-1996] Ghana Law Report

attainAge(first_defendant, 21).

isCtz(first_defendant, gh).

upon(isCtz(first_defendant, gh), attainAge(first_defendant, 21)).

isCtz(first_defendant, not(gh)).

not(renounce(isCtz(first_defendant, not(gh))).

upon(not(isCtz(first_defendantgh)),

attainAge(first_defendant,21)).

Therefore;

not(isCtz(first_defendant,gh)):-

upon(isCtz(first_defendant, gh),

attainAge(first_defendant,21)),

isCtz(first_defendant,not(gh)),

not(renounce(isCtz(first_defendant, not(gh))).

not(qualified(X, candidateFor(officeOfPresidentOfGhana))).

Court Decision

Formalism of Sections 1(a) of the Presidential Elections Law, 1992 (PNDCL)

Person X is citizen by birth; byBirth(isCtz(X, gh)).

Candidate of the office of the president of Ghana;

candidateFor(officeOfPresidentOfGhana).

Person X is a qualified candidate for the office of the president of Ghana;

qualified(X, candidateFor(officeOfPresidentOfGhana)).

not(qualified(X,candidateFor(officeOfPresidentOfGhana))):-

not(byBirth(isCtz(X, gh))).

Sections 2(a) of the Presidential Elections Law, 1992 (PNDCL 285)

owesAllegiance(X, not(gh)).

not(qualified(X,candidateFor(officeOfPresidentOfGhana))):-

owesAllegiance(X, not(gh)).

This implies for sections 1(a) and 2(a) that;

not(qualified(X,candidateFor(officeOfPresidentOfGhana))):-

not(byBirth(isCtz(X,gh))),

owesAllegiance(X, not(gh)).

Therefore;

qualified(X,candidateFor(officeOfPresidentOfGhana)):-

byBirth(isCtz(X,gh)),

owesAllegiance(X,gh).

Section 8(1) and 8(1)(a) of the Ghana Nationality Act, 1971 (Act 361)

X attains age 21; attainAge(X, 21).

X is citizen of Ghana; isCtz(X, gh).

X is not citizen of Ghana; not(isCtz(X, gh).

X is citizen other than Ghana; isCtz(X, not(gh)).

Specified date; specified(date(T)).

77

upon(not(isCtz(X, gh)), specified(date(T)))):-

upon(isCtz(X, gh),

attainAge(X, 21)) ,

isCtz(X, not(gh)).

not(renounce(isCtz(X, not(gh)))).

upon(isCtz(X, gh), specified(date(T))).

upon(isCtz(X, gh), specified(date(T))):-

upon(isCtz(X, gh),

attainAge(X, 21)) ,

isCtz(X, not(gh)),

renounce(isCtz(X, not(gh))).

Section of 8(1)(b)

upon(isCtz(X, gh), specified(date(T))):-

upon(isCtz(X, gh),

attainAge(X, 21)) ,

isCtz(X, not(gh)),

renounce(isCtz(X,not(gh))).

upon(isCtz(bornOut(X,gh),gh),specified(date(T))):-

upon(isCtz(X,gh),

attainAge(X,21)),

isCtz(X,not(gh)),

78

renounce(isCtz(X,not(gh))),

registered(isCtz(bornOut(X,gh),gh),

withMinister(declaration(intention(resideInGhana)))).

Section 8(2)(a)

Important definitions;

X attain age 21 on the coming into force of the constitution;

on(attainAge(X, 21), t_CAEoC (T_edc, T_eoc)).

Section 8(2)(b)

On(isCtz(X, gh), t_CAEoC (T_edc, T_eoc)).

Section 8(2)(c)

on(isCtz(X, not(gh)), t_CAEoC (T_edc, T_eoc)).

take(X, oath(alegience)).

Complete model of 8(2)(a)(b)(c).

upon(isCtz(X, gh), specified(date(T))):-

on(attainAge(X, 21),

t_CAEoC (T_edc, T_eoc)),

On(isCtz(X, gh),

t_CAEoC (T_edc, T_eoc)),

on(isCtz(X, not(gh)),

t_CAEoC (T_edc, T_eoc)),

renounce(isCtz(X,not(gh))).

The plaintiff claims

not(isCtz(first_defendant,gh)):-

upon(isCtz(first_defendant, gh),

attainAge(first_defendant,21)),

79

isCtz(first_defendant,not(gh)),

not(renounce(isCtz(first_defendant, not(gh))).

Facts of the first defendant.

bornIn(first_defendant, gh).

bornAt(first_defendant,t_B57(1947, 1957)).

parent(victoria, first_defendant)).

bornIn(victoria, ghana).

bornIn(parent(victoria, first_defendant) , gh).

victoria is pareant of first_defendant and victoria is born in ghana.

Prolog queries;

?- isCtz(first_defendant, gh).

TRUE

?-

qualified(first_defendant,candidateFor(officeOfPresidentOfGhana)).

TRUE

?-byBirth(isCtz(first_defendant,gh)).

TRUE

owesAllegiance(first_defendant,gh).

TRUE

Formalised Text of the Fundamental Human Rights and Freedom Laws

of the 1992 Constitution of the Republic of Ghana as a Prolog progamme

Article 13(1)

person([ ]).

deprivedOf(person([ ]), life).

80

intentionally(deprivedOf(person([ ]),life)).

person([X]).

criminal(Offence).

of(laws,ghana).

convictedOf(person([X]),criminal(Offence)).

under(convictedOf(person([X]),criminal(Offence)),of(laws,ghana)).

deprivedOf(person([X]),life).

of(sentence,court).

of(execution,of(sentence,court)).

in(deprivedOf(person([X]),life),of(execution,of(sentence,court))).

Complete model of Article 13(1)

intentionally(deprivedOf(person([ ]),life)).

intentionally(deprivedOf(person([X]),life)):-

under(convictedOf(person([X]),criminal(Offence)),of(laws,ghana)),

in(deprivedOf(person([X]),life),of(execution,of(sentence,court))).

Article 13(2)

person([Y]).

Person([X]).

of(life, person([X])).

justifiable(useOfForce).

diesOf(person([X]),lawfulActOfWar).

diesOf(person([X]), justifiable(useOfForce)).

not(HTHD(person([Y]), of(life, person([X])))):-

diesOf(person([X]),lawfulActOfWar);

81

in(diesOf(person([X]),justifiable(useOfForce)),

particular(circumstance)).

The law is clear on the particular circumstance necessary which

is modelled as follows;

defenceOf(property).

defenceOf(person([X])).

from(defenceOf(person([X])),violence).

lawfullArrestOf(person([X])).

effect(lawfullArrestOf(person([X]))).

lawfullydetained(person([X])).

escapeOf(lawfullydetained(person([X]))).

prevent(escapeOf(lawfullydetained(person([X])))).

suppressing([riot,insurrection,mutiny]).

commissionBy(crime,person([X])).

prevent(commissionBy(crime,person([X]))).

particular(circumstance):-

from(defenceof(person([Y])),violence);

defenceOf(property);

effect(lawfullArrestOf(person([X])));

prevent(escapeOf(lawfullydetained(person([X]))));

suppressing([riot,insurrection,mutiny]);

prevent(commissionBy(crime,person([X]))).

Article 14(1)

personal(liberty).

82

entitledTo(person([X]), personal(liberty)).

deprivedOf(person([ ]), personal(liberty)).

Article 14(1)(a)

convictedOf(person([X]),criminal(offence)).

deprivedOf(person([X]),personal(liberty)):-

of(execution,of(sentence,court)));

of(execution,of(order,court))),

convictedOf(person([X]),criminal(offence)).

Article 14(1)(b)

contemptOf(court).

pusnish(person([X]),contemptOf(court)).

of(order,court).

of(execution,of(order,court)).

for(pusnish(person([X]),contemptOf(court)),

of(execution,of(order,court))).

in(for(pusnish(person([X]),contemptOf(court)),

of(execution,of(order,court)))).

Article 14(1)(c)

bringingBfore(person([X]), court).

in(bringingBfore(person([X]), court), of(execution,of(order,court))).

Article 14(1)(d)

contagious(disease).

unsound(mind).

addiction(drug).

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addiction(drug).

addiction(alcohol).

vagrant((person([X])).

careOf(person([X])).

treatmentOf(person([X])).

protectionOf(community,from(person([X]))).

sufferingFrom(person([X]),[contagious(disease),

unsound(mind),addiction(drug), addiction(alcohol)]).

deprivedof(sufferingFrom(person([X]),[contagious(disease),

unsound(mind),addiction(drug),addiction(alcohol)]),personal(liberty)):

-

forpurposeOf([careOf(person([X])),

treatmentOf(person([X])),

protectionOf(community,from(person([X])))]).

Article 14(1)(e)

age(person([X]), less(18)).

educating(person([X])).

welfare(person([X])).

deprivedof(person([X]),personal(liberty)):-age(person([X]),less(18)),

forpurposeOf([educating(person([X])), welfare(person([X]))]).

Article 14(1)(f)

unlawful(person([X]), entry).

into(unlawful(person([X]), entry),Ghana).

prevent(into(unlawful(person([X]), entry),Ghana)).

84

lawful(removal).

from(lawful(removal),Ghana).

affecting(person([X]),

[expultion,extradition,from(lawful(removal),Ghana)]).

restrict(person([X])).

lawfully(person([X]), convayed).

through(lawfully(person([X]), convayed), Ghana).

restrict(through(lawfully(person([X]), convayed), Ghana)).

inTheCourseOfextraditionOf(restrict(through(lawfully(person([X]),

convayed), Ghana))).

removedFrom(person([X]), to(country(A),country(B))).

deprivedof(person([X]),personal(liberty)):-

        prevent(into(unlawful(person([X]), entry),Ghana));

        affecting(person([X]),

        [expultion,extradition,from(lawful(removal),Ghana)]);

        inTheCourseOfextraditionOf(restrict(through(lawfully(person([

        X]), convayed),Ghana)));

        removalOf(person([X]),from(to(country(A),country(B))))).

Article 14(1)(g)

of(laws, Ghana).

criminal(offece).

committed(person([X]),criminal(offece)).

aboutTO(committed(person([X]),criminal(offece))).

suspicionThat(committed(person([X]),criminal(offece))).

85

suspicionThat(aboutTO(committed(person([X]),criminal(offece)))).

under(suspicionThat(committed(person([X]),criminal(offece))),of(laws

, Ghana)).

under(suspicionThat(aboutTO(committed(person([X]),criminal(offece)

))),of(laws, Ghana)).

deprivedof(person([X]),personal(liberty)):-

under(suspicionThat(committed(person([X]),criminal(offece))),

of(laws, Ghana));

under(suspicionThat(aboutTO(committed(person([X]),criminal

(offece)))),of(laws, Ghana)).

Article 14(2)

is([arrested,restricted,detained]).

who(person([X]),is([arrested,restricted,detained])).

understands(person([X]), lang(L)).

in(understands(person([X]), lang(L))).

shallBe(InformedImediatly(person([X]),in(understands(person([X]),

lang(L))))).

Complete model of Article 14(2)

reasonsFor(shallBe(InformedImediatly(person([X]),

in(understands(person([X]),lang(L))))),

is([arrested,restricted,detained])).

Article 14(3)(a)

broughtBefore(court).

86

shallBe(person([X]), broughtBefore(court)).

within(shallBe(person([X]), broughtBefore(court)), hours(48)).

after(within(shallBe(person([X]),broughtBefore(court)),

hours(48)),a(person([X]), is([arrested,restricted,detained]))).

after(within(shallBe(person([X]),broughtBefore(court)),hours(48)),

a(person([X]),is([arrested,restricted,detained]))):-

forThePurposeOf(in(bringingBefore(a(person([X]),

is([arrested,restricted,detained])),court),

of(execution,of(order,court)))).

Article 14(3)(b)

criminal(offence).

of(laws, ghana).

reasonable(suspicion).

hours(48).

broughtBefore(court)).

released(person([X])).

not(released(person([X]))).

a(person([X]), is([arrested,restricted,detained])).

beingAboutToCommit(a(person([X]),is([arrested,restricted,detained])),

criminal(offence)).of(reasonable(suspicion),beingAboutToCommit(a(p

erson([X]),is([arrested,restricted,detained])),

criminal(offence))).under(of(reasonable(suspicion),beingAboutToCom

mit(a(person([X]),is([arrested,restricted,detained])),criminal(offence)))

,of(laws, ghana)).

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Complete model of Article 14(3)

after(within(shallBe(not(released(person([X]))),broughtBefore(court)),

hours(48)),a(person([X]),is([arrested,restricted,detained]))):-

upon(under(of(reasonable(suspicion),beingAboutToCommit(a(person(

[X]), is([arrested,restricted,detained])), criminal(offence))), of(laws,

ghana))).

Article 14(4)

reasonable(time).

upon(reasonable(condition)).

tried(a(person([X]), is([arrested,restricted,detained]))).

not(tried(a(person([X]), is([arrested,restricted,detained])))).

shallBeReleased(a(person([X]),is([arrested,restricted,detained])),

upon(reasonable(condition))).

shallBeReleased(a(person([X]),is([arrested,restricted,detained])),

unconditionally).

withing(not(tried(a(person([X]),is([arrested,restricted,detained])))),

reasonable(time)):-shallBeReleased(a(person([X]),

is([arrested,restricted,detained])),

unconditionally);shallBeReleased(a(person([X]),

is([arrested,restricted,detained])), upon(reasonable(condition))).

Article 14(5)

Complete Model of Article 14(5)

shallBe(by(unlawfully(a(person([X]),is([arrested,restricted,detained])))

, person([Y])) , compensated(from(person([Y])))).

Article 14(6)

is([convicted,sentenced])).

termOf(imprisonment, for(offence)).

spentTime(T).

trial(person([X])).

completion(trial(person([X]))).

before(completion(trial(person([X])))).

inRespect(offence, before(completion(trial(person([X]))))).

lawful(custody,inRespect(offence,

before(completion(trial(person([X]))))))).

taken(intoAcc,termOf(trial)).

imposing(termOf(imprisonment)).

in(taken(intoAcc,termOf(trial)), imposing(termOf(imprisonment)))).

Complete model of Article 14(6)

to(a(person([X]),is([convicted,sentenced])),termOf(imprisonment,

for(offence))):-

shallBe(in(spentTime(T),lawful(custody,inRespect(offence,

before(completion(trial(person([X]))))))),

in(taken(intoAcc,termOf(trial)),

imposing(termOf(imprisonment)))).

Article 15(1)

of(dignity, person([X])).

inviolable(of(dignity, person([X]))).

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Article 15(2)

subjected(a(person([]),is([convicted,sentenced])),

to([torture,inhumane,degradingTreatment,degradingPunishment])).

Article 15(2)(b)

detractFrom([dignity,worthAs(hunamBeing)]).

condition(detractFrom([dignity,worthAs(hunamBeing)])).

to(condition(detractFrom([dignity,worthAs(hunamBeing)]))).

shallBe(subjected(a(person([]),is([convicted,sentenced])),

to(condition(detractFrom([dignity,worthAs(hunamBeing)]))))).

Article 15(3)

from(convicted (person(X)).

kept(separately, from(convicted (person(X)))).

treatedAs(convicted(person(X))).

convicted (person(X)).

not(convicted (person(X))).

of(not(convicted (person(X))) , criminal(offence)).

shallBe(of(not(convicted(person(X))),criminal(offence)),

treatedAs(convicted(person(X))))),kept(separately,from(convicted

(person(X))).

not(shallBe(of(not(convicted(person(X))),criminal(offence)),

treatedAs(convicted(person(X))))),kept(separately,from(convicted

(person(X)))).

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shallBe(not(shallBe(of(not(convicted(person(X))),criminal(offence)),

treatedAs(convicted(person(X))))),kept(separately,from(convicted

(person(X))))).

Complete Model of Article 15(3)

not(shallBe(not(shallBe(of(not(convicted(person(X))),criminal(offence

)),

treatedAs(convicted(person(X))))),kept(separately,from(convicted(pers

on(X))))))).

Article 15(4)

juvinile(person([X])).

adult(person([X])).

offender(adult(person([X]))).

offender(juvinile(person([X]))).

in(offender(juvinile(person([X]))), lawful(custody)).

Kept(separately , from(offender(adult(person([X]))))).

ShallBe(in(offender(juvinile(person([X]))),lawful(custody)),Kept(sepa

rately, from(offender(adult(person([X])))))).

Testbed of Formalised Text of Supreme Court Case as Prolog

Programme: In the Superior Court of Judicature

Article 22(2)

spouse(S).

of(p_rights , spouse(S)).

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regulating(of(p_rights , spouse(S))).

legislation(regulating(of(p_rights , spouse(S)))).

shallEnact(parliament,legislation(regulating(of(p_rights,spouse(S))))).

Complete Model of 22(2)

at(shallEnact(parliament,legislation(regulating(of(p_rights,spouse(S)))

))))) , t_CAEoC (T_edc, T_eoc)).

Model of Article 22(3)(a)

Important Definition;

some([spouse(S1),spouse(S2)]).

jointlyAcquired(some([spouse(S1),spouse(S2)]), property).

access(equal,jointlyAcquired(some([spouse(S1),spouse(S2)]),

property)).

during(jointlyAcquired(some([spouse(S1),spouse(S2)]),property),

marriage).

access(during(jointlyAcquired(some([spouse(S1),spouse(S2)]),pro

perty),   marriage)).

Complete Model of 22(3)(a)

shallHave(spouse(S)),access(equal,during(jointlyAcquired(some([

spouse(S1),spouse(S2)]), property) ,marriage))).

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shallHave(spouse(S)),access(equal,property)):-

during(jointlyAcquired(some([spouse(S1),spouse(S2)]),property),

marriage).

Model of 22(3)(b)

between(spouse(S1), spouse(S2)).

distributed(between(spouse(S1), spouse(S2))).

Complete Model of Model of 22(3)(b)

shallBe(during(jointlyAcquired(some([spouse(S1),

spouse(S2)]),property),marriage),equally(distributed

(between(spouse(S1), spouse(S2))))).

shallBe(property,equally(distributed(between(spouse(S1),

spouse(S2)))):-during(jointlyAcquired(some([spouse(S1),

spouse(S2)]), property),marriage).

Formalised Evaluation of Evidence and Decision of Trial Court

jointlyAcquired(some([spouse(petitioner),spouse(respondent)]),

property).

during(jointlyAcquired(some([spouse(petitioner),spouse(responde

nt)]), property),marriage).

Prolog query:

?- jointlyAcquired(some([spouse(S1),spouse(S2)]), property).

S1

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S2

?-during(jointlyAcquired(some([spouse(S1),spouse(S2)]),

property),marriage).

TRUE

?-shallHave(spouse(petitioner)), access(equal, property)).

TRUE

?-shallHave(spouse(respondent)), access(equal, property)).

TRUE

?-shallHave(spouse(S)), access(equal, property)).

S=petitioner.

S=respondent.

?-

shallBe(property,equally(distributed(between(spouse(petitioner),

spouse(respondent))))).

TRUE

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The Fallacy Discovery Model

Pseudo Code for Automatic Fallacy Discovery.

Fetch Cl.

Fetch Lw.

DO Lw =@= Cl.

    If FALSE PRINT "Fallacy" else GOTO NEXT

DO same_length(Pc, PL).

    If FALSE PRINT "Fallacy – insufficient Premises" else

GOTO NEXT.

DO subset(Pc,PL).

    If FALSE PRINT "Fallacy – False Premises" else

DO ?-CL.

STOP.

Fallacy(S):-   Lw \=@=CL; \+ same_length(Pc, PL); \+

subset(Pc,PL); ([Lw \=@=CL; \+ same_length(Pc, PL); \+

subset(Pc,PL)]).

Discussion

    The major solution I have presented in this study is the provision of a computational mechanism for dealing with the problem of ambiguity and fallacies in the natural form of legal text by means of a logic tool. I have provided a means for deductive reason and discovery of fallacies by means of having natural legal text formalised in FOL and implemented in Prolog programme.

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The major problem of fallacies in natural language has been a problem of the existence of ambiguities in language or text. I have established that, dealing with fallacies would mean dealing with ambiguities to a large extent. I have demonstrated that, the presentation of legal text with minimal ambiguity largely avoids misunderstanding and preserves the intended semantics of the text. This is done by formalising the text to a logic programme, which enforces the right semantics.

The question as to whether the formalised text does provides clarity and comprehensibility or not is addressed in the formalised text of the Citizenship Act 2000 of the Republic of Ghana, and a court case which was presented based on the Act. The logic model revealed the difference in the semantic consequence on the choice and use of words between the natural and logic form. The logic model of the text established a pattern of reasoning through the text, contrasting all other possible meaning that could be ascribed to the text wrongly, either accidentally or deliberately.

The testbed of the court case applied to the Act emphasised sound reasoning through the text, which as well provides a mechanism for the right application of legislative instruments in legal discourse. Sound reason and minimal or no ambiguity in text are therefore the basis for the model of automating a fallacy discovery system by this study.

The automated approach of deducing fallacies in legal text is modelled to function as a system that analyses the logical structure and consequence of a piece of argument against the logical structure of a piece of law which resides

in a knowledge base. The logical pattern of the analysed text then reveals the occurrence or non-occurrence of fallacies.

In general, I have presented a mechanism for dealing with ambiguities, a mechanism for sound reasoning and the discovery of fallacies in legal text. The ensuing aspects of this section details the discussion on the results of the study.

Formalised Text in First Order Logic: Citizenship Act 2000 (Act 591) of the Republic of Ghana

The Citizenship Act of the Republic of Ghana outlines three general patterns; patterns that describes different kinds of citizenship a person can have in Ghana.

First, a citizenship defined for persons who are already considered to be citizens of Ghana before the date of its independence. Such persons are said to have at least a parent or a grandparent born in Ghana as a constitutional condition. This implies that their citizenship is obtained through their parents or grandparents. However, what remains unclear, is the conditions that established the citizenship of their parents which is not defined within the scope of this Act. So, we do not know explicitly, what conditions establish that type of citizenship of the parents or grandparents.

By constitutional provision however, such citizenship do not expire even after the colonial age of Ghana. Other researchers extrapolate that the parents or grandparents who are considered citizens of Ghana before its independence are the indigenes of the nation, or, they might have obtained their citizenship through their parents who were indigenes of the nation.

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That notwithstanding, we may at best handle this definition of Ghanaian citizenship of such parents or grandparents specified by the Act as an axiom, and treat it as citizenship by descent, beyond this, there cannot be any logical deduction on this type of citizenship within the scope of the Act.

Citizenship by decent technically, is citizenship ascertained through a mother's or a father's citizenship irrespective of place of birth of the person (Manby, 2010). The first part of the Act is dedicated to defining citizenship by birth of a person, or more generally citizenship by descent, defined by different constitutions from the time of independence to the time the 1992 Constitution of Ghana came into force.

Second, the Act defines citizenship other than the birth of a person. This type of citizenship is acquired by a person's free will, desiring to be a citizen of Ghana. The law requires that the person must show interest by applying for Ghanaian Citizenship which must be approved by the president of Ghana, provided the person meets the requirements of the law stipulated in the Act. Persons who acquire citizenship through registration may per their free will register their children to be citizens of Ghana.

This section as well allows for children who are sixteen years and below, whose parents are not Ghanaians but are adopted by Ghanaian citizens to be considered as citizens of Ghana by law.

The Act also makes provision for people who have resided in Ghana for a stipulated period to apply to become citizen by Naturalisation.

I have elaborated the formalisation process in FOL, and I have as well coded text into placeholders, functors, and arguments to the functors in the

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Prolog programme of the text of the Act. The formalised text gives us unambiguous presentations of legal text, with unambiguous semantics, which allows for better understanding of text and a formal deduction of conclusions with unique semantics independent of different interpretations.

It is important to note that, every analysis and logical implication of this model is based on the letter of the laws, keeping in mind that the law is subject to several interpretations by the law makers. However, the argument remains that, if the rules of sound reasoning is properly followed, every interpretation should lead to one and the same meaning at all times, which is one of the major facts established by this study.

The key analysis I have discussed with some aspects of the modelled text in FOL and Prolog, represents a panoramic idea of the study for all aspect of the modelled text.

Semantic Analysis of the Formalised Text: Citizenship Act 2000 (Act 591) of the Republic of Ghana

Semantic Consequence of the Modelled Text

First, I will like to establish, from results of this study, that, the textual construction of the statements in the Act presents some form of inherent ambiguities. The use of some words and the role they play in the internal structure of the statements made, presents different meaning from their logical consequence. This kind of confusion does not seem to be apparent in the natural use of the words. The logical consequence of the use of the words or the style of sentence structure is only made picturesque in the logical form of the text.

Clarity of statements allows for comprehensibility and sound reasoning of the statements. If a statement is comprehensible, then, it reduces or takes away the possibility for wrong conclusions that can be derived from it.

The statements in the citizenship Act takes the form of antecedents and a consequents, that is, a structure that allows for deductive reasoning. The modelled text in the results of this study does not only offer clarity and comprehensibility of the text, it as well presents the text in a logic structure that allows for deductive reasoning.

The logic model allows us to move through the propositions systematically, assessing the truth state of each axiom during the process of reasoning to establish the semantics of the statement that is made. All consequents of the statements in the Act are derived from their antecedents by means of the material implication, per the use of *if..then* conditionals in the Act. Thus, for all unit proposition presented in the Act:

1. If all premise of a model holds true and the consequent is true, then the model or argument is valid

2. If all premise of a model holds false and the consequent is false, then the model or argument is valid

3. If all premise of a model holds false and the consequent is true, then the model or argument is valid

4. If all premise of a model holds true and the consequent is false, then the model or argument is invalid

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The statements in the Act as well follow the semantic consequence pattern, $\Gamma \vDash A$, thus, for all set of premise that makes Γ true, or that deduces Γ, also necessarily makes A true or deduces A, and it is therefore impossible for a set of premise to be true and the semantic consequent to be false.

This pattern is enforced and maintained in the modelled text. If all necessary conditions for an argument is established to be true then, its derived conclusion must be true. This however reveals that, the material implications as used in the textual representation of the Act does not hold true for all instances of its use in the Act. The logical consequence turns out to violate the very rules set by the Act for the acquisition of some type of citizenship.

In the modelled text of Section 1, the necessary condition that deduces *cont(Ctz(x, gh))* is $\forall x$ *at(by(existing(Ctz(x, gh)), lw), T_eoc)*, which is a nested form of several predicates, defines an existing citizen for the variable *x* which is not a deduced proposition but a stated fact or axiom. So, all we know per the Act is that, there are a group of people who are existing citizens. The material implication works well for this model, on the account that, if a person satisfies *at(by(existing(Ctz(x, gh)), lw), T_eoc)*, and such a person necessarily satisfies *cont(Ctz(x, gh))* as well, then the argument $\forall x$ *at(by(existing(Ctz(x, gh)), lw), T_eoc)* $\rightarrow$ *cont(Ctz(x, gh))* is valid. If a person does not satisfy *at(by(existing(Ctz(x, gh)), lw), T_eoc)*, and as well does not satisfy *cont(Ctz(x, gh))*, then, the argument is still valid.

However, if a person does not satisfy *at(by(existing(Ctz(x, gh)), lw), T_eoc)*, but satisfies *cont(Ctz(x, gh))*, the argument will still remain valid; this is because, *at(by(existing(Ctz(x, gh)), lw), T_eoc)* should not be the only

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proposition that should deduce *cont(Ctz(x, gh))* according to the material conditional deduction rules. There should be other propositions that should deduce *cont(Ctz(x, gh))*.

The challenge with the definition of existing citizenship in this context is that, it is constructed in the Act to be a consequent of only persons who already had citizenship at the time the constitutions came into force. However, the text conditional provided in the Act does implements a unidirectional material implication, which does not enforce the intended deduction of *cont(Ctz(x, gh))* to be based on only *at(by(existing(Ctz(x, gh)), lw), T_eoc)*. So, even though the argument is valid for an instance where *x* does not satisfy *at(by(existing(Ctz(x, gh)), lw), T_eoc)* but satisfies *cont(Ctz(x, gh))*, it changes the semantics consequence in the context of the Act, and this features a problem of fallacy in this context.

A way to fix the problem is to model the text with a material bi-conditional—which is not the way the statement was constructed in the Act— By doing so, the semantics of the intent of the Act is maintained. Thus; *cont(Ctz(x, gh)) ↔ at(by(existing(Ctz(x, gh)), lw), T_eoc)*. This is to say that a person can have continuous citizenship if and only if such a person satisfies *at(by(existing(Ctz(x, gh)), lw), T_eoc)*. Therefore;

cont(Ctz(x, gh)) → at(by(existing(Ctz(x, gh)), lw), T_eoc)

at(by(existing(Ctz(x, gh)), lw), T_eoc) → cont(Ctz(x, gh))

What this means is that, if a person satisfies *at(by(existing(Ctz(x, gh)), lw), T_eoc)* necessarily makes such a person continuous citizen. This does not

only make *at(by(existing(Ctz(x, gh)), lw), T_eoc)* a necessary condition, but a sufficient condition as well for continuous citizenship.

Based on the bi-conditional implication the model *cont(Ctz(x, gh))* ↔ *at(by(existing(Ctz(x, gh)), lw), T_eoc)* is not valid for two instances elaborated below. The validity check takes the form:

p → q
q → p

¬ p

‾‾‾
q

Thus;

cont(Ctz(x, gh)) → at(by(existing(Ctz(x, gh)), lw), T_eoc)

at(by(existing(Ctz(x, gh)), lw), T_eoc) → cont(Ctz(x, gh))

¬ cont(Ctz(x, gh))

‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾

at(by(existing(Ctz(x, gh)), lw), T_eoc)

AND

p → q
q → p

p

‾‾‾
¬ q

Thus;

cont(Ctz(x, gh)) → at(by(existing(Ctz(x, gh)), lw), T_eoc)

at(by(existing(Ctz(x, gh)), lw), T_eoc) → cont(Ctz(x, gh))

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$$cont(Ctz(x, gh))$$

$$\overline{\qquad\qquad\qquad\qquad\qquad\qquad\qquad}$$

$$\neg\, at(by(existing(Ctz(x, gh)), lw), T\_eoc)$$

For every instance of *x*, *at(by(existing(Ctz(x, gh)), lw), T_eoc)* is necessary for *cont(Ctz(x, gh))*, and *cont(Ctz(x, gh))* is sufficient for *at(by(existing(Ctz(x, gh)), lw), T_eoc)*. This satisfies the intended semantic consequence of the natural statement in the citizenship Act. The logic structure here emphasises that, a person must have existing citizenship before he or she can have continuous citizenship of Ghana. This condition is however not made firm by the structure of natural expression of the text in the Act. The logical implecation expressed in the text of the Act— which is an unintended outcome or misrepresentation by the use of textual implicaiton— allows for a person to have continuous citizenship whithout necessarily having an exisiting citizenship of Ghana. The Act in converse seeks to establish that the, there are no other means of having continuous citizenship except for the condition of having exisiting citizenship, which unfortunately was misrepresented by the choice and use of natural implecation in the text.

One of the important factors that determine the semantics of a statement, is the entities in the statements and how they relate with each other in the sentence structure. The true meaning of a statement can be easily thrown off if the intended relations of the objects in the internal structure of the statements are misplaced or misinterpreted. The literal intended meaning of statements of

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the Act as well as their legal implications can be easily misinterpreted if a reader is not guided, since that is one of the generic problems of natural language.

A logical construction of the statements in the Act required that, entities in the statements are clearly identified, as well as how these entities relate. This can be very challenging, because, some words are used differently in the Act from their generic or lateral usage, which creates the problem of ambiguities in the Act.

In the Section 1 of the Citizenship Act, the statement is presented in a long non-punctuated sentence, until at its end, which makes it difficult to determine the scope of application of some of the entities in the text. In the Sextion 1, there is an established entity *every person* who becomes *Citizen*; the remaining phrase between these two phrases *every person* and *Citizen* establishes how they relate, thus;

every person ………….. Citizen.

This sequence makes it possible to establish the predicates *person( )* and *Citizen( )*. What remains in the statement, even though may carry other entities, suggests how a *person(x)* continuous be *Citizen(x)*. The rest of the statement reads; *who on the coming into force of the Constitution was a citizen of Ghana by law*, presents different possible ways of thinking through the text.

One possible way to think about the full statement per the structure of the text in the Act is; every person in the universe was already a Citizen of Ghana by law, at the time the constitution came into force. This mode of reasoning through the statement presents citizenship at a time *t* for every person

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x. This presents the following model; $\forall x \, person \, (x) \rightarrow \exists t \, time(t) \land at(Ctz(x,gh), t)$

However this is not the intent of the statement of the Act. Persons who had Citizenship of Ghana at the time the constitution came into force, are the persons being referred to, and not just every person in the universe being citizen of Ghana at that particular time.

The correct model for this statement as presented in the results of this study, $\exists T\_eoc, lw \, time(T\_eoc) \land law(lw)$ such that $\forall x \, at(by(existing(Ctz(x, gh)), lw), T\_eoc) \rightarrow cont(Ctz(x, gh))$, presents the statement as an atomic proposition with defined arguments. It is clear in the model that, all the *x* being referred are specific *x* that have citizenship of Ghana at time T_eoc, these persons *x* are being referred to as persons with existing citizenship by definition of the Act.

The predicate *existing( )* applied to the citizenship of *x* further preserves the group of persons being referred to in the statement. By this, the scope of application of the universal quantifier $\forall$ which binds on *x* is maintained on the function *existing( )* which thus removes all possible ambiguities on the statement.

The figure below illustrates the semantic analysis and interpretation of the proposition of Section One, through a scope expression that resolve ambiguity. In the model, there are two entities *time* and *law* which are bound by the existential quantifier. There is also the variable *x* of person bound by the universal quantifier which has been discussed already to some extent.

The model gives the binding of the universal quantifier on persons *x* a narrow scope with respect to the binding of the existential quantifier on the *time*

and *law* entities; $\exists T\_eoc,lw$ having a wider scope over $\forall x$, emphasises that persons x can only have continuous citizenship at the time T_eoc and by law lw, this becomes a necessary condition for continuous citizenship. If the model had presented $\forall x$ to wider scope over $\exists T\_eoc,lw,$ that would have meant that, for every person x there exists a time T_eoc and a law lw by which he or she can become citizen. This scopal ambiguity is however resolved by the structure of model that is presented.

By convention, *time( )*, *law( )*, *by( )*, *at( )*, and *Ctz( )* predicates as well defines the scope of entities necessary to establish the semantics of the statements. The argument x bound by the universal quantifier $\forall$ is as well uniquely defined by all the predicates that define x which specifies explicitly which universal set of x is being referred to.

$\exists T\_eoc, lw \; \forall x \; at(by(existing(Ctz(x, gh)), lw), T\_eoc) \rightarrow cont(Ctz(x, gh))$

$\exists T\_eoc, lw$

$\forall x \; at(by(existing(Ctz(x, gh)), lw), T\_eoc) \rightarrow cont(Ctz(x, gh))$

$\forall x$

$at(by(existing(Ctz(x, gh)), lw), T\_eoc) \rightarrow cont(Ctz(x, gh))$
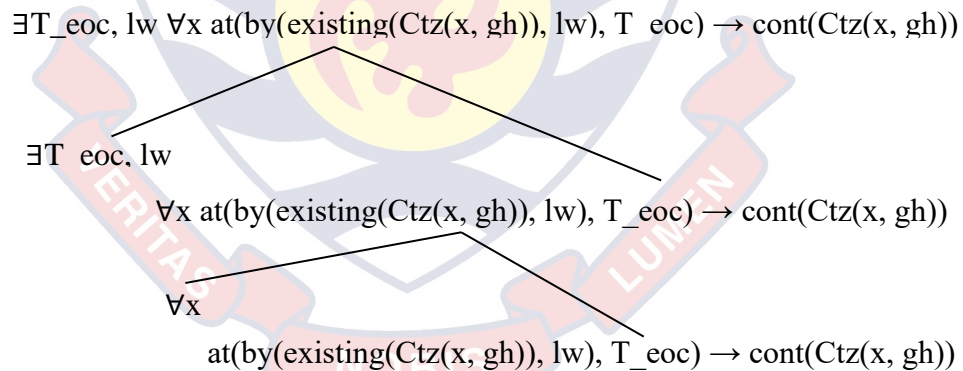
Figure 1: Resolution of Scopal Ambiguity.

There are two other possible ways the statement in Section One of the Act could be contemplated, depending on how a reader may break them down; which is basically because of the sentence structure of the text. The application of the term *by law* in the statement presents two different meanings in the whole statement, depending on how it is applied or connected to the rest of the

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sentence. I have divided the statements into two parts with a sheffer stroke, denoting which part of the statement the term *by law* may possibly apply to.

> *Every person who on the coming into force of the Constitution was a citizen of Ghana by law | shall continue to be a citizen of Ghana.*

And

> *Every person who on the coming into force of the Constitution was a citizen of Ghana | by law shall continue to be a citizen of Ghana*

The first statement suggests that, the persons were citizens of Ghana *by law*, while the second suggests that, the persons were citizens of Ghana but shall now continue to be citizens *by law*. These two presentations of the same statement do not essentially carry the same meaning. The application of the law shifts the whole meaning and intention of the statement.

It is important to note that, the statement is a declarative sentence and therefore holds truth-values, and the consequence of the statement should largely depend on the true meaning of the statement and not how it is being interpreted.

It is easier for an unguided reader to misunderstand this statement because of the missing punctuations in the statement. Punctuations enforces intended meaning in sentences, and they serve as a guide to readers as well. As long as the statement in Section One of the Act is not punctuated, the reader is free to infer any possible meaning to it. This form of presenting texts generates ambiguities.

The FOL model $\forall x \, at(by(existing(Ctz(x, gh)), lw), T\_eoc) \leftrightarrow cont(Ctz(x, gh))$ constructed with predicates and their arguments, clarifies the various

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concepts applied to the various objects in the statements. The axiom *by(existing(Ctz(x, gh)), lw)*, clarifies that *x* is citizen of Ghana *by law*. This removes the possibility of any contemplating of where *by law* should be appropriately applied.

The Section Nine of the Citizenship Act is also another section among others that poses a problem of scope ambiguity. Thus;

> *A child of not more than sixteen years of age neither of whose parents is a citizen of Ghana who is adopted by a citizen of Ghana shall by virtue of the adoption, be a citizen of Ghana.*

There are two possible ways to contemplate the statement above. By common sense and intuitive reasoning, it should be easy to know that the person that is adopted by a citizen of Ghana is the child in the statement. However, from the statement, a possible way to think about it per the textual presentation is that, it is the *parents* that are the object of adoption by a citizen of Ghana, and the *parents* by virtue of their adoption shall be citizen of Ghana. Once, again, there is nothing enforcing the relation of adoption to the *child*, a reader of the statement reserves the right to relate the action of being adopted to the *parents* or the *child*. That is because, the scope of application and relationship of *adoption* with the rest of the statement are loosely connect.

In the modelled text of this statement in the results of this study, there are three variables, *x*, *p* and *y*. Where *x* is the defined child with a parent *p*, and some Ghanaian citizen *y*, and the one who gets adopted by the Ghanaian citizen *y* is *x*. In such a presentation of the statement where the scope of application of entities are explicitly defined, all possibilities of wrong association of relation

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between entities is removed. This property of the modelled text is preserved in all aspects of the results presented in the study.

The Section 3 of the Act describes a citizenship type defined for persons born before the independence of Ghana. This citizenship type is not based on any known law preceding the independence of Ghana. It is however a citizenship by birth obtained by decent which is also a legal means of attaining citizenship in Ghana even though we do not have any conditions defining citizenship by decent.

There exists a time *t* which is the date of the independence of Ghana, such that every person *x* born before that time *born(x, before(t))* is citizen of Ghana by birth *byBirth(Ctz(x, gh))*, but on the basis that the person should be born in Ghana *born(x, in(gh))*, and at least one of his parents was born in Ghana *born(p, in(gh))*, or grandparent was born in Ghana *born(gp, in(gh))*. The use of *p* for parent provides a variable for either mother or father, thus, *parent(p, x)* → *father(x, x) ∨ mother(p, x)*. The same is done with the use of *gp* as a variable for any of the grandparents of *x* who is a parent of *p*, *grandparent(gp, x)* → *parent(p, x) ∧ parent(pg, p)*. The model is as follows;

∃t,x time(t) ∧ person (x) ∧ time(t)=03.06.57 ∧

born(x, before(t))

father(p, x) ∨ mother(p, x)

parent(p, x) → father(p, x) ∨ mother(p, x)

grandparent(gp, x) → parent(p, x) ∧ parent(gp, p)

∃p parent(p, x) ∧ born(p, in(gh))

∃gp grandparent(gp, x) ∧ born(gp, in(gh))

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∃t, p, gp time(t) = 03.06.57 ∧ born(x, in(gh)) ∧ born(x, before(t)) ∧

parent(p, x) ∧ grandparent(gp, x) ∧ [born(p, in(gh)) ∨ born(gp, in(gh))]

→ byBirth(Ctz(x, gh))

∃p, parent(p, x) ∧¬ born(x, in(gh))

∧ born(p, in(gh)) → byBirth(Ctz(x, gh))

Again we come across a very tricky sentence structure in the Act; a structure that is open ended and allows for further queries to the text without solution. In both subsections, the model revealed that, the citizenship of any arbitrary *x* is dependent on only the birth places of the parent or grandparent as external factors, and thus, *born(p, in(gh)) ∨ born(gp, in(gh))*. Person *x* per these conditions derives citizenship from *p* and *gp*, the tricky aspect is that the citizenship state of *p* and *gp* is unknown, which cannot also be established from the piece of the Ghanaian citizenship laws.

The possible interpretations which introduces the twist to the semantics of this section is that, if the condition *born(p, in(gh)) ∨ born(gp, in(gh))* is satisfied, and *p* and *gp* do not have citizenship of Ghana, will still qualify *x* to be citizen of Ghana according to this Section Three of the Act.

However, this may not work even for the literal inference for having citizenship of Ghana. That is because, parents of *x* not being Ghanaian, irrespective of their place of birth, may as well mean that, *x* is originally not Ghanaian by birth.

If another variable *y* is introduced satisfying all the conditions of this Section Three as child of *x* whose citizenship is yet to be determined. Such a *y*

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will still qualify to be citizen of Ghana as long as the birth place of *x* is Ghana,
and this should not be the case even though is exactly so per the text of the Act.

parent(x, y)

grandparent(gp, x)

∃t, ∀y time(t) ∧ person (y) ∧ time(t)=03.06.57 ∧

born(y, before(t))

∃gp grandparent(gp, y) ∧ born(gp, in(gh))

∃t, p, gp time(t) = 03.06.57 ∧ born(y, in(gh)) ∧ born(y, before(t)) ∧

parent(x, y) → byBirth(Ctz(y, gh))

In the model above, *y* derives citizenship from *x* who has already been
defined in the previous model as a person born in Ghana. By definition of the
law, this is sufficient for *y* to be citizen of Ghana, even though the citizenship
of *x* is yet to be asserted. This presents a problem of inherent fallacy in this
Section of the law. That is because, it presents a situation of affirming a person
to be citizen by birth whose parents may not have citizenship of Ghana, which
defies the very rule of obtaining citizenship from a parent who is Ghanaian.

The semantics of the natural presentation of this text can be resolved, if
the relationship established by the law between the antecedent and the
consequent is more of causal relationship than a logical deductive relationship.
By this, I can say that, *born(p, in(gh)) ∨ born(gp, in(gh))* is part of the system
that causes *x* to be citizen of Ghana by birth, since it is considered relevant by
the constitution. This makes this type of citizenship of Ghana an empirical event
other than a logic condition.

The causal effect relationship in this piece of law rest on some qualitative theoretical assumptions; the assumption that parents or grandparents of persons born in Ghana before the independence of Ghana have citizenship of Ghana by decent. Even though stating this as an axiom in a logical proposition works well, the possibilities of occurrences of such persons not being Ghanaians will always result in a logical fallacy which is undesirable for any logic system. The probabilistic cause of a parent or a grandparent born in Ghana but not Ghanaian will result into *x* not being Ghanaian as well. This study presents the consequents of Section Three of the Act as a causal effect of the antecedent other than as logical effect, as solution to the preservation of the intended semantics in the Act. Thus;

$$P(\neg\, Ctz(x, gh) \mid \neg\, [Ctz(p, gh) \lor Ctz(gp, gh)]).$$

The citizenship defined in the Section Four of the Act is enforced by the first parliamentary elections in Ghana. It considers two different time stamps that is used to define citizenship by birth. First, there exists a time *t1* which holds a value *03.06.57* and a time *t2* which holds the value *22.08.69*. The definition entails that a person should be born between *t1* and *t2* to qualify for citizenship of Ghana by birth following the other conditions in the section. The literal use of the disjunction *or* for *x* to be born between *t1* and *t2*, is inclusive. Thus, *born(x, on(t1) ∨ born(x, after(t1))*. The default or natural implecation of the use of the *or* disjunction means that, only *born(x, on(t1)* can occur, or only *born(x, after(t1)*, or both conditions can occur at the same.

However, it is not possible for a person to be born on two different dates, as suggested by the literal implication of the inclusive use of the *or* disjunction

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in the statement. The use of *either* in the text would have enforced an exclusionary application of the disjunction that will avoid ambiguity and maintain the intended semantics of the statement.

This study therefore makes the clarity by use of the exclusive disjunction to take out the possibility of the occurrence of *born(x, on(t1)* and *born(x, after(t1))* at the same time. Therefore;

$\exists$t1, t2 time(t1)=03.06.57 $\wedge$ time(t2)=22.08.69

$\forall$x born(x, on(t1) $\oplus$ born(x, after(t1)) $\wedge$ born(x, before(t2))

A person defined by the model above can be citizen of Ghana by birth if he or she satisfies either of the two conditions in Section 4(1) of the Act. Section 4(1)(a) is specified for persons born in or outside Ghana; the law requires that either of the parents of the person should be born in Ghana and at least a grandparent or great grand parent of the person should be born in Ghana.

Here again, the exclusive use of the disjunction *either* — used in the natural language— for the parents of *x* being born in Ghana, distorts the semantics in the statement; either of the parents of person *x* would mean that, either the mother or the father of *x*, and not both of them being born in Ghana. By extension, *x* qualifies for citizenship of Ghana, if only the mother of *x* was born in Ghana, or if only the father was born in Ghana. Person *x* however, is disqualified if both mother and father are born in Ghana, according to the exclusionary use of the disjunctive *either* as naturally expressed in the Act. This however, does not conform to the common sense of the law. The inclusive use of the disjunction *or* in *born([father(p, x) $\vee$ mother(p, x)], in(gh))*, will rather maintain the intended semantics of the statement. The inclusive use of the

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disjunction, would imply that, both mother and father born in Ghana does not violate the ascertaining of citizenship by person *x*.

Persons born in Ghana:

father(p, x) ∨ mother(p, x)

parent(p, x) → father(p, x) ∨ mother(p, x)

grandparent(gp, x) → parent(p, x) ∧ parent(gp, p)

greatgrandparent (ggp, x) → grandparent(gp, x) ∧ parent(ggp, gp)

Therefore;

∃x,p, gp, ggp

parent(p, x)

∧ grandparent(gp, x)

∧ greatgparent(ggp, x)

∧ born(x, in(gh))

∧ born([father(p, x) ∨ mother(p, x)] , in(gh))

∧ [born(gp, in(gh)) ∨ born(ggp, in(gh))]

Persons born outside Ghana:

∃x,p, gp, ggp

parent(p, x)

∧ grandparent(gp, x)

∧ greatgparent(ggp, x)

∧ ¬ born(x, in(gh))

∧ born(p, in(gh))

∧ [born(gp, in(gh)) ∨ born(ggp, in(gh))]

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Therefore;

∀x [born(x, in(gh)) ⊕ ¬ born(x, in(gh))] ∧ [born(x, on(t1) ⊕ born(x, after(t1))] ∧ born(x, before(t2))] → ∃p, gp, ggp parent(p, x) ∧ grandparent(gp, x) ∧ greatgparent(ggp, x) ∧ born([father(p, x) ∨ mother(p, x)] , in(gh)) ∧ [born(gp, in(gh)) ∨ born(ggp, in(gh))] → byBirth(Ctz(x, gh))

∀x,∃p, gp born(x, in(gh)) ∧ parent(p, x) ∧ ¬ born(p, in(gh)) ∧ grandparent(gp, x) ∧ born(gp, in(gh)) → byBirth(Ctz(x, gh))

The Section 4(2) of the Act presents similar mode of citizenship type. It defines person *x* to claim its citizenship through their parent, *claimedThrough(Ctz(x, gh), p)*, grandparent, *claimedThrough(Ctz(x, gh), gp)*, or great grandparent *claimedThrough(Ctz(x, gh), ggp)*. This however, emphasises, that if *p* or *gp* or *ggp* through whom *x* claims citizenship lose their citizenship at the time of birth of *x*, *x* will in effect not be citizen of Ghana by birth.

∃p, gp, ggp

parent(p, x)

∧ grandparent(gp, x)

∧ greatgparent(ggp, x)

∧ [claimedThrough(Ctz(x, gh), p) ∨ claimedThrough(Ctz(x, gh), gp) ∨ claimedThrough(Ctz(x, gh), ggp)]

∧ [at(¬ Ctz(p, gh), birth(x)) ∧ at(¬ Ctz(gp, gh), birth(x)) ∧ at(¬ Ctz(ggp, gh), birth(x))]

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$\rightarrow \neg$ Ctz(x, gh)

The Section 4(3) of the Act emphases the importance of *p* and *gp* having citizenship of Ghana, and even the type of citizenship they must possess for *x* to be able to claim citizenship through them, thus, *by(at([Ctz(father(p,x))∨Ctx(mother(p,x))],birth(x)),registration)⊕by(at([Ctz(father(p,x)) ∨ Ctx(mother(p,x))], birth(x)), naturalization)*. This as well comfirms the fact that the citizenship state of a parent through whom a person claims citizenship must be defined in definite terms.

The literal implication of the use of the disjunction has been misplaced in the natural text. However, a parent should have citizenship of Ghana either by registration or naturalisation and not both type of citizenship at the same time. The citizenship status of a parent that qualifies *x* can be the father or mother, or both at same time. This is enforced by the right use of the disjunctive connectives in the model.

The Section 4(3)(a) and 4(3)(b) in the Act are the same but are separated as different conditions. The difference lies in the use of *both* for persons born outside Ghana in Section 4(3)(b) in place of *either* for persons born in Ghana in Section 4(3)(a). Hence, the first part of the statement is presented as;

∃t1,t2 time(t1) ∧ time(t)=03.06.57 ∧ time(t2) ∧ time(t2)=22.08.69

∀x born(x, in(gh)) ∧ [born(x, on(t1) ⊕ born(x, after(t1))] ∧ born(x,

before(t2))] →

∃p father(p, x) ∨ mother(p, x)

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$\wedge$ by(at([Ctz(father(p,x)) $\vee$ Ctz(mother(p,x))], birth(x)), registration) $\oplus$

by(at([Ctz(father(p, x)) $\vee$ Ctz(mother(p,x))], birth(x)), naturalization) $\rightarrow$

byBirth(Ctz(x, gh))

The use of *both* is to emphasise that, one parent alone, whether mother or father being born in Ghana does not form part of the qualifying criteria for persons born outside Ghana. Both parents at least should be born in Ghana. The use of *both* therefore will function as conjunctive connective in the statement.

$\exists$t1,t2 time(t1) $\wedge$ time(t)=03.06.57 $\wedge$ time(t2) $\wedge$ time(t2)=22.08.69

$\forall$x born(x, in(gh)) $\wedge$ [born(x, on(t1) $\vee$ born(x, after(t1))] $\wedge$ born(x, before(t2))] $\rightarrow$

$\exists$p father(p, x) $\vee$ mother(p, x)

$\wedge$ by(at([Ctz(father(p,x)) $\wedge$ Ctz(mother(p,x))], birth(x)), registration) $\oplus$

by(at([Ctz(father(p, x)) $\wedge$ Ctz(mother(p,x))], birth(x)), naturalization)

$\rightarrow$ byBirth(Ctz(x, gh))

This Section Five is defined for persons born on or after the date of enforcement of the 1960 constitution of Ghana. It follows the same definition as the previous section, but with a new the time stamp *time(t3) =24.09.79*, by which *x* has to be born at *t2* in the previous section but before *t3*. The citizenship status of *p* is also defined to have citizenship of Ghana. However, *gp* does not form part of the criteria for *x* to claim citizenship, and this is because, *p* being citizen of Ghana remains sufficient for *x* to claim citizenship through *p* without seeking to extend claim of citizenship through *gp*. The citizenship of *p* however, should be valid at the time *x* was born, otherwise, *x* will not be able to claim citizenship through *p*. This emphasises the importance of Citizenship of *p* or *gp*

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to have effect on the Citizenship of *x*, which is in converse description of ascertaining citizenship in the Section 3 of the Act.

$\exists$t3 time(t3) =24.09.79

$\forall$x [born(x, in(gh)) $\oplus$ $\neg$ born(x, in(gh))] $\wedge$ [born(x, on(t2) $\oplus$ born(x, after(t2))] $\wedge$ born(x, before(t3))] $\rightarrow$

$\exists$p parent(p, x)

$\wedge$ [at(Ctz(p, gh), birth(x))]

$\rightarrow$ byBirth(Ctz(x, gh))

Section Six of the Act implements citizenship definition from the 1979 constitution of Ghana which is part of the Act. The citizenship of *x* is also the same as that of Section Five of the Act, but with a time stamp of *t4*. Here again, the definition states explicitly that *p* or *gp* should have citizenship of Ghana as a criteria to for *x* to claim his or her citizenship through them.

$\exists$x,t4,p,gp born(x, in(gh)) $\wedge$ time(t4)=07.01.93

$\wedge$ [born(x, on(t3)) $\oplus$ born(x, after(t3))] $\wedge$ born(x, before(t4))]

$\wedge$ parent(p, x)

$\wedge$ grandparent(gp, x)

$\wedge$ [at(Ctz(father(p, x)), birth(x)) $\vee$ at(Ctz(mother(p, x)), birth(x))]

$\vee$ Ctz(grandparent(gp, x)), birth(x))

Sections 6(b) follows the same as 6(a), but *x* can only claim citizenship through *p*.

$\exists$x,t4,p,gp $\neg$ born(x, in(gh)) $\wedge$ time(t4)=07.01.93

$\wedge$ [born(x, on(t3)) $\oplus$ born(x, after(t3))] $\wedge$ born(x, before(t4))]

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∧ parent(p, x)

∧ [at(Ctz(father(p, x)), birth(x)) ∨ at(Ctz(mother(p, x)), birth(x))]

The Section Seven of the Act provides that, a person is citizen of Ghana by birth if he or she is born on or after the stipulated date in the provision, and at the time of his birth *either* [emphasis added] of his parents was citizen of Ghana. Either of the parents of the person, to mean that, if the mother only [emphasis added] of the person was citizen of Ghana, or, if the father only [emphasis added] of the person was citizen of Ghana, but not both of them with citizenship of Ghana at the same time according to the exclusivity use of the disjunctive *either*.

The disjunctive *either* in the Section Seven just as in the other sections might have not been intended for its exclusive use, which presents different logical consequence all together for the statements it connects, this is because — as elaborated in the other sections— the default literal and structural use *either* implies exclusivity.

∃t4 time(5)=07.01.93

∀x born(x, in(gh)) ⊕ ¬born(x, in(gh))]

→ ∃t4, p, gp born(x, on(t4) ∨ born(x, after(t4))]

∧ parent(p, x)

∧ grandparent(gp, x)

∧ [at([Ctz(father(p, x)) ∨ Ctz(mother(p, x))], birth(x)) ∨ at(Ctz(gp, gh), birth(x))]

→ byBirth(Ctz(x, gh))

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The Citizenship of a child *x* whose is found in Ghana, *found(x, in(gh))* whose age is not more than seven years, *age(x) < 8* and whose parents are unknown ¬ *known(p)* is considered to be a citizen of Ghana by default. This type of citizenship is based on some assumption and therefore cannot be logically queried beyond the assumption.

∀x child(x) → ∃p, parent(p, x) ∧ age(x) < 8 ∧ found(x, in(gh)) ∧ ¬ known(p) → byBirht(Ctz(x, gh))

The composition of some aspects of the law makes it challenging to process, especially for proofing, their complete logical deductions. While some aspects present open-ended statements, others are defined with limited logical provision.

Thus far, all the logical theorems I have provided in this study specifies or defines the various type of criteria for a person to obtain citizenship of Ghana. Each level of definition is uniquely defined by time stamps that determine the conditions that apply at the specified times. I will like to emphasise that, each stage of the model defined by each section of the Act presents sufficient premises for a person to be citizen of Ghana by birth.

Some of the interesting issues that are found in this discusion brings to bare other meanings presented by the statement of the pieces of law modelled, which is quite different from the intention of the framers of the law.

I have discovered through the formalism that, the use of words in legal statements is done with their leteral and default engalish meaning, except for instances where they are explicitly specified to mean something else as

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prescribed by the law. The literal use of these words in natural expression at human level does not really pose any serious situations for confusion.

However, these words in the statements sometimes changes the logical presentation from the intention of the composition of the text made, by their literal use. This is found through the semantic analysis of the logical implications of the words in the statements. I have there discussed the logical implications of some statements which have been apparently different from how the statements were constructed to mean. This is important because, words and their meaning in legal statements have always been debated in legal discourse in order to ascertain the implication of statements in decision-making processes.

Acquisition of Ghana Citizenship otherwise than by Birth

The ensuing theorems are based on the second part of citizenship in the Act. This kind of citizenship is acquired otherwise than by birth of a person. The various provisions for this type of citizenship by the Act is made possible through adoption, registration and naturalisation of a person. In my discussions on aspects of citizenship, I have tried to highlight, as done in the previous sections, the ostensibly different semantics presented by natural text of the Act and that of the logic models I have generated. Every analysis at each stage has a unique emphasis on the logic implication of the text.

The adoption rule for citizenship (under Section 9) applies to children not more than 16 years whose parents p, do not have Ghanaian citizenship. Such children if adopted by some Ghanaian citizen y will obtain citizenship of Ghana through y.

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∃p,y ∀ x, [child(x) ∧ age(x)<17 ∧ parent(p, x) ∧ ¬ Ctz(p, gh) ∧ Ctz(y, gh) ∧ adopts(y, x)] → Ctz(x, gh)

The other means by which a child can become citizen of Ghana is by registration. However, the application for citizenship by registration has to be done by the parents of the child who have citizenship of Ghana by registration or by naturalisation.

∃m, [minister(m) ∧ upon(as(register(m, x), Ctz(x, gh)), applies(p)] → ∃p,x child(x) ∧ [parent(p, x) ⊕ guardian(p, x)] ∧ [byRegistration(p, gh) ∨ byNaturalisation(p, gh)]

The rules or conditions for citizenship by registration is one of the aspects of the Act that is difficult to analyse logically. It is defined by too many terminologies that do not have their meaning specified in the Act, which makes it difficult to infer the right semantics to the text.

The registration rule (Section 10) specifies registration for a person who is citizen of an approved country, *approved(country(c))*, who is of age and of capacity of the approve country *ofAge(x, of(c)) ∧ ofCapacity(x, of(c))*.

The challenge presented by these conditions is that, there is no way of deducing *approved( )*, *ofAge( )*, and *ofCapacity( )*. This is because the Act does not say what it means to be an approved country, a person of age, and person of capacity. It is also difficult to tell what the Act means by a person of good character *has(x, good(character))*. There should be at least certain elements that constitute a good character, which is possibly what the Act would look out for, even though not specified. Again, elements of good character for an approved

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country may not necessarily be the same for Ghana, and that presents different levels of ambiguities in the text.

Even though these terminologies are presented as axioms in the models, if there is a contention on any of those terms, the model will be limited in the resolution of such terminologies.

∃x,c Ctz(x, approved(country(c))) ∧ ofAge(x, of(c)) ∧ ofCapacity(x, of(c)) ∧ approved(applied(x), by(president)) ∧ has(x, good(character)) ∧ ordinarily(resident(x, gh))

∃pr1 period(pr1)=5 ∧ resident(x, through(pr1))

∃L indigenous(language (L), gh) ∧ speaks(x, L)

∃x,c Ctz(x, approved(country(c))) ∧ ofAge(x, of(c)) ∧ ofCapacity(x, of(c)) ∧ approved(applied(x), by(president)) ∧ has(x, good(character)) ∧ ordinarily(resident(x, gh)) ∧ [∃pr1 period(pr)=5 ∧ resident(x, through(pr1))] ∧ [∃L indigenous(language (L), gh) ∧ speaks(x, L)] → byRegistration(Ctz(x, gh))

Distinct conditions apply for *applied(x)* in the above model if *x* is a man which require that he should be a permanent resident of Ghana.

∃x man(x) ∧ ¬ Ctz(x, gh) ∧ seeking(x, registration) ∧ permanently(resident(x, gh))

Some parts of the rules for citizenship by registration boarders on marriage. The Act allows persons *x* to be registered as citizens through their marriage with persons *y* with citizenship of Ghana at the time of the death of *y*.

∃x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [married(x, y) ⊕ at(was(married(x, y)), death(y))] ∧ applied(x)] → byRegistration(Ctz(x, gh))

The dissolution of marriage between *x* and *y* does not affect the citizenship of *y* obtained through his or her marriage with *x*.

∃x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ dissolved (married(x, y)) ∧ applied(x)] → byRegistration(Ctz(x, gh))

Children who are born to *x* and *y* under the above conditions also become citizens of Ghana, and will not lose their citizenship even if the marriage of the parents is dissolved.

∃x ¬ Ctz(x, gh) ∧ [∃y Ctz(y, gh) ∧ [married(x, y) ⊕ at(was(married(x, y))] ∧ applied(x)] → byRegistration(Ctz(x, gh))

∃z child(z, byRegistration(Ctz(x, gh))) → Ctz(z, gh)

The minister who makes the registration of *x* as citizen of Ghana reserves the right to establish that the marriage between *x* and *y* was not primarily entered into for *x* to obtain citizenship of Ghana but was entered into in good faith.

∃x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [in(married(x, y), good(faith)) ⊕ in(was(married(x, y)), good(faith))] ∧ ¬ primarily(married(x, y), for(registration)) ∧ applied(x)] → byRegistration(Ctz(x, gh))

In all the provisions made for persons ∀*x person(x)*, to obtain citizenship of Ghana by registration, the very critical principle is that *x* must take an oath of allegiance, otherwise will not be registered as citizen of Ghana.

∀ x byRegistration(Ctz(x, gh)) → take(x, of(oath, allegiance))

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The citizenship by registration (Section 12(1)) is effected from the date a person takes the oath of allegiance which shall be stated on the certificate of registration.

∃x,c Ctz(x, approved(country(c))) ∧ ofAge(x, of(c)) ∧ ofCapacity(x, of(c)) ∧ approved(applied(x), by(president)) ∧ has(x, good(character)) ∧ ordinarily(resident(x, gh)) ∧ [∃pr1 period(pr)=5 ∧ resident(x, through(pr1))] ∧ [∃L indiginous(language (L[ ]), gh) ∧ speaks(x, L[ ])] → byRegistration(Ctz(x, gh)) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [married(x, y) ∨ was(married(x, y))] ∧ applied(x)] → byRegistration(Ctz(x, gh)) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [married(x, y) ∨ at(was(married(x, y)), death(x))] ∧ applied(x)] → byRegistration(Ctz(x, gh)) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ dissolved (married(x, y)) ∧ applied(x)] → cont(byRegistration(Ctz(x, gh))) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

∃x, y person(x) ∧ child(y) ∧ of(child(x), of(marriage, x)) ∧ byRegistration(Ctz(x, gh))) → cont(Ctz(y, gh)) ∧ [∃Tc date(Tc) ∧

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date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

∀x ¬ Ctz(x, gh) [∃y Ctz(y, gh) ∧ [in(married(x, y), good(faith)) ∨ in(was(married(x, y)), good(faith))] ∧ ¬ primarily(married(x, y), for(registration)) ∧ applied(x)] → byRegistration(Ctz(x, gh)) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

∀ x [man(x) ∧ ¬ Ctz(x, gh) ∧ seeking(x, registration) ∧ permanently(resident(x, gh))]

[∃y Ctz(y, gh) ∧ [married(x, y) ∨ was(married(x, y))] ∧ applied(x)] → byRegistration(Ctz(x, gh)) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

Tc; coded for date (time) stated on certificate of registration

∃x, m child(x) ∧ minister(m) ∧ as(register(m, x), Ctz(gh)) → ∃y person(y) ∧ [parent(y, x) ∨ guardian(y, x)] ∧ [byRegistration((Ctz(y, gh)) ∨ byNaturalisation(Ctz(y, gh))] ∧ applies(y) ∧ [∃Tc date(Tc) ∧ date(Tc, of(certificate, registration)) ∧ from(byRegistration(Ctz(x, gh)), Tc)]

Toa; date of taking of oath of allegiance

∃Ta; date(Toa) ∧ date(Toa) = date (Tc) ∧ on(taken(x, of(oath, allegiance)), Toa)

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The provisions made for persons to acquire citizenship by naturalisation (Section 13) requires the review of the minister and the approval of the president of a person's qualification to obtain such citizenship.

The qualification relies on some fundamental facts that must be established about the applicant. The applicant or person should be resident in Ghana *resident(x, gh)* within a period of twelve month, *period(pr2)=1* before making his or her application, the date of the application *Ta* therefore forms part of the criteria. I have for the sake of consistency with the other dates coded the period of twelve month as one year in the model.

∃x, person (x) ∧ qualifies(x, naturalisation) ∧ resident(x, gh)

∧ on(applied(x), time(ta))

∃pr2, ta period(pr2)=1 ∧ timeofApp(ta) ∧ resident(x, through(pr2)) ∧ immediatelypreceding (resident(x, through(pr2)), on(applied(x), time(ta)))

∃x, pr2, ta person(x) ∧ resident(x, gh) ∧ period(pr2)=1 ∧ timeofApp(ta) ∧ resident(x, through(pr)) ∧ immediatlypreceding (resident(x, through(pr2)), on(applied(x), time(ta))) → qualifies(x, naturalisation)

∃x, pr3, pr4, pr5 person(x) ∧ period(pr3)=7 ∧ period(pr4)=1 ∧ period (pr5)

∧ resident(x, gh) ∧ immediatlypreceding (pr3, pr4)

∧ resident(x, during (immediatlypreceding (pr3, pr4))> 4

→ qualifies(x, naturalisation)

It is also required that the person must demonstrate a good character, but in this case there is a request for an attestation by two other citizens of Ghana

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who are either lawyers *lawyer(lwr)*, notaries public *notriesPublic(np)* or senior public *officers seniorPublicOfficer(spo)*. Even though there is an attestation required in this criteria to establish whether the applicant is of good character or otherwise, the good character still remains contentious and ambiguous as long as the Act does not specify what it means by good character.

∃np,lwr,sponotriesPublic(np) ∧lawyer(lwr) ∧ seniorPublicOfficer(spo)

∧ Ctz(np, gh) ∧ Ctz(lwr, gh) ∧ Ctz(spo, gh) ∧

∃ x, person(x)

∧ attest([np ∧ lwr], has(x, good(character)))

∨ attest([lwr ∧ spo], has(x, good(character)))

∨ attest([np ∧ np], has(x, good(character)))

∨ attest([lwr ∧ lwr], has(x, good(character)))

∨ attest([spo ∧ spo], has(x, good(character)))

→ qualifies(x, naturalisation)

The law also requires that the person should not be an ex-convict of Ghana or any other country, or have any criminal offence *ofence(ofn)* according to the laws of Ghana .

∃x, lw, ofn, pr person(x) ∧ law(lw)∧ of(lw, gh) ∧ ofence(ofn)

∧ period(pr)

∧ recognisedby(ofn, lw)

∧ [for(¬ in(sentenced(x, of(pr, imprisonment)) , gh), recognisedby(ofn, lw))∨for(¬in(sentenced(x,of(pr,imprisonment)),¬gh),

recognisedby(ofn, lw))]

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$\rightarrow$ qualifies(x, naturalisation)

The person should as well be able to speak an indigenous language of Ghana. The indigenous language *L[ ]* is modelled as list of items to hold more than one language.

∃L indigenous(language(L[ ]), gh) ∧ speaks(x, L[ ])

∃L indigenous(language (L[ ]), gh) ∧ speaks(x, L[ ])

$\rightarrow$ qualifies(x, naturalisation)

It is also required that, *x* should be able to make substantial contribution to any area of national progress or advancement.

∃x,cnt person(x) ∧ contribution(cnt) ∧ ¬ Ctz(x, gh) ∧

[to(made(x, substantial(cnt)), national(progress)) ∨

to(Of(capable(x) , making(substantial(cnt))), national(progress)))]

$\rightarrow$ qualifies(x, naturalisation)

Person *x* should have been assimilated or should be capable of being easily assimilated into the way of life of Ghana. This is aspect of the Act requires a more intuitive assertion than a logical analysis. It is difficult to logically assert how a person *can be easily assimilated* and even into a way of life that has no definite definition. That is because the way of expressing some legal concepts in the Act is done in a way that communicates both intuitively and logically. The model provided for this piece of law will depend on meaning beyond the scope of the text given to *canBeEasily(assimilated(x, ghl))* in the Act.

∃gl,x ghanaianLife(ghl) ∧ person(x) ∧ assimilated(x, ghl) ∨

canBeEasily(assimilated(x, ghl)) $\rightarrow$ qualifies(x, naturalisation)

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Person *x* should also have a valid residence permit *possessed(x, pmt)* before applying for naturalisation. By this, *x* will have to establish that he or she intends to stay permanently in Ghana.

∃x, person(x) ∧ permanently(reside(Intends(x), gh)) ∧ granted(x, certificate)

∧ [∃ pmt,ta permit(pmt) ∧ timeofApp(ta) ∧ valid(resident (pmt)) ∧ on(possessed(x, pmt), ta)]

→ qualifies(x, naturalisation)

The evaluation of qualification for naturalisation is also done by a minister with approval of the president of the country. Here again we come across phrase such us, *the minister may in such a special circumstance as he thinks fit*; These are the aspects of the piece of law I have consistently mentioned as difficult to evaluate by means of a logic tool. This section of the law leverages the assertion of the right time to the minister. This allows for different timing for the exercise at different periods depending on who is minister. The time that may be ascribed as fit cannot be based on a logic deduction. It can only be treated as the perspective the minister, which is open-ended enough for contention.

∃ m, pr6,ta, minister(m)

∧ period (pr6)=1

∧ timeofApp(ta)

∧ mayAllow(m, before(ending(continuous(pr6))=< 0.5 , ta))

∧ asThough(for(reckoned (pr) , purposesOf([resident(x, through(pr))

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∧immediatlypreceding(resident(x,through(pr2)),on(applied(x),time(ta))

)])) , immediately(preceding , ta))

∃c, 1b,r approved(country(c)) ∧ residence(r) ∧   in(r , c) ∧

asThough(reckoned(mayAllow(m , r), for(purposesOf([resident(x, gh)

∧ immediatlypreceding (pr3, pr4)

∧ resident(x, during (immediatlypreceding (pr3, pr4))> 4])) , in(r, gh))

In general, the translation of the Citizenship Act of Ghana into FOL in this study has revealed and established the technical faults of textual presentation of the Act, by elaborating the logical consequence of the statements of the Act. The presentation of the Citizenship Act in FOL establishes that, the choice and use of words in the sentential structure of the Act, presents different meaning from its logical analysis, which as well presents different levels of semantics to the text of the Act. The model also points out, areas of the Act which limits any kind of inference of meaning that can be done on those aspects of the text.

The model however, enforces the intended meaning as demonstrated, and as well ensures clarity and comprehensibility in the text of the Act.

Testbed of Formalised Text of Supreme Court Case in First Order Logic: [1995-1996] Ghana Law Report

This is a case presented in the Supreme Court of Ghana for verdict, which is used in this study as testbed to the formalised text of the Citizenship Act of Ghana, for sound reasoning and automated discovery of fallacies.

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It is imperative to note that, decision-making process in the court is not a simple or mechanical process that is designed as a crystallised step-by-step system to yield results. As a matter of fact, it is a very tedious process that engages intellectual discourse, application of law and experience.

Decision-making process in the court is an *undecidable* procedure as it is in decision procedure for FOL. I am therefore not providing a generic decision-making mechanism in the law court by means of a logical tool in this research. What I have done is to provide one possible pattern of sound reasoning through legal text by means of a logic tool. The modelled text of the Ghanaian Citizenship laws form a knowledge base of the whole automated system for sound reasoning and the discovery of fallacies in legal text. This court case is therefore a testbed to the modelled law, which is done to establish the process of sound logical or deductive reasoning through the law.

In this case, as generally presented in court cases, there was a claim made by an accuser, a claim which was mainly relied on the Sections One and Eight of the Ghana Nationality Act (361) 1971. It should be noted that, the Ghana Nationality Act (361) 1971 has been consolidated into the Citizenship Act (591) 2000 of Ghana.

The plaintiff accused the first defendant of not being qualified to stand for the Office of the President of Ghana, and by that allegations, the plaintiff established the premise on which he made his argument, that is, the first defendant is not citizen of Ghana, following another premise, which he pointed out that the first defendant had citizenship of another country other than Ghana and citizenship of Ghana at the same time, and when the first defendant attained

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21 years, he did not renounce his citizenship of the other country, and by virtue of his failure of renunciation ceases to be Ghanaian.

I have modelled the claim made by the plaintiff, which is to allow for the assertion of the logical satisfiability of the claim made. It is important to note that, the logical correctness alone of the claim cannot be used for making any decision. The claim is evaluated with the related law from the knowledge base, to assert its legal validity. If the claim made is in tune with the law, then the facts of the accused or the first defendant is as well established to assert whether he or she has violated the law, on which basis the accusation was made.

According to the claim, there exists a person, who in this case is called the first defendant coded as *f_d*, thus, *∃f_d, person(f_d)*, who has citizenship of Ghana *Ctz(f_d, gh)*, and at the same time has citizenship of another country other than Ghana *Ctz(f_d, ¬ gh)*. The first defendant however, when he attained the age 21 with both citizenship, thus, *at(Ctz(f_d, gh), age(21))* and *at(Ctz(f_d, ¬ gh), age(21))* did not renounce his citizenship for the country other than Ghana, *¬ renounce(f_d, Ctz(f_d, ¬ gh))*. The plaintiff therefore concludes that, the first defendant lost his citizenship of Ghana based on the claim he made.

∃f_d, person(f_d) [at(Ctz(f_d, gh), age(21))

∧ at(Ctz(f_d, ¬ gh), age(21))

∧ ¬ renounce(f_d, Ctz(f_d, ¬ gh))]

→ ¬ Ctz(f_d, gh)

The argument is further advance to state that, the first defendant does not qualify to stand for the office of the President of Ghana coded as *pog*, and thus, *¬ Ctz(f_d, gh) → ¬ qualified(f_d, of(office, pog))*.

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∃f_d, person(f_d) [at(Ctz(f_d, gh), age(21))

∧ at(Ctz(f_d, ¬ gh), age(21))

∧ ¬ renounce(f_d, Ctz(f_d, ¬ gh))]

→ ¬ Ctz(f_d, gh)

¬ Ctz(f_d, gh) ↔ ¬ qualified(f_d, of(office, pog))

The Referenced Law of the Case

The claim was made in reference to the law which is as well modelled

for the assertion of the claim.

∃t, x time(t) ∧ person (x) ∧ time(t)=03.06.57 ∧

born(x, before(t))

∃p parent(p, x) ∧ born(p, in(gh))

∃gp grandparent(gp, x) ∧ born(gp, in(gh))

∃t, p, gp time(t) = 03.06.57 ∧ born(x, in(gh)) ∧ born(x, before(t))

∧ parent(p, x) ∧ grandparent(gp, x) ∧ [born(p, in(gh)) ∨ born(gp,

in(gh))] → byBirth(Ctz(x, gh))

The Section Eight of the Act 361 as presented here, establishes

citizenship of Ghana and any other country other than Ghana for all *x* when they

attain age 21, thus, ∀*x* *[at(Ctz(x, gh), age(21))* and *at(Ctz(x, ¬ gh), age(21)).*

Any arbitrary *x* under such condition who does not renounce his citizenship of

the country other than Ghana, ¬ *renounce(x, Ctz(x, ¬ gh))*, will no longer be

citizen of Ghana, ¬ *Ctz(x, gh)*, upon a specified *sdate(T)*.

∀x [at(Ctz(x, gh), age(21))

∧ at(Ctz(x, ¬ gh), age(21))

∧ ¬ renounce(x, Ctz(x, ¬ gh))]

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↔ upon(¬ Ctz(x, gh), sdate(T))

Therefore;

∀x [at(Ctz(x, gh), age(21))

∧ at(Ctz(x, ¬ gh), age(21))

∧ renounce(x, Ctz(x, ¬ gh))]

→   Ctz(x, gh)

The law further specifies the same case but for people who are not born in Ghana ¬ *bornIn(x, gh)*. The additional condition specified here is that, such a person should register with the minister a declaration of his intention which is coded as *doi,* to reside in Ghana, *with(registered(x, doi(in(reside, gh))), minister)*.

∀x [at(Ctz(x, gh), age(21))

∧ ¬ bornIn(x, gh)

∧ at(Ctz(x, ¬ gh), age(21))

∧ ¬ renounce(x, Ctz(x, ¬ gh))

∧ ¬ with(registered(x, doi(in(reside, gh))), minister)]

↔ upon(¬ Ctz(x, gh), sdate(T))

Therefore;

∀x [at(Ctz(x, gh), age(21))

∧ ¬ bornIn(x, gh)

∧ at(Ctz(x, ¬ gh), age(21))

∧ ¬ renounce(x, Ctz(x, ¬ gh))

∧ with(registered(x, doi(in(reside, gh))), minister)]

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$\rightarrow$ Ctz(x, gh)

The law addresses particular persons *x* who had existing citizenship of Ghana, and therefore attained continuous citizenship at the age of 21 years, *at(cont(Ctz(x, gh), age(21)))*. If such persons at the same time, had citizenship other than Ghana at the time the constitution came into force, *at(Ctz(x, ¬ gh), T_eoc)*, have to renounce the citizenship of the other country other than Ghana, *renounce (x, Ctz(x, ¬ gh))* or take an oath of allegiance, *taken(x, of(oath, allegiance))*, or otherwise lose their Ghanaian citizenship.

at(cont(Ctz(x, gh), age(21)))

$\wedge$ at(Ctz(x, ¬ gh), T_eoc)

$\wedge$ ¬ renounce (x, Ctz(x, ¬ gh))

$\wedge$ ¬ taken(x, of(oath, allegiance))

$\leftrightarrow$ upon(¬ Ctz(x, gh), sdate(T))

Therefore;

at(cont(Ctz(x, gh), age(21)))

$\wedge$ at(Ctz(x, ¬ gh), T_eoc)

$\wedge$ renounce (x, Ctz(x, ¬ gh))

$\wedge$ taken(x, of(oath, allegiance))

$\rightarrow$ Ctz(x, gh)

Court Decision

The decision of the case relied on the truth values established on the facts of the first defendant against the claim that was made. The court upon the review of the case looked out for evidence of the claim made, before it could further evaluate the claim with the related laws of Ghana. The final decision of

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the court was taken based on different application of different legislative instrument. I have therefore modelled some of the instances of the decisions taken and analysed their logical and legal implications. The modelled decision of the court presents a picturesque form of the sound reasoning through the text of the claim, the applied law and the decision process itself.

The first stage of assertion is to establish whether the first defendant is a citizen of Ghana or otherwise, as challenged by the claim. The court established that, the claim that the first defendant had citizenship of another country other than Ghana when he attained age 21 *at(Ctz(x, ¬ gh), age(21))* could not be accepted as a fact since the plaintiff failed to establish the evidence proving that claim. The effect is that, this statement can no longer be part of premises of the plaintiff. Since *at(Ctz(f_d, ¬ gh), age(21))* cannot form part of the argument made, then there is nothing to renounce, which also means that, ¬ *renounce(f_d, Ctz(f_d, ¬ gh))* cannot also form part of the argument made. The lack of evidence for *at(Ctz(f_d, ¬ gh), age(21))* and ¬ *renounce(f_d, Ctz(f_d, ¬ gh))* made the court at one instance of the decision process state that, those two claims cannot form part of the basis for the conclusion made. This will result in the model being processed as;

∃f_d, person(f_d) [at(Ctz(f_d, gh), age(21))

∧ ∅

∧ ∅

↔ ¬ Ctz(f_d, gh)

In this model, there are no sufficient premises to evaluate the whole argument. We are left with *at(Ctz(f_d, gh), age(21))* which is a necessary but

not a sufficient premise for the ¬ *Ctz(f_d, gh)* to be deduced. The deductive rule

of the conclusion of the model is defined by the related law or applied legislative

instrument, which requires three atomic premises necessary and sufficient for

the conclusion to be deduced.

Another way the court evaluated the claim was to consider the truth state

of each of the premises in the proposition. I have used the claim as presented by

the plaintiff, by this, what is being asserted is that *upon(¬ Ctz(f_d, gh),*

sdate(T)) is true for the case of the first defendant according to the plaintiff.

However, the applicable truth state of first defendant can only be determine by

the court and therefore will be the only truth state of the claim for the evaluation

in the decision process.

The decision taken by the model uses the outline of each atomic premise

with its truth-value as established by the court, against the truth-value of the

conclusion made in the claim, which is the same system of reasoning by the

court.

Premises;

at(Ctz(f_d, gh), age(21)) = T

at(Ctz(f_d, ¬ gh), age(21)) = F

¬ renounce(f_d, Ctz(f_d, ¬ gh)) = F

Conclusion;

¬ Ctz(f_d, gh) = F

The figure illustrated here outlines, the logical process undertaken by

the model to arrive at a decision. The illustration outlines how each atomic

statement in the model is processed based on the truth-values provided by the

court. This analysis reveal that, the reasoning process of the court is logically correct, and hence, produces the right logical consequence of each stage of the argument.
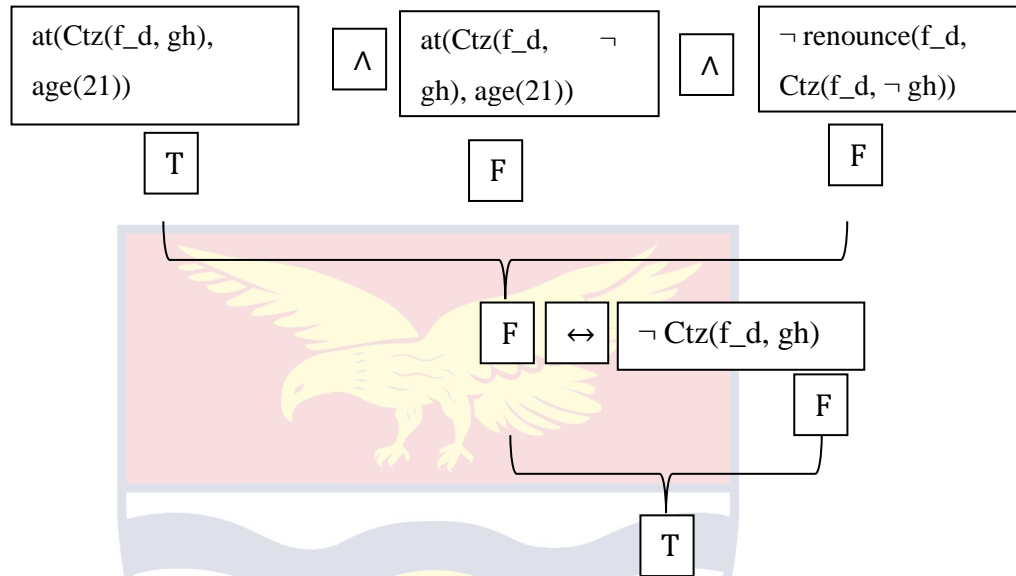
Figure 2: Logical Analysis of Decision-making Process.

The premises made in the claim are conjunctively connected to each other, which results in a *False* value for the *ANDed* premises. The truth-value for the premises is further evaluated with the conclusion statement by means of a bi-conditional implication, which finally results into a *True* value, or valid state for the whole argument.

The second stage of assertion is to establish whether the first defendant qualifies to stand for the position of the Office of the President of Ghana or otherwise. The law provides that, if a person is not citizen of Ghana, such person cannot stand for the office of the presidency of Ghana, $\neg\ Ctz(f\_d,\ gh) \leftrightarrow \neg$ *qualified(f_d, of(office, pog))*. From the first semantic evaluation, I established that, $\neg\ Ctz(f\_d,\ gh)$ for the first defendant holds a *False* value, even though the

plaintiff makes his calim, ¬ *qualified(f_d, of(office, pog))* as true. Therefore by illustration;

$$\neg \text{Ctz(f\_d, gh)} \leftrightarrow \neg \text{qualified(f\_d, of(office, pog))}$$

F   F

T
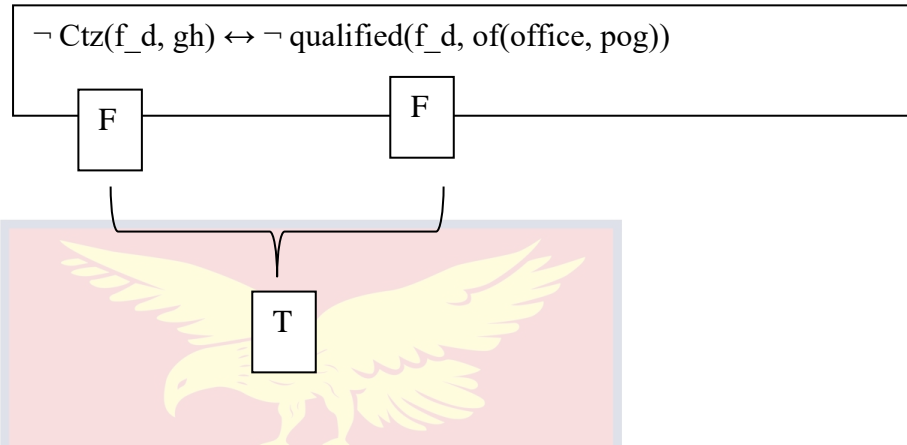
Figure 3: Logical Analysis of Claim Made by Plaintiff

The bi-conditional implication rule for a false antecedent and a false consequent results in a true value for the whole proposition. By this evaluation, and as asserted by the court, it is a valid argument that, if the first defendant is not a citizen of Ghana should not be qualified to stand for the Office of the President of Ghana. The logic process and analysis clarifies the pattern of reasoning that should be employed in the evaluation of the situation, this takes out all systems of contentions and further arguments that can possibly be generated after a ruling of a case,

The model provided here is not an exclusionary provision of all the legislative instruments employed by the court. They are aspects but sufficient provision that properly validates the same conclusion or decision of the court on the case.

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The court for the purpose of avoiding doubt in its decision-making, employs as many legal instruments as possible to arrive at a decision. The purpose of the logic paradigm provided by this study is not to exhaust all means used by the court which included jurisprudence. The focus here has been the application of key aspects of the constitution sufficient for the decisions-making process. The court however used the following legislative instruments:

1. Electoral Commission Law 1991 (PNDCL 271)

2. Presidential Elections Law, 1992 (PNDCL 285)

3. Ghana Nationality Act 1971 (Act 361)

4. Constitution of Ghana 1979

5. Statutory declaration of the defendant

6. Jurisprudence: Punjabi Bros vs Namih (1958) 3 WALR 381

All these legislative instruments used at different levels of the decision process placed emphasis on the pattern of reasoning charted to arrive at the conclusion. However, what remained central to the decision of the case was the legislative instruments the plaintiff relied on to make his claim. The logic program therefore followed only such aspects for the semantic evaluation of the decision of the court, since such aspects are sufficient and necessary.

The logic program of the piece of Ghanaian legislation, and its application to decision-making process in the court, presented in this study as computational method or a logic tool for asserting sound and deductive reasoning of legal text. The complexity of legal language is here reduced, clarity

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and pattern of sound reasoning through the text is preserved, and the decision can be evaluated for logical and legal consistency.

Citizenship Act 2000 (Act 591) of the Republic of Ghana as a Prolog Programme

The modelled text of the citizenship Act of Ghana implemented as a Prolog programme in this study, is done to test for coherence of internal logic proofs of FOL, by means of a Prolog theorem prover, and also for the purpose of the automated reasoning mechanism provided by the study.

This aspect of the study expanded the discussion on the Prolog programme paradigm of the modelled text in FOL and its implications. The Prolog programme does not only present the natural language text in different syntax from the FOL syntax, it does presents a more robust mechanism for deductive reasoning and automation functionality.

The Prolog programme based on the various provisions given in the Act uses a combination of the time stamps and logical conditions in the Citizenship laws for ascertaining citizenship of Ghana.

The first part of the Section One of the Citizenship Act which provides definitions for persons who are citizens before the independence of Ghana, *was_Ctz(X, gh)*, functions as an axiom in the system. There are however implications of the two time stamps for person *X*, and thus. *time of effective date of citizenship* coded as *T_edc*, and *time of enforcement of constitution* coded as *T_eoc*, such that *T_edc* happens before *T_eoc*, and thus, *T_edc@<T_eoc*.

Therefore, a person *X* who was citizen of Ghana, *was_Ctz*(X, gh), implies that the effective date of the citizenship of the person *T_edc*, happened before the enforcement of the Constitution *T_eoc*, and thus,

was_Ctz(X, gh):- T_edc@<T_eoc.

This is implied by the constitution that, if a person is a citizen by this definition, then such person is known officially as an *Existing Citizen.*

existing(isCtz(X)):- was_Ctz(X, gh).

This expression is evaluated as, a person *X* is an existing citizen, *existing( )*, if he or she was citizen of Ghana, *was_Ctz(X, gh)*. The axiomatic implementation of *was_Ctz(X, gh)*, forces the system not to require proof of how person *X* becames citizen before the independence of Ghana, which is done following the definition in the Act. This introduces a limitation on the system to assert the citizenship of a person under this definition, and thus only applies the axiomatic state of any person *X*, whether the person in real case was citizen of Ghana or not.

The second part of the clause of Section One defines what happens to the state of an existing citizen after the coming into force of the constitution, which is defined as *t_CAEoC*. This time stamp here takes the same conditions as *was_Ctz(X, gh)*, however, *T_edc* happens at, or, after the coming into force of the constitution, and thus is programmed, *t_CAEoC (T_edc, T_eoc):- T_edc @>= T_eoc.*

This is also implied by the constitution that, if a person is a citizen at time *t_CAEoC( )*, then the citizenship of such a person is known officially as a

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Continuation of Existing Citizenship, thus; *cont(isCtz(X)):- existing(isCtz(X)), t_CAEoC(T_edc, T_eoc).*

A person *X* who has a Continuation Citizenship, *contCtz(X),* implies, and as a necessary condition, must have been an Existing Citizen, and the Continuation of Existing Citizenship happens at time function *t_CAEoC( ).*

Ascertainment of the Law Applicable to Citizen by Birth

The Section Two of the Citizenship law is not programmed as part of this study for several reasons which as well points out an important emphasis of this study. The focus of the study is to first, establish that the text at least holds some basic form of logical structure before it can be formalised or programmed. Second, the clauses in the section must have logical implications that affects the general semantics of the Act.

The clause in this section however is presented in a less logic form; it is presented in a highly unstructured language form, which also, does not form part of the conditions for the acquisition of any form of citizenship of Ghana. It only makes expression on restating the applicable provision to make the law on Ghanaian citizenship by birth understandable. A model of this kind of statement may only at best be made as a comment in the programmed system for the sake of clarifications.

Persons born before 6/3/57

The 6th of March 1957 which is the Independence Day of Ghana, is expressed as *time_date of independence* and coded as *T_doi*. It should also be noted that, *a person born before* indicates the date of birth of a person, which is coded as *T_dob*, precedes 6th March 1957 by definition of the law, which implies

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that *T_dob* happens before *T_doi*. These two dates will therefore become arguments to the main clause of Persons born before 6th March 1957. This clause or statement is coded as *t_B6357*.

There is such a time *t_B6357* defined for time before 6th March 1957, when a person is born, such that, the person's date of birth *T_dob* happens before that time, which is the date of independence of Ghana, *T_doi*. Therefore, for person *X* born at the time *t_B6357* means that, *bornAt (X, t_B6357(T_dob, T_doi)).* such a person *X* qualifies to be citizen by birth, *byBirth(isCtz(X, gh)).*

However, this statement is dependent on conditions 3(1)(a) and 3(1)(b) of Section 3. This program is complete only at instances where the two conditions are applied to it. For such a person *X* to be citizen will depend on clause 1(a) or 1(b). Therefore, the following definitions are necessary, where;

A person X born in country gh is defined as; bornIn(X, gh).

A person X born outside country gh is defined as; bornOut(X, gh).

A person Z is a parent of a person X is defined as; parent(Z, X).

A person G is a grandparent of a person X implies that Z is a parent of X and G is a parent of Z is defined as; gparent(G,X):-parent(Z,X), parent(G,Z).

A person GG is a great grand parent of X implies, G is a grandparent of X and GG is a parent of G is defined as; g_gparent(GG,X):-gparent(G,X), parent(GG,G).

A person Z who is a parent of X is born in country gh is defined as; bornIn(parent(Z, X), gh).

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A person G who is a grandparent of X is born in country gh is defined as;

bornIn(gparent(G, X), gh).

A person GG who is a great grandparent of X is born in gh is defined as;

bornIn(g_gparent(GG,X),gh).

Therefore;

bornIn(P, gh):-bornIn(parent(Z,X), gh).

bornIn(GP, gh):-bornIn(gparent(G,X), gh).

bornIn(GG,gh):-bornIn(g_gparent(GG,X),gh).

The variable *P* is a parent who is born in country *gh* and *GP* is a grandparent born in country *gh*.

The rest of the condition in 1(a) states that *X* is born in Ghana which is defined as *bornIn(X,gh)*, and at least one of his parent is born in Ghana, defined as *bornIn(P,gh)*, or grandparent was born in Ghana, *bornIn(GP,gh)*.

byBirth(isCtz(X,gh)):-bornAt(X,t_B6357(T_dob,T_doi)),bornIn(X,gh),

bornIn(P,gh); bornIn(GP,gh).

byBirth(isCtz(X,gh)):-bornAt(X,t_B6357(T_dob,T_doi)),

bornOut(X,gh),bornIn(P,gh).

It is important to note that *P* and *GP* in the programme are variables that can hold values of mother or father, and grandmother or grandfather for the case of parents and grandparents respectively.

Persons Born on or after 6/3/57 but 22/8/69

The Section Four of the Citizenship Act defines citizenship for persons born on or after the independence day of Ghana for time periods on or after 6th March 1957 and before 22nd August 1969, that is, *t_OA57B69.* However, the

time *T_dob* and *T_doi* still hold their respective previous function and as defined here, t_OA57B69 (T_dob,T_doi,T_69c):-T_dob@>=T_doi, T_dob@<T_69c.

There is such a time function *t_OA57B69( )*, that takes three arguments, the date of birth of a person *T_dob*, the independence date of Ghana *T_doi*, and the date of enforcement of the 1969 constitution of Ghana, *T_69c*, such that, a person's date of birth is either on or before the independence of Ghana which occurres before 1969.

The definition of this time function now makes it possible to situate a person's birth and the implication of the birth at such a time, and thus, *bornAt(X, t_OA57B69 (T_dob,T_doi,T_69c))*.

This section is the first condition that satisfies the definition of being citizen by birth of a person in section 4(1). Person *X* is citizen of *gh* by birth if such a person *X* is born at time *t_OA57B69( )*, and *X* is born in *gh* or *X* is born outside *gh* or the grandparent *GP* of person *X* is born in *gh* and the great grandparent *GG* of person *X* is born in *gh*.

Section 4(1)(b) of the Act is an alternative clause that defines citizenship by birth in Section 4(1), which is however specified only for people who are born in Ghana but have parents who are not born in Ghana.

The condition specifies that, a person *X* is citizen of *gh* by birth, if such a person is born in *gh* at time *t_OA57B69*, whose parents *P* are not born in *gh* but their grandparents *GP* are born in *gh*, therefore, *byBirth(isCtz(X,gh)):- bornAt(X,t_OA57B69(T_dob,T_doi,T_69c)),   bornIn(X,gh),not(bornIn(P,gh)), bornIn(GP,gh)*.

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Section 4 (2) makes reference to the definition of citizenship in Section 4(1), where persons *X* claim their citizenship through their parents or grandparents depending on the citizenship status of the parents or grandparents.

Therefore, a person *X* is not citizen of gh, *not(bybirth(isCtz(X,gh,T_dob)))*, at the time of his birth *T_dob*, if he was born during *t_OA57B69*, and his parents, grandparents or great grandparents through whom he or she claims citizenship are stripped off their citizenship.

The following definitions are necessary for the complete programme of Section 4(2). Person *Z* is parent of person *X*, *parent(Z, X)*, and person *Z* is citizen of Ghana at the time he or she was born, therefore, *isCtz(parent(Z,X),gh,T_dob).* Person Z, who is a parent is however stripped off his or her citizenship of Ghana; in other words, person *Z* ceases to be citizen which he gained at the time of his birth, *stripped(isCtz(parent(Z,X),gh,T_dob)).*

By the same definition, person *G* who is a grandparent and person *GG* who is a great grandparent also cease to be citizens of Ghana which they acquired by birth, *stripped(isCtz(gparent(G,X),gh,T_dob)). stripped(isCtz(g_gparent(GG,X),gh,T_dob)).*

If the above definition holds true for a person *X*, then such a person will cease to be citizen, because he or she claims his or her citizenship through his or her parents or grandparents, or great grandparents who have been stripped off their citizenship.

not(byBirth(isCtz(X,gh,T_dob))):-bornAt(X,t_OA57B69

(T_dob,T_doi,T_69c)) , stripped(isCtz(parent(Z,X),gh,T_dob));

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stripped(isCtz(gparent(G,X),gh,T_dob));

stripped(isCtz(g_gparent(GG,X),gh,T_dob)).

Section 4 (3) defines citizenship by birth of persons who claim their citizenship through their parents *Z* who are citizens by registration or naturalization, in order words, not by birth.

Citizen by registration; byReg(isCtz(parent(Z,X),gh,T_dob))

Citizen by naturalization; byNat(isCtz(parent(Z,X),gh,T_dob))

byBirth(isCtz(X,gh,T_dob)):-   bornAt(X,   t_OA57B69 (T_dob,T_doi,T_69c)),

bornIn(X,gh);bornOut(X,gh),byReg(isCtz(parent(Z,X),gh,T_dob));

byNat(isCtz(parent(Z,X),gh,T_dob)).

Persons Born on or after 22/8/69—Constitution 1969

Section Five of the Act presents another time period of definition of Ghanaian citizenship by birth, beyond the period specified in Section 4. This is the period where the 1969 Constitution of Ghana was effected. The 1969 Constitution does not review or overwrites the previous definitions for being citizen in Ghana, it only makes provision for people who were born at the time that constitution took effect and after. This kind of citizenship is also claimed through parents, but the difference here lies in the fact that, the citizenship status of such parents is clearly specified in this section, unlike the previous definitions.

In this instance, there is a new time function, *t_OA69B79( )*, with arguments specifying that a person's date of birth, *T_dob*, happens before or at

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time *T_69c*, that is, the time the 1969 Constitution took effect, and before the time *T_79c* which is the effective time of the 1979 Constitution. Thus,

t_OA69B79 (T_dob,T_69c,T_79c):-T_dob@>=T_69c,T_dob@<T_79c.

The conditions that allow any person *X*, whether born in Ghana, *bornIn(X,gh)*, or born outside Ghana, *bornOut(X,gh)*, to be citizen of Ghana requires that, *X* should have a parent *Z* who should have had citizenship of Ghana at the time of the birth of person *X*. The type of citizenship is however not specified for *Z*, implying that, *X* derives his or her citizenship from any type of citizenship of *Z*.

bornAt(X, t_OA69B79 (T_dob,T_69c,T_79c)).

wasCtz(parent(Z, X), gh, T_dob).

byBirth(isCtz(X,gh,T_dob)):-

bornAt(X,t_OA69B79(T_dob,T_69c,T_79c)),bornIn(X,gh);

bornOut(X, gh), wasCtz(parent(Z, X),gh, T_dob).

Persons Born on or after 24/9/79—Constitution 1979

Section Six of the Act defines citizenship by birth from a new constitution which came into force in 1979. The definition in this section follows similar definition and conditions of Section Five, except for the differences in the time periods within which both citizenships happen.

t_OA79B93(T_dob,T_79c,T_93c):-

T_dob@>=T_79c,T_dob@<T_93c.

bornAt(X, t_OA79B93 (T_dob,T_79c,T_93c)).

wasCtz(gparent(G,X).

byBirth(isCtz(X,gh,T_dob)):-

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bornAt(X,t_OA79B93(T_dob,T_79c,T_93c)), bornIn(X,gh);

bornOut(X,gh),

wasCtz(parent(Z,X),gh,T_dob);

wasCtz(gparent(G,X),gh,T_dob).

Person *G* in this programme would have to proof true in *wasCtz(gparent(G,X),gh,T_dob)* when tested for being citizen in any of the defined citizenship in the previous clauses for *X* to hold true.

Persons Born on or after 7/1/93—Constitution 1992

Similarly, this section as well defines citizenship as presented by the previous sections, except for the differences in the time within which the citizenships happens. This citizenship is provided by the 1992 Constitution of Ghana, which is the last and current constitution in effect. It is important to emphasise that, the later constitutions do not overwrite the previous ones, that is why all citizenship laws are consolidated in the Citizenship Act 200.

The time function *t_OA93( )*, as mentioned in the 1992 Constitution, considers the date of birth of a person, *T_dob*, and the effective date of the 1992 Constitution *T_93c*; the effective date of the 1992 Consitution is 1993, t_OA93 (T_dob,T_93c):-T_dob@>=T_93c.

bornAt(X, t_OA93 (T_dob,T_93c)).

byBirth(isCtz(X,gh,T_dob)):-bornAt(X,t_OA93(T_dob,T_93c)),bornIn(X,gh);

bornOut(X,gh),wasCtz(parent(Z,X),gh,X,T_dob);wasCtz(gparent(G,X),gh,T_ dob).

Foundlings

The Section Eight of the Act introduces a new function for defining citizenship, which is age. A foundling *X*, *foundling(X):-child(X), age(A, child(X))* is a child whose age, *A*, is less than 7 years *age(A, child(X)):- A@<=7*. Such a child is considered to be citizen by birth, if it is found in Ghana, *found(child(X),gh)*, and its parents, *father* and *mother*, are not known *not(known(of(parents([father, mother])))*. Therefore

byBirth(isCtz(child(X),gh)):-foundling(X),found(child(X),gh),not(known

(of(parents([father, mother])))),

child(X)))).

Implication of Prolog programme of modelled text

The Prolog programme constrains the pattern of deduction based on the set rules given by the law. Proof of a piece of model is done by the analysis of premise that deduces the conclusion. The evaluation made by the Prolog programme provided here reveals that, some conditions which form part of statements cannot be evaluated in the proof system. Queries applied to such aspects of the model leaves the programme in an undefined state which return no value to be used for further deductions

Section Three of the Act makes provision for persons who were born on or after the independence day of Ghana. The Prolog proofing of 1(a) and 1(b) of Section Three reveals an undefined state problem in the conditional clauses. The law allows for persons to claim their citizenship through their parents or grandparent or great grandparents, with the condition that, the parents or grandparents were born in Ghana. These parents or grandparents become

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placeholders for determining a person's citizenship state, and if they satisfy the condition that they were born in Ghana then the person is citizen of Ghana or otherwise.

The provision of the Citizenship Act of Ghana as a Prolog programme establishes further logic implication between modelled texts and its natural form. The conditions for a person to become citizen of Ghana are declarative statements in all sections of the Act. The statements which generally take the form of a set of premise and conclusion can be assessed through deductive reasoning.

The statements do not reveal the citizenship state of the parents or grandparents through whom a person attains citizenship. This leaves the state of citizenship of the parents or grandparents unknown in the Prolog programme. This also implies that persons can have their citizenship claimed through such parents or grandparents whether they were Ghanaian or not; they only need to be born in Ghana, which does not give any proof of being Ghanaian. If the law presumes by some other interpretation that being born in Ghana means you are a Ghanaian, then that would have to be explicitly stated in the citizenship law or miscellaneous of the constitution. Again, that would also introduce some form of contradiction in the other sections, which requires parents to have further proof of being citizen other than just being born in Ghana for a person to claim citizenship through them.

As presented in the implementation of the model, the only implied placeholder for *parent(Z,X)* and *gparent(G,X)* is the functor *bornIn*. An attempt to query *?-isCtz(Z, Country)* or   *?-isCtz(G,Country)* leaves the system in an

undefined state, and that is because the system is not able to find a value for the variable *Country* of *Z* or *G*, since it was not possible to define the function *isCtz( )* by provision of the Act for *G* and *Z*. There are convincing or sufficient basis to define a functor to evaluate the citizenship state of *Z* or *G*, and even if that could be done, the variable *Country* will hold a value for Z and G in *isCtz( )* as a country other than Ghana, which has no effect on the proofing of *isCtz( )* of any person *X*. This is because, *G* and *Z* being born in Ghana is sufficient condition for *isCtz( )* of person *X*, if *X* is born in Ghana or Outside Ghana by the provision of the Act.

The knowledge-base of the system are developed from the declarative statements of the Citizenship Act, and, it will not be prudent to introduce any new facts into the system based on assumptions that are not explicitly stated in the letter of the Act.

In Section One, the citizenship state of the persons is specified as part of the conditions for being a continues citizen, *cont(isCtz(X))*, even though there are no further details to proof that type of citizenship, *isCtz(X)*, forms part of the premise of continues citizenship.

Again, the *was_Ctz( )* sate of *X* can be resolved, since it forms part of the fact list of the system. What is not possible in the proofing system is how persons *X* yield true or false for *was_Ctz( )*, modelled per the provision of the Act. The citizenship state of persons explicitly stated, defining which particular *every person* that is being referred to, would have resolved the problem of undefined state if there were further premises leading to the deductions of persons who were citizens before the independence of Ghana.

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What is clear as revealed by the Prolog programme is that, Section One leads to a point where we have no further details to proof *was_Ctz( )* and thus, stances the possibility of controversy to establish a person *X* for *was_Ctz( )*. This controversy could further lead to fallacious statements since the Act does not provide any premise to be used for the proof for *was_Ctz( )*. Section Four as well, presents a similar difficulty, by providing for persons to claim citizenship by birth, *byBirth(isCtz( ))*, through their parents or grandparent without establishing the citizenship state of the parents or grandparents. Unless, of course, the Act is making such propositions as being self-evidently true, or accepted facts that would need no further questioning by any legal instrument of Ghana.

Section Five, Section Six and Section Seven of the Act in the Prolog programme, presents very straight forward definitions for being citizen per their respective time periods. The conditions are clear and gives no room for inferring meaning other than that which is specified by the Act. The state of persons through whom citizenship is claimed is stated clearly and thus presents unambiguous premises for proofing their citizenship in the Prolog programme. The closed form solution in these sections by their models, is however in converse with Section One, Section Three and Section Four of the Act, where a closed form solution for the definition of citizenship by birth is not achieved in the proofing system, and thus presents a problem of indeterminacy.

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Implemented Testbed of Formalised Text of Supreme Court Case as a Prolog Programme: [1995-1996] Ghana Law Report

The Citizenship laws of Ghana, which are usually referenced by other legislative instruments for decision-making on issues that boarder on the Citizenship Act, is programmed as the knowledge-base of the automated system. All judicial decisions are founded within the supreme laws of Ghana, which follows a distinctive approach to justify a decision that is taken legally. First, a judge has to establish facts on a case made. Second, a judge has to find the legislative instruments which are applicable to the case. Third, a judge has to interpret the law and apply it as interpreted to the facts of the case established. Toulmin (1958) in his "theory of justified argument", affirms that, arguments' claim should be supported by grounds with a warrant or legal rule which are applicable and logically connects the claim and the grounds.

This is a generic process for arriving at legal decision in the courts of Ghana; other courts may have other unique approaches to decision-making beyond this generic approach.

I have however, used this generic decision-making approaches employed in the courts, in the efforts made to automatically reason through legal statements, as well as assess them for fallacies.

As a test bed, the FOL model of excerpts of the 1995 - 1995 Ghana law Report, compiled by the Supreme Court of Ghana, as a case that was ruled primarily on the basis of the Citizenship laws of Ghana. The excerpts of the decision of the report is programmed in Prolog and applied to the system's

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knowledge base. This is done to assert the functional ability of FOL and Prolog to handle legal reasoning, as is done on real cases in courts.

The case used as the system's testbed presents a situation where a person challenges the Ghanaian citizenship of another. The law report is quite comprehensive and presents all the arguments made by the counsel for the plaintiff, who makes the allegation or the claim, and the counsel for the first defendant who responds to the allegation. Argumentations in courts may not readily be suitable for formalisation, since this can take a wide variety of expressions in a highly unstructured language.

However, I have for the purpose of logic proofing through the formalised text, maintained the facts as stated by the plaintiff, the laws or legal rules as applied by the Judge or the court, and the decision-making process as well as the conclusion of the court on the case. The court established that;

> '(4) The plaintiff says that the first defendant had at the age of 21 years dual nationality. He then owed allegiance to the Republic [p.420] of Ghana and also to a foreign country and/or the United Kingdom. He has not renounced his citizenship since attaining the age of 21 and he thus still owes allegiance to the foreign country and/or the British crown. In the circumstances by the laws of Ghana he ceased to be a Ghanaian citizen after attaining the age of 21 years.' (Bilson v. Rawlings and Another, 1992).

Based on his allegation, the plaintiff argues or requests of the first defendant that, "And until he satisfies the court that he has renounced his foreign citizenship and therefore he is a Ghanaian by birth, he should be restrained from

offering himself as a presidential candidate." (Bilson v. Rawlings and Another, 1992).

The plaintiff after making the allegation or claim, needs to establish the grounds or facts to support the claim with applicable legal warrant. The court affirmed that "the law was that he who alleged had to prove the allegation" (Bilson v. Rawlings and Another, 1992).

The generic system for decision-making in courts is maintained here for the test of logic reasoning in Prolog programme of the study. The claim made by the plaintiff, the counter-claim made by the defendant and the legislature employed by both parties and court are here programmed in Prolog, on which an applicable legislature is employed to assert the legal decision by the court. The Prolog programme is useful in the tracking of logical consistency of the modelled text, and does provides the automated mechanism for the reasoning process and the discovery of fallacies.

Per the claim of the plaintiff, the *first_defendant* was citizen of Ghana when he attained age 21, and at the same time had citizenship of a country other than Ghana. Therefore, by definition;

attainAge(first_defendant, 21).

isCtz(first_defendant, gh).

upon(isCtz(first_defendant, gh), attainAge(first_defendant, 21)).

isCtz(first_defendant, not(gh)).

The claim also states that the *first_defendant* did not renounce his citizenship for the country other than Ghana. *not(renounce(isCtz(first_defendant, not(gh)))).* The claim then advances to

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conclude that the *first_defendant* ceases to be citizen of Ghana after attaining 21 years *upon(not(isCtz(first_defendant, gh)),attainAge(first_defendant, 21))*. Therefore;

not(isCtz(first_defendant,gh)):-

upon(isCtz(first_defendant, gh),

attainAge(first_defendant,21)),

isCtz(first_defendant,not(gh)),

not(renounce(isCtz(first_defendant, not(gh))).

The plaintiff based on this conclusion to further argue that *not(qualified(X, candidateFor(officeOfPresidentOfGhana)))*. The first defendant does not qualify to stand for the office of the president of Ghana,

Court Decision

The approach to the decision-making of this case employed by the court is programmed in Prolog, to assert the reasoning of the system through the various aspects of the legislative instruments, for consistency with the natural process of the court that lead to its decision.

The key aspect of this law which played a role in the Prolog proofing system required that for a person *X* to qualify for the presidency of Ghana *qualified(X, candidateFor(officeOfPresidentOfGhana)*, *X* must be a citizen of Ghana *isCtz(X, gh)*, and must not hold allegiance to any other country other than Ghana, *owesAllegiance(X, not(gh))*. This directly translates into *not(qualified(X,candidateFor(officeOfPresidentOfGhana))):-*

not(byBirth(isCtz(X, gh))) which establishes the instance under which *X* cannot stand for the Office of the President of Ghana, on the basis of the citizenship

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status   of   *X*,   as   well   as   *not(qualified(X,candidateFor (officeOfPresidentOfGhana))):- owesAllegiance(X, not(gh))*, on the basis of which country *X* owes allegiance to.

The allegation that was made by the plaintiff claimed that, the defendant was not a citizen of Ghana based on the Citizenship Act, which specifies that, if *X* is not citizen of Ghana upon a specified date *upon(not(isCtz(X, gh)), specified(date(T)))),* and if *X* upon *attainAge(X, 21)),* is citizen of Ghana and also citizen of a country other than Ghana loses the citizenship of Ghana.

It is important to note that, the negation in the model is applied on *gh* which maintains that *X* is citizen of any other country but Ghana. This is quite different form the rendering *not(isCtz(X,gh))* which would mean that *X* is not citizen of Ghana. However, *X* not being a citizen of Ghana does not necessarily translate into the fact that *X* has citizenship of another country. This is done particular to resolve any issue of scopal ambiguity; *gh* is modelled to have a narrow scope to *not*, which maintains the semantics of the text of the Act.

The provision in the Section Eight of the Act 361 further requires that *X* has to renounce his or her citizenship of the country other than Ghana *renounce(isCtz(X, not(gh)))*. That is, if *X* had citizenship of Ghana *upon(isCtz(X, gh), attainAge(X, 21))* and a country other than Ghana *isCtz(X, not(gh)),* at the age of 21 years, in order not to lose his or her citizenship as Ghanaian *upon(not(isCtz(X, gh)), specified(date(T)))).* This has to happen on the coming into force of the Act, and is therefore time stamped with *t_CAEoC (T_edc, T_eoc))* such that, the citizenship of *X* happens *on(isCtz(X, gh),*

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t_CAEoC (T_edc, T_eoc)), and the citizenship of *X* of a country other Ghana also happens *on(isCtz(X, not(gh)), t_CAEoC (T_edc, T_eoc))*.

The system is programmed to evaluate every claim made by the counsel of the alleging person. One of the responsibilities of the court is to establish whether the claim made about the defendant is true or false. This evaluation is as well done by the system, requiring established facts of the defendant by the court to compare with what is stated by the alleging person.

The facts of the citizenship of the *first_defendant* is first evaluated as asserted by the court. The court established that, the first defendant is born in Ghana *bornIn(first_defendant, gh)*. His date of birth is evaluated against the date of independence of Ghana as the first test to assert his qualifies for citizenship of Ghana by birth, *bornAt(first_defendant,t_B57(1947, 1957))*. His date of birth *T_dob* established is before the date of the independence of Ghana *T_doi*.

The next evaluation of the system checked whether either of the parents of the defendant is born in Ghana or otherwise. On this basis the following is supplied to the programme;

parent(victoria, first_defendant)).

bornIn(victoria, ghana).

bornIn(parent(victoria, first_defendant) , gh).

The system performed a deductive process to assert the citizenship status of the first defendant. The first Prolog query tested was *?- isCtz(first_defendant, gh)*. which returned *TRUE*, following the definition of citizenship by birth in the programme.

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The claims made by the plaintiff is further evaluated against the facts established about the first defendant. The plaintiff claimed that, the first defendant had citizenship of a country other than Ghana, *not(isCtz(first_defendant,gh))*, and at the same time had citizenship of Ghana when he attained 21 years, *upon(isCtz(first_defendant, gh), attainAge(first_defendant,21)), isCtz(first_defendant,not(gh)),* but did not renounce his citizenship of the other country *not(renounce(isCtz(first_defendant, not(gh)))).* The system unified the arguments provided with the programmed knowledge-base for this evaluation process.

The query *?-isCtz(first_defendant, not(gh))* returned *FALSE* by deduction, establishing that, the first defendant did not have citizenship of a country other than Ghana. This is because the first defendant could provide the facts that deduced he is a citizen of Ghana only. The plaintiff could not also provide evidence of his claim, and this further renders the query *?-not(renounce(isCtz(first_defendant, not(gh))))* to return *FALSE*. This is also because, the inner structure of that claim already evaluates to *FALSE*. The court in its evaluation stated that;

"since the plaintiff failed to give particulars in his pleadings as to how the first defendant acquired his citizenship of the foreign country or United Kingdom or both, his assertion the the [*sic*] first defendant held dual nationality was speculative and would be dismissed." (Bilson v. Rawlings and Another, 1992).

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The plaintiff further argues that the "…first defendant unqualified to stand for or hold office as President…" (Bilson v. Rawligns and Another, 1992). The system therefore evaluates *?-not(qualified(first_defendant, candidateFor(officeOfPresidentOfGhana))),* which as well returns a *FALSE* value. This is because, one of the conditions of the claim; *owesAllegiance(first_defendat, not(gh))* returns a *FALSE* value, because the alleging person could not provide evidence to support the premises of his argument that would have lead to the deduction of the first defendant owing allegiance to another country.

The system however evaluates *owesAllegiance(first_defendat, gh)* to *TRUE* value. This fact is provided by the court, stating that the first defendant by virtue of his offices held in the Ghana Armed force and as head of state of Ghana, swore oath of allegiance to Ghana.

The report also stated that, the plaintiff could not provide evidence for his claim *owesAllegiance(first_defendat, country(not(gh))).* The statement, *not(qualified(first_defendant,candidateFor(officeOfPresidentOfGhana))):-owesAllegiance(first_defendat, not(gh))* therefore evaluates to *FALSE*.

The first defendant was further assessed to establish whether he qualified to stand for the position of the office of the president of Ghana per the facts established about him in this case and the provisions of the law;

qualified(first_defendant,candidateFor(officeOfPresidentOfGhana)):-

byBirth(isCtz(first_defendant,gh)),

owesAllegiance(first_defendant,gh).

The query *?-qualified(first_defendant, candidateFor(officeOfPresidentOfGhana)).* returns *TRUE*. for the first defendant. The system

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evaluates *TRUE* for *?-byBirth(isCtz(first_defendant,gh)).* and *owesAllegiance(first_defendant,gh).* as well.

The Citizenship Act as well as the testbed presented as a Prolog programme, provides a logic means of reasoning through the text, which preserves consistency of the application of legal instruments, as well as the avoidance of influence of individual thought processes. It is therefore established by this system, that, Prolog has the functionalities to be used as an efficient programme for deductive reasoning.

Formalised Text of the Fundamental Human Rights and Freedom Laws of the 1992 Constitution of the Republic of Ghana as a Prolog programme

The Chapter Five of the 1992 Constitution of the Republic of Ghana was difficult to deal with in terms of translating it into logic language that would capture or maintain the semantics that is intended in its natural language form.

The text, just as other parts of the constitution is composed with several levels of assumptions of general understanding to some terminologies that are used to describe certain objects and entities. These assumptions largely make sense, as it is extremely difficult and not even common practice to try to define the intended meaning of every word that is used in the documents. However, there are certain areas in the chapter that needed a little clarity. The absence of this clarity introduces some level of ambiguities in the text of the constitution, ambiguities that made modelling and programming of the text a difficult task, and impossible in some cases.

The programmed text draws its semantics from its natural language form. If the meaning in the natural form is missed, then the modelled text may as well not be able to capture the right semantics of the text.

The use of terminologies such as *natural and legal person* in Article 12 is done to carry a generic meaning. For example, *biological person*, is understood in common language without need for any technical explanation.

The phrase *natural and legal person* however does not present the same level of meaning in the context in which it is presented. It is rather very difficult to have a straight forward interpretation to what the constitution really means by *natural* and *legal* being referred to a person.

The authors of the constitution of Ghana acknowledges how technical the constitutional language is, and possibilities of misunderstanding and interpretation of some aspects of the constitution. They have therefore composed a miscellaneous of the constitution, which defines in specific terms, the usage of some words, even words with lateral default or generic meaning, and this is to help provide more clarity to those words which may have the natural propensity to introduce some level of ambiguity or misunderstanding in the constitution. For instance, the miscellaneous of the constitution specifies that, the word *person* could be an organisation or a biological person depending on the context it is being used, which to a great extent brings clarity to the word *person* in the constitution. However, there are some defined words, which are being described with some adjectives which have not been defined in the miscellaneous or in any part of the law document, and may not be understood by people outside the legal domain.

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In the case of the use of the term *natural and legal person*, it presents two qualifications of a person without any clue as to what exactly the law means by natural and legal. Logically, it should be possible to assert the fact as to whom a legal person is, so that it can be possible to query, *?-legal(X)*, on which bases other deductions can further be made.

The important thing to note here is, the basic premises put together to establish that someone is legal by showing proof of all such premises required is what is missing in the constitutional text. Instances such as these, where the law does not clearly provide meaning to clauses might need the attention of the legal practitioners for further interpretation.

The use of the term *natural and legal person* does sound like a universal set of all kinds of persons in Ghana—my speculation—, and even if this holds true, statements like these are good entrants for challenging resolution of cases of litigation. Being a *natural and legal person* has a finite set of descriptions that the constitution could capture so that even the lay of the law could straight away tell what the law means by natural and legal. This as well would have made it possible for any logic system to be able to provide a deductive or proofing mechanism for such a person.

Programming a legal person is quite straight forward, and thus, *legal(person(X))*, but this piece of programme is not useful to the system that is designed for logical deductions of legal text once the system cannot go further to proof a person as legal or not. This is because, when the logic system tried to make this assertion it *failed* at all instances of the queries. There is no mechanism of proof for *legal(person(X))*, since the constitution does not

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provide textual definition for the use of the terminology. The *legal(person(X))* can form part of a proofing system, if it is stated as an atomic fact in the Prolog system, or as an axiom, as seen in the FOL model. In that case, when a person claims he or she is a legal person of Ghana, the system will not be able to proof him or her as legal or otherwise. This instance is converse to a person who may claim to be citizen of Ghana, which can be asserted through the clauses of the constitution, which lead to some final deduced conclusions.

This situation however reveals that, translating natural text to logic language depends on the level of understanding provided by the natural text. The level of clarity in the natural language itself crucially determines the level of precision that can be provided in deductive reasoning by computational tools.

There are also other important instances in the Chapter Five of the Constitution that poses similar difficulty. Phrases such *reasonably justifiable, reasonable suspicion*, *reasonable time*, *reasonable condition*, *reasonably necessary*, appear very ambiguous in the textual presentation of the constitution, which translate in the same difficulty for such text to be appropriately modelled or programmed for any logic system; to what extend is an action reasonably justifiable, to what extent is a suspicion reasonable, and to what extent is condition necessary. These phrases have not been further clarified by the constitutions and open to interpretations outside the constitution from legal practitioners.

The kind of interpretations that would be done on these kind of phrases would be done intuitively, which at human level of reasoning poses no challenge at all. It will be easy for the court to be able to measure what is reasonably

justifiable by intuition, through technical knowledge and experience. But intuitive reasoning is what computers cannot simply do, and that is the major challenge for some logic propositions in this study.

These unclear phrase-propositions or ambiguous offer a great opportunity for generating fallacious statements, when applying them especially to claims made in legal discourse. It would have been somewhat easier if the constitution specified the indicators associated with an action that makes it reasonably justifiable, or what to consider in order to claim that a suspicion is reasonable.

The Article Twelve of the constitution presents some level clarity, by use of the phrase *every person*, which is quite a sufficient phrase that further gives some description of all attributes that may characterise the type of person it is describing. This avoids any form of confusion at all levels. This is a good practice and good presentation of natural text for any logic system. Here there is a perfect universal set, that defines and captures exactly what kind of person the constitution is referring to in this case. A logic system at this point will capture any defined person.

The formalism of the Fundamental Humal Rights and Freedom of Ghana by this research reveals an important weakness of representing natural expressions with logic systems. As much as logic language, ideally, provides a simple reasoning system through statements, it is however yet to have the full robustness to completely represent the complexities of ideas or concepts that are naturally expressed. Logic programme can be limited by the natural provision

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of text, since there are no fixed logic meanings to use of words, but a wide variety of natural expression.

Testbed of Formalised Text of Supreme Court Case as a Prolog Programme: In the Superior Court of Judicature

The formalism and programming of the Fundamental Human Rights and Freedom Ghana forms part of the knowledge base of the system provided by this study. A court case is well formalised and programmed as a testbed to the human rights and freedom law. This particular case was used as a testbed in this study because of the different levels and complexities it presented in the court decision-making process. The case was independently ruled by three different courts of Ghana, which were all consistent in the decision taken, as well as the legal thought process that lead to the decisions.

The thought process employed by all the courts used combinations of different kinds of legislative instruments, which include the use of common sense and jurisprudence. This complexity is what is being ascertained by this study, whether, computational logic tools have the robust ability enough to undertake similar processes, in the discharge of legal decision-making as done in the courts.

The testbed presents spouses contending for the distribution of property between them, following a divorce of their marriage. The case was first ruled by a High Court, in favour of the woman, known as the Petitioner in the case, who petitioned the court for their property to be equally shared between them. The man, known as the Respondent in the case, however was dissatisfied with

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the ruling of the High Court and contended the decision of the High Court by presenting the case to an Appeal Court. The Appeal Court after examining the case affirmed the decision of the High Court in favour of the Petitioner. That Respondent, dissatisfied with the decision of the Appeal Court made another appeal to the Supreme Court, which also affirmed the decision of the Appeal Court in favour of the Petitioner.

The facts of the case and the grounds for the appeal are well elaborated in the report of the court (Gladys v. Mensah, 2012). The study therefore focused on the issue that were of core interest to the court "in the instant case since the parties are not contesting the issue of divorce, but only devolution of property acquired during the subsistence of the marriage upon divorce, we will focus our attention to those issues." (Gladys v. Mensah, 2012).

Therefore, the appeal of the case made, the facts established by the court, the constitutional provision employed or applied in the case, the decision-making process and the conclusions arrived at by the court are the major areas considered by this study. The issues for determination by the Supreme Court follows that;

"We have perused the statement of case of the parties. From the arguments contained in the Statements of case by the parties, the following issue stands out as the main issue for determination, although there are some other ancillary issues. This is:

Whether the equality principle used by the trial and appellate courts in the distribution of the marital

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> property acquired during the marriage following the
> dissolution of the marriage between the parties is
> sustainable under the current state of the laws in
> Ghana based on the available evidence on record."
>
> (Gladys v. Mensah, 2012)

The court considered Article 22(2) of the Human Rights and Freedom laws of the 1992 Constitution as a major legislative instrument for making its decision; "in view of the effect some provisions of the Constitution 1992 will have on this case, we deem it expedient to set out these provisions in extenso." (Gladys v. Mensah, 2012).

The legislation regulating the property rights of spouses was enacted on the coming into force of the constitution, to give equal access to spouses to jointly acquired property during their marriage. A spouse *S* takes the value of any arbitrary person, which could be a husband or wife, distinguished by *S1* and *S2* arbitrarily, and *S* has property rights *p_rights*.

The parliament of Ghana has the responsibility to legislate the regulation of property rights of spouses, which is here applied as part of the facts established for the devolution of property by the court, thus, *at(shallEnact(parliament, legislation(regulating(of(p_rights , spouse(S))))) , t_CAEoC (T_edc, T_eoc)).*

The Article 22(3)(a) of the 1992 Constitution stipulates that, spouses shall have equal access to property they acquired jointly. The merit of spouses for *shallHave(spouse(S)),access(equal,property))*   only   applies   when

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jointlyAcquired(some([spouse(S1),spouse(S2)]), property) holds true for the spouses.

Article 22(3)(b) further stipulates that, the property shall be equally distributed between them upon the dissolution of the marriage. This however implies that, the equal distribution *shallBe(property,equally(distributed(between(spouse(S1), spouse(S2))))*) can only be done when the property is jointly acquired during marriage *during(jointlyAcquired (some([spouse(S1),spouse(S2)]), property), marriage)*.

The equality principle used in the distribution of marital property is the major issue for review as appealed. The evaluation of the court determined whether the petitioner jointly owned the property, and is entitled to an equal access and distribution of the property. The review was based on facts established on record and evaluated with the laws of Ghana.

The Supreme Court established the arguments made by the Petitioner, the Respondents and the witnesses of the Respondent, as well as its own facts finding results for the decision it made on the case.

The provision of a computational tool by this study to resolve the case, as done in the court revealed important possibilities and the extent to which logical tools can be useful to the processing and automation of legal text, as far as thought process is concerned. Sound reasoning through these statements are less complex computationally, especially when they stand alone without applying them to any case or situation.

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In this testbed, it is easy for the system to assert whether the Petitioner has the legitimacy to equal access to the property or otherwise, as provided by the law. A simple query *?-shallHave(spouse(petitioner)), access(equal, property))* allows the system to reason through the facts available for the Petitioner against the stipulations of the law to deduce a conclusion. The conclusion of query however depends on the results of *?-during(jointlyAcquired(some([spouse(S1),spouse(S2)]), property),marriage)*, which requires *spouse(S1)*, which is the Petitioner in this case, to provide proof of jointly acquiring property during their marriage.

The process of establishing how a spouse jointly acquires property during marriage is however, not explicitly written in the law. The law does not also provide what it means to have made substantial contribution to another person. This assertion is left in hands of the court to decide what it thinks right on case-by-case situation (Gladys v. Mensah, 2012), within the boundaries of the law. The court therefore depended on the claims made by the Petitioner, the Respondent and the witnesses of the Respondent to decide or establish whether indeed the Petitioner jointly acquired the property or otherwise.

The use of *Common Sense* by the court assessed the peculiarities of the situation, thus, the domestic activities provided by the Petitioner, which created the congenial environment for the Respondent to undertake his business, as argued by the court, and therefore intuitively amounted the weight of such activities to having provided substantial contribution to the business of the Respondent.

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This thought process even though may work well for the courts, cannot be adequately handled by logic tools or automated by use of only the formalised law, which is the knowledge base of the system. The court has access to, and uses other knowledge bases outside written legal documents, which may not be readily formalised for this purpose. Another exhibition of such decision-making approach is the use of *Common Sense* by the Supreme Court to ascertain that the Petitioner jointly acquired property with the Respondent during marriage.

Other facts established in favour of the Petitioner were not provided as hard evidence. They were deduced by the court from the witnesses of the Respondent. This inferences made by the court on this aspect did not have strong logic deductive process. For instance, for the court:

1. The Petitioner was seen in the house, with drums of palm oil and tomatoes in the house, even though it was not known who sold them, it meant that she engaged in trading at the house.

2. The Petitioner was seen in the store of the respondent, even though it was not known what she was doing there at that time, it meant that she took part in the business of the Respondent.

These conclusions made by the court on these aspects should at least be founded on some logic or legal grounds which stipulates that being seen in a store without knowing what you are doing meant you were engaged in the business, or, being seen in the house with goods meant you are the one trading them. This does not seem to work properly with logic deductions as done by

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the court in this case and therefore reveals an unsound reasoning approach by the court through the logic system. It is difficult to capture any of such approaches used by the court to make its decision in the logic system, especially because of the intuitive reasoning involved, which however is normal for court processes.

The court was able to connect pieces of information with others, as well as some hard evidence and legal provision to rule in favour of the Petitioner. A logical tool may not be able to follow all the aspects of reasoning of a court; aspects such as the use of common sense and jurisprudence.

That notwithstanding, I still maintain that, the use of such approach should be founded on logical grounds, as well as legal stipulations. I am not by this arguing that all applicable inference can be captured in within the scope of the law, but what is made clear as presented by this study is that, inferences outside the scope of the law used in decision-making process, should logically deduce conclusions made in the use of the law. The computational tool provides a crisp logical reasoning pattern through the legal text and thus maintains the use of the law as it is written.

The decision process for *?- jointlyAcquired(some ([spouse(S1) ,spouse(S2)]), property)*, made by the court returns a *TRUE* value for *spouse(S1)* and *spouse(S2)*. This was therefore programmed as an axiom in the system, since some aspects of the proofing approach of the court was out of the limits of the logic systems. Once this is established, it is easy to

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assert *?-shallHave(spouse(S)), access(equal, property))* by the system, which returns *S1* and *S2*.

This reasoning done by the system is consistent with the decision of the court based on the legislative rules applied to the case. As long as it established that, the Petitioner jointly acquired property with the Respondent, the system is able to use the hard evidence provided in the case leading to its conclusion. However, as stated earlier, the intuitive process of the court does not form part of the decision-making process of the system.

This testbed also revealed that, the law, even if it is crisply written, it may apply differently by the court as it deems right, which also poses another challenge to logic systems. For instance, the law has it that, the burden of proof lies on the one who makes the claim. In this case, however, the Petitioner did not provide proof of the facts she gave to the court. The court had to deduce the proof from the witnesses of the Respondent in favour of the Petitioner; this introduces a different application of that piece of law, which is different from what is written. This kind of application of the law is intuitively done, which cannot be handled by any logic system. The logic system would have requested for proof of the evidence from the Petitioner, and if that is not provided, the system would have dismissed the case, as seen in the first testbed.

The emphasis by this testbed is that, the logic system is programmed to handle text of the law and its application for decision-making processes, other

intuitive approaches that may be used by the courts cannot be handled by the logic system unless they draw from existing legislative and logic instruments that can be formalised and referenced by the system.

The Automated Fallacy Discovery Process

So far, I have demonstrated some reasoning ability and decisions taken by the model based on the Citizenship Act and the Fundamental Human Rights and Freedom of Ghana. All of these however leads to the crux of this study, which is to be able to identify whether statements of the law and statements made in the cause argumentation are fallacious or not. This study therefore provides a logic tool that automatically discovers fallacies inherent or introduced in legal text.

There are over a hundred types of fallacies that have been classified by their nature and how they are presented in language by other researchers. I admit that it is quite challenging to have one computational system that can adequately process all the types of fallacies. I am therefore only concerned with logical fallacies that occur in legal language and have used some of the basic rules for defining Non Sequitur Fallacies for this system.

Logical fallacies occur in the process of reasoning where the logics of an argument is undermined. There are several types of logical fallacies, which are not any easy to analyse as compared to other forms of fallacies. I have only maintained the generic structure of Non Sequitur fallacies for their deductions and not really considering their specific form and complexities. The generic

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structure maintained here is sufficient for the purpose and delimitation of this study. Fallacies can occur at several places in the context of the text used here.

1. Fallacies can occur in a claim made against an opponent or respondent.

2. Fallacies can occur in facts presented to a court about a respondent.

3. Fallacies can occur in the law or legislative instrument employed for judgement

4. Fallacies can occur in the conclusion or decision of a judge on a case.

These are therefore the areas the system checks for any occurrence of fallacies. Usually in a court case, a claim is made to challenge facts of a respondent based on some piece of law. The claim by logic structure is a conclusive statement that holds some premises made according to the piece of law that support both premise and conclusion. This claim *Cl* has a set of premises *Pc*, where *Pc* holds a list of statements *Pc₁, Pc₂,.....Pcₙ.* . and *Cl* is implied by *Pc*;

Cl:-Pc . where

Pc= [Pc$_1$, Pc$_2$,Pc$_3$,…,Pc$_n$].

The claims made, which are usually based on a piece of law, have truth-values which can be asserted by the various laws. Some existing piece of law that would be employed by a court on a claim is coded as *Lw*. Again, these laws are also built based on some legal premises that are stated as facts.

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Therefore the list of premise of the law *PL* will hold;

PL$_1$, PL$_2$,….,PL$_n$ which are labels holding atomic sentences of premises

Where PL=[PL$_1$,PL$_2$,….,PL$_n$].

And Lw is implied by PL;

Lw:-PL.

The decision of the judge or the court is here defined as *D* with a list of premises *PD*, with elements *PD$_1$, PD$_2$,…,PD$_n$.* Which are based on legal provision.

Therefore, D:-PD.

Where PD=[PD$_1$, PD$_2$,PD$_3$,…,PD$_n$].

The defined premises and implied conclusions are variables that hold atomic statements defined in the law and the claim, which could return true or false.

The few principles used here are sufficient for declaring a statement as a logical fallacy, as done by analysts theoretically. The principles below apply in the system's analysis.

The system makes an evaluation of claim and its associated legislations. The evaluation is to ascertain whether the claim is made on valid legal grounds, even before the process of facts finding is engaged. Claims generated must correspond to some legal provision to allow for legal argumentation and reasoning. The atomic statement made in a claim should have some coherence with atomic statement made in the declaration of its associated law, $Lw =@=$ Cl as well as *subset(Pc,PL).* A false value at this point of evaluation will not

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allow the system to proceed. This is because, statements that do not have any legal backing amounts to a fallacy by the law.

A returned true value will however, proceed to check if the claim holds sufficient premises for its conclusions according to the law, thus, *same_length(Pc, PL).*

The system as well evaluates the premises to ascertain whether they logically, and or, legally deduce the conclusion of the claim based on the law applied. The established claim against a respondent must however be proven by evidence, these evidences when available are as well assessed by the system to ascertain their truth-values. The knowledge base of the system allows for deductive reasoning in the decision-making process, which at each of reasoning is able to identify a fallacy if available.

Pseudo Code for Automatic Fallacy Discovery.

The pseudocode provides a framework that can retrieve any claim made, as well as associated legislative instrument employed by a court. It also uses facts established by the court and performs a deductive reasoning through all the text available for the discovery of logical fallacies that may occur in the process.

Fetch Cl.

Fetch Lw.

DO Lw $=@=$ Cl.

If FALSE PRINT "Fallacy" else GOTO NEXT

DO same_length(Pc, PL).

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If FALSE PRINT "Fallacy – insufficient Premises" else

GOTO NEXT.

DO subset(Pc,PL).

If FALSE PRINT "Fallacy – False Premises" else

DO ?-CL.

STOP.

The complete computational tool that analyses legal text for fallacies is based on the principles of Non Sequitur Fallacies.

Fallacy(S):-   Lw \=@=CL; \+ same_length(Pc, PL); \+ subset(Pc,PL); ([Lw \=@=CL; \+ same_length(Pc, PL); \+ subset(Pc,PL)]).

In summary, the general analysis of the whole model reveals some important findings. The placement of *and* and *or* connectives used exclusively or inclusively in the Act to a large extent determined the semantic consequence of the statements in the Act. Most of the statements in the Act were disjunctively connected by use of the text *or* or *either*. The text as presented in the Act to some extent poses no confusion by use of these connectives when they are read, this is because readers can intuitively ascribe to the intended meaning of the text.

However, the modelled text revealed that, the intention of the written text has a different semantic consequence from the logical implication of the text. The differences in the semantic consequence of the text is established by the natural use of disjunctive connectives in the text against their logical implication.

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The natural use of *or* and *either* directly translates into their logical implications. The use of *or* is for connecting options, but there should be a minimum occurrence of one of the options or all of them. This is an inclusive use of a disjunctive connective both naturally and logically. On the other hand, *either* is used to establish the occurrence of any of two options but not both. This is an exclusive use of a disjunctive connective both naturally and logically.

Chapter Summary

I have established that, the natural sentential construction of the constitution of Ghana, can be easily misunderstood or misinterpreted, following how the sentences in the clauses of the constitution are constructed, how the connectives are used to bind the sentences together and how they finally relate to the consequents of the sentences. The modelled text revealed, as explained earlier, that the use of some of the words, especially the connectives and logical consequents in the sentences did not reflect the intention of the semantics of the statements made, in their natural structure. The technical faults of the structure of some aspects of the text of the law, as shown by the study was not deliberate; it is a fault that is unavoidable in the natural expression of language which has wide expressive power, and the use of words whose meaning may be context-dependent. However, the intention of expression, in whatever form it may take, has always been to establish one meaning which can be inferred by any receiver of the expression being made.

This intention is what I have proven that formalism by means of First Order Logic and Prolog programme establishes.

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First, every subject and object are defined by means of predicates and their arguments. The relationships are further established and validated to ensure the right relationship is established. This essentially helps in the application of the law by avoiding wrong inferences for interpretation. The validity of the statement is then made with all possible instance where the statement can be a valid argument or otherwise. This analysis done in this study therefore provided a structure of the text in logic form with reduced ambiguity and thus establishes clarity and comprehensibility of the text.

The various stages of proofing for the deductions of fallacies also captures most general rules as used by the courts in the cases modelled. This general approach is similar to most decision-making process of other court systems. The major idea unravelled is that, there a framework that can be adapted and expanded for the discovery of other types of fallacies.

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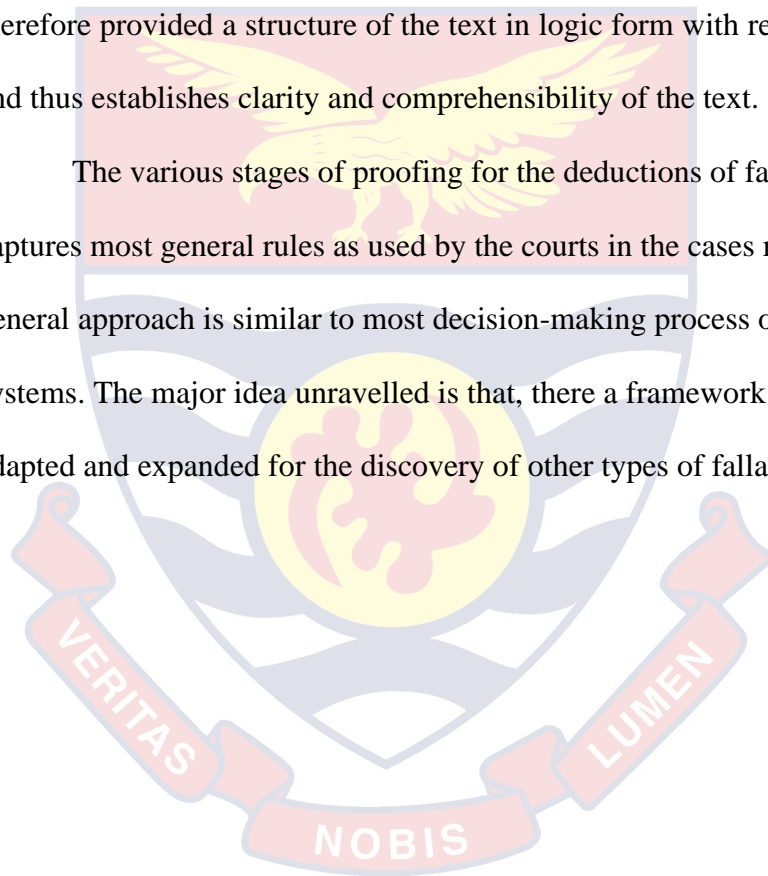
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study primarily addressed the problem of discovering fallacies in legal text by means of a computational logic tool. The problem of fallacies has mainly been the existence of ambiguities in text, which at human level is difficult to track or discover in the cause of communicating. This is because, the very nature of naturally expressed language is done successfully with inherent ambiguities without misunderstanding. This is quite different for legal domains, where right interpretation of text is very crucial to decision-making.

The natural means of identifying fallacies in legal text is usually done by argumentation theorists, who analyse legal statements after they have been effected or applied to a situation. The results of such analysis usually may not affect any decision made, which almost renders the exercise non-productive. It has therefore been the quest of researchers in computer science, law and other related disciplines, to find the best means to deal with the problem of ambiguities and fallacies in legal texts. Even though some researchers have been sceptical about such quest, there have been different levels of computational

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solution that have been provided for different processing mechanisms of legal text that supports decision-making.

I am able to appreciate the fact that, the problem of ambiguity and fallacy in legal language is very painful to deal with. At one level, we are faced with legal practitioners using jargons and highly unstructured expressions in texts, making them incomprehensible and quite unfriendly to read. At another level, we are faced with the letter of the law having its true meaning subject to the interpretation of the law makers.

There have been several questions raised from ancient times, about having   information presented with minimal ambiguity, and having sound reasoning through legal text and natural language in general, by scholars in various disciplines. Some of the thoughts expressed were, how legal text could be made more comprehensible for sound reasoning in order to avoid the commission of fallacies in legal argumentations. In the reviews by this study of other works of computer scientist who have explored various mechanisms and the use of logic tools to deal with the problems, I agree generally with the school of thought that, computational tools does have the ability to offer solution to some of the problems of legal text processing as demonstrated in this study.

The provision of a logic tool for the discovery of fallacies by this study addresses the problem of ambiguities in legal text. Legal text may not readily be comprehensible; inferences of other legal texts for the purpose of interpretation even complicates the situation further. However, legal text is presented here as a logic theorem, which preserves the intended semantics of the framers of such text, which as well allows for clarity and comprehensibility.

The logic mechanism I have provided would be essential to legal practitioners in the discharge of legal argumentation and decision-making; since it is modelled to support sound reasoning and automates the process of discovering fallacies. Logical connotation of legal text by this tool could be useful to legal practitioners, since it minimises inferential errors and erroneous conclusions.

There were several sequences of steps taken in the modelling of the tool. First, two pieces of the Ghanaian laws were formalised, thus, the Citizenship Act and the Fundamental Human Rights and Freedom of Ghana. The formalised pieces of law formed part of the knowledge base of the logic tool, and as well presented the text as a logic theorem, a form that is crisp and comprehensible. Second, two court cases were formalised as testbed to the knowledge base; this was done to test the reasoning ability of the system against natural processing of decisions in courts. Third, part of the logic system was modelled to evaluate claims made in a court, against their associated laws, to ascertain whether there are fallacies in them or otherwise. The formalism of the text was done in FOL and implemented in Prolog programming language.

Even though the logic tool demonstrated an effective reasoning ability through the text, aspects of legal text such as, the use of jurisprudence and the use of common sense in the decision-making process of the courts cannot be adequately handle by the tool. This is because, the court employs the use of such approaches intuitively, which is beyond the process of logic tools. Some aspects of the law also presents several levels of challenges for semantic analysis; the

use of some terminologies in the law are not defined by the law and cannot be deduced.

Decision-making in the law court is not a simple process that can be easily modelled computationally. Knowledge base available to courts is not static; ruled cases become law and can be referenced for new cases. The dynamism of discourse on legal text introduces several complexities on how legal text can be modelled for use on real argumentations.

These complexities have raised different kinds of questions on the provision of computational solution, which to some extent does not demonstrate the capacity to fully handle human thought processes and communications. The form of reasoning as done by humans is completely different from how computers reason or process information. These analysis have been considered by philosophers, logicians and computer scientists, which establishes the limits machines can process human ingenious communication systems.

However, the structure of legal language closely relates to logic systems, a form that is comprehensible by machines. This has caused scholars to explore the possibility of using machines to process legal language. Even though some scholars in law disagree completely that, machines can be used to process legal discourse, insisting that the life of the law has not been logic, my explorations have revealed interesting possibilities and the use of logic tools for processing legal language.

The research methodology which guided this study, was the ontological technique of the philosophical research design. This generally uses NLP mechanisms for information processing and implementation, and thus, uses

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analytical tools such as ontology, axiology and epistemology. This methodology allows for logical modelling of information, which defines properties of entities and how they relate. The practical and theoretical use of concepts and their definitions is further strengthened by the design as an empirical tool for ethical decision-making process. I therefore, adopted the technique of modelling legal text in FOL and Prolog, where legal entities are defined and logically related for deductive reasoning purposes. My research was however limited by the general weaknesses of the research method. Highly unstructured language, terminologies or statements without definite meaning, and intuitive application or use of statements are aspects that are beyond the scope of the study.

The results of the study presents a significant paradigm to the processing of legal text. All aspects of the results work together for the overall purpose of automatic discovery of fallacies. I developed the following steps for the complete modelling of the tool:

1. The formalism of Citizenship Act of Ghana in FOL.

2. The formalism of court case as a testbed to the Citizenship Act in FOL.

3. The implementation of the formalised text of the Citizenship Act as a Prolog programme.

4. The implementation of the formalised text as a testbed to the Citizenship Act as Prolog programme.

5. The implementation of the Fundamental Human Rights and Freedom of Ghana as a Prolog programme.

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6. The implementation of a court case as a testbed to the Fundamental Human Rights and Freedom of Ghana as a Prolog programme.

7. The formalism of automatic fallacy discovery process

These results establishes the fictional ability and limitation of FOL and Prolog in the handling of legal text, at the level of processing and discourse. The formalism of the text deals with the problem of ambiguities, establishes clarity in the semantics of the text and provides some level of comprehensibility. The implementation of the text in Prolog further affirms the reasoning power of the tool in decision-making process. The deductive reasoning function of the tool is done base on the logics and definitions of the law, and is therefore limited at instances where the law is unable to clearly define some entities and their relations.

The automatic fallacy discovery process draws from the formalised text as a knowledge base. It is modelled to evaluate claims made in legal arguments against their associated laws to establish sound reasoning and the discovery of fallacies in a decision-making process.

Conclusions

Human natural communication, thus, the choice and use of words, whether written or orally generated, is not done with strict coherence of logical implications in mind. It is only at machine level that, the logical processing and the logical consequence of information can be adequately synthesised.

I have in this study established that, First Order Logic and Prolog have the functional capacity to offer clarity and comprehensibility in legal text

through formalism. The formalised text of the pieces of Ghanaian law, presented as a logic theorem and as a Prolog programme, reveals different levels of semantic consequences which is different from their natural form. The study established that, language expressed in natural form sometimes carry different semantic consequences from the intention of the composers of the text. The variance in meaning is introduced through the structure and form of construction of statements, which may be rendered with technical textual faults.

The structure of every natural text has its logic connotation. Logic notations are therefore, developed from the default use of natural text, which universally maintains natural language understanding and minimizes context specifics of the use of some words in language. I have discovered by this study that, some textual presentation in the laws misrepresented the semantics of the statements, as some did not connect logically with the rest of the statements they are found in. The use of some terminologies, introduced different logical consequence of the statements which was revealed by the logical analysis of the model I provided. I have also established a clear difference in the semantic consequence of naturally expressed language and the consequence of its logic form. The logical consequence in the process and use of information is however enforced and maintained through the logic form of natural language. The level of clarity in the natural language however, is very crucial to the level of precision that can be provided in the semantics of text, and for deductive reasoning.

The logic model as well clarifies scopal ambiguities in the text, which defines the extent or scope of use of words in statements, which enforces or

maintains the intended semantics of statements. The logic model employed techniques that ensured validity of statements of the pieces of the law used. This defined the pattern of logic reasoning that must be followed in the use of the law for sound reasoning. The model maintains a proof system for validity check and how to arrive at right deductive conclusions.

I have also established that, legal decision-making processes can be adequately handled by the logic model. The decision-making process of assessing a claim on the bases of a piece of law, establishing the facts of the claim and deducing the legal implication of the claim as a decision, is here modelled and tested with real court cases. However aspects of decision-making process such as intuitive reasoning, use of common sense and the application of jurisprudence introduces a complex and dynamic paradigm that cannot be adequately handled by the model.

The discovery of fallacy by computational means has been made possible and as demonstrated by this study. The modelled text of the law serves as a knowledge base against which related cases are evaluated to ascertain their logical and legal validity. The evaluation process is an automated deductive reasoning process that is able to reveal fallacies in legal text or otherwise. The principles of Non Sequitur Fallacies are here preserved for the determination of the kind of fallacies that can be discovered by the model.

Recommendations

I am optimistic that, the semantic gap in legal language can be completely bridged over the period of time, by means of computational tools if

researchers make more explorations in the area. The knowledge I have provided here raises new questions and reveals other opportunities to expand the use of computational tools for the processing of legal text, generally, to enforce clarity and comprehensibility, sound reasoning and deductive reasoning.

The formalism and use of logical analysis for the assertion of semantic consequence of legal text, as demonstrated in the research, should be further expanded by other researchers. Such analysis would be very useful for constructing new legal text. The knowledge of the semantic implication of use of words, whether literally or legally used, will guide the composition of legal text in a structure that can avoid ambiguities, misrepresentation in meaning and so forth. Legislative instruments should be translated to logic tools which will guide every logic processes that is needed to be done on text. The logic system of a legal text resolves ambiguities and scope of use of statements

Other formal languages should also be explored for processing legal text. The use of FOL and Prolog even though have been adequate for the purpose of this research, thus, the formalism of aspects of the Ghanaian law, aspects such as the intuitive use of information cannot be handle by these languages adequately.

Researchers should explore the possibilities of applying the framework provided here for the processing of other types of fallacies. Even though this can be a very painful exercise because of the nature of fallacies. There are some of logical principles that can capture some of these fallacies for further analysis.

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APPENDICES

APPENDIX A

PROLOG EXECUTABLE CODE FOR CITIZENSHIP ACT 2000 (591)

OF GHANA

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:11:

Singleton variables: [X,T_dob,T_doi]

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Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:13:

    Singleton variables: [X,C]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:14:

    Singleton variables: [X,C]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:15:

    Singleton variables: [Z,X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:19:

    Singleton variables: [Z,X,C]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:19:

    Clauses of bornIn/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/citizenship.pl:13

    Current predicate: g_gparent/2

    Use :- discontiguous bornIn/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:20:

    Singleton variables: [G,X,C]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:21:

    Singleton variables: [P,Z,X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:22:

    Singleton variables: [GP,G,X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:23:

    Singleton variables: [X]

201

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:25:

    Singleton variables: [T_dob,T_doi,P,GP]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:25:

    Singleton variable in branch: T_dob

    Singleton variable in branch: T_doi

    Singleton variable in branch: P

    Singleton variable in branch: GP

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:26:

    Singleton variables: [T_dob,T_doi,P]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:31:

    Singleton variables: [X,T_dob,T_doi,T_69c]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:31:

    Clauses of bornAt/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/citizenship.pl:11

    Current predicate: time4/3

    Use :- discontiguous bornAt/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:33:

    Singleton variables: [Z,X,C,T_dob]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:34:

    Singleton variables: [G,X,C,T_dob]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:35:

    Singleton variables: [GG,X,C,T_dob]

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Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/citizenship.pl:38:

    Singleton variables: [T_dob,T_doi,T_69c,P,GP,GG]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/citizenship.pl:38:

    Clauses of isCtzBB/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/citizenship.pl:25

    Current predicate: strippedCtz/3

Use :- discontiguous isCtzBB/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/citizenship.pl:38:

    Singleton variable in branch: T_dob

    Singleton variable in branch: T_doi

    Singleton variable in branch: T_69c

    Singleton variable in branch: P

    Singleton variable in branch: GP

    Singleton variable in branch: GG

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/citizenship.pl:41:

    Singleton variables: [T_dob,T_doi,T_69c,GP]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/citizenship.pl:44:

    Singleton variables: [T_doi,T_69c,Z,G,GG]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/citizenship.pl:44:

    Singleton variable in branch: T_doi

    Singleton variable in branch: T_69c

    Singleton variable in branch: Z

    Singleton variable in branch: G

    Singleton variable in branch: GG

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:48:

    Singleton variables: [Z,X,C,T_dob]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:49:

    Singleton variables: [Z,X,C,T_dob]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:51:

    Singleton variables: [T_doi,T_69c]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:51:

    Clauses of isCtzBB/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/citizenship.pl:25

    Current predicate: isCtzBR/3

    Use :- discontiguous isCtzBB/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:51:

    Singleton variable in branch: T_dob

    Singleton variable in branch: T_doi

    Singleton variable in branch: T_69c

    Singleton variable in branch: Z

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:57:

    Singleton variables: [X,T_dob,T_69c,T_79c]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:57:

    Clauses of bornAt/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/citizenship.pl:11

    Current predicate: time5/3

Use :- discontiguous bornAt/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:59:

Singleton variables: [Y,C,X,T_dob]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:60:

Singleton variables: [T_69c,T_79c,Z]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:60:

Clauses of isCtzBB/2 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d

research/chapter three & five_ modeled/citizenship.pl:25

Current predicate: isCtz/3

Use :- discontiguous isCtzBB/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:60:

Singleton variable in branch: T_dob

Singleton variable in branch: T_69c

Singleton variable in branch: T_79c

Singleton variable in branch: Z

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:65:

Singleton variables: [X,T_dob,T_79c,T_93c]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:65:

Clauses of bornAt/2 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d

research/chapter three & five_ modeled/citizenship.pl:11

Current predicate: time6/3

Use :- discontiguous bornAt/2. to suppress this message

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Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:67:

    Singleton variables: [Y,C,X,T_dob]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:67:

    Clauses of isCtz/3 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/citizenship.pl:59

    Current predicate: bornAt/2

    Use :- discontiguous isCtz/3. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:68:

    Singleton variables: [T_79c,T_93c,Z,G]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:68:

    Clauses of isCtzBB/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/citizenship.pl:25

    Current predicate: isCtz/3

    Use :- discontiguous isCtzBB/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:68:

    Singleton variable in branch: T_dob

    Singleton variable in branch: T_79c

    Singleton variable in branch: T_93c

    Singleton variable in branch: Z

    Singleton variable in branch: G

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:74:

    Singleton variables: [X,T_dob,T_93c]

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Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/citizenship.pl:74:

   Clauses of bornAt/2 are not together in the source-file

   Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/citizenship.pl:11

     Current predicate: time6/2

     Use :- discontiguous bornAt/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:76:

   Singleton variables: [Y,C,X,T_dob]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:76:

   Clauses of isCtz/3 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter

three & five_ modeled/citizenship.pl:59

     Current predicate: bornAt/2

     Use :- discontiguous isCtz/3. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:77:

   Singleton variables: [T_93c,Z,G]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:77:

   Clauses of isCtzBB/2 are not together in the source-file

   Earlier definition at c:/users/callitus/documents/awbc/ph. d

research/chapter three & five_ modeled/citizenship.pl:25

     Current predicate: isCtz/3

     Use :- discontiguous isCtzBB/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/citizenship.pl:77:

   Singleton variable in branch: T_dob

   Singleton variable in branch: T_93c

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Singleton variable in branch: Z

Singleton variable in branch: G

?-

conteusCtz(A, B) :-

    existingCtzAt(A, B),

    t_CAEoC(A, B).

:- multifile prolog_clause_name/2.

:- thread_local thread_message_hook/3.

:- dynamic thread_message_hook/3.

:- volatile thread_message_hook/3.

isCtzBR(parent(_, _), _, _).

isCtzBR(parent(_, _), _, _).

isCtzBB(A, B) :-

    (　bornAt(A, t_B57(_, _)),

      bornIn(A, B),

      bornIn(_, B)

    ;　bornIn(_, B)

).

isCtzBB(A, B) :-

    bornAt(A, t_B57(_, _)),

    bornOut(A, B),

    bornIn(_, B).

isCtzBB(A, B) :-

```
(   bornAt(A, time4(_, _, _)),

    bornIn(A, B)

;   bornOut(A, B),

    bornIn(_, B),

    bornIn(_, B)

;   bornIn(_, B)

).

isCtzBB(A, B) :-

    bornAt(A, time4(_, _, _)),

    bornIn(A, B),

    bornIn(_, B).

isCtzBB(A, B) :-

    (   bornAt(A, time4(_, _, _)),

        bornIn(A, B)

    ;   bornOut(A, B),

        isCtzBR(parent(_, A), B, _)

    ;   isCtzBN(parent(_, A), B, _)

    ).

isCtzBB(A, B) :-

    (   bornAt(A, time5(_, _, _)),

        bornIn(A, B)

    ;   bornOut(A, B),

        isCtz(parent(_, A), B, bornAt(A, _))

    ).

isCtzBB(A, B) :-   (   bornAt(A, time6(_, _, _)),

        bornIn(A, B)

    ;   bornOut(A, B),

        isCtz(parent(_, A), B, bornAt(A, _))

    ;   isCtz(gparent(_, A), B, bornAt(A, _))

    ).

isCtzBB(A, B) :-
```

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```
    (   bornAt(A, time6(_, _)),

        bornIn(A, B)

    ;   bornOut(A, B),

        isCtz(parent(_, A), B, bornAt(A, _))

    ;   isCtz(gparent(_, A), B, bornAt(A, _))

    ).
```

:- multifile message_property/2.

:- multifile prolog_predicate_name/2.

:- dynamic message_hook/3.
:- multifile message_hook/3.

```
t_B57(A, B) :-
        A<B.
```

:- dynamic exception/3.
:- multifile exception/3.

:- dynamic resource/3.
:- multifile resource/3.

```
time6(A, B) :-
        A<B.
```

210

```prolog
time5(A, B, C) :-
    A>=B,
    A<C.


:- dynamic prolog_exception_hook/4.

:- multifile prolog_exception_hook/4.


prolog_exception_hook(error(A, context(D, B)), error(A,
context(prolog_stack(J), B)), G, C) :-
   prolog_stack:
   (   current_prolog_flag(backtrace, true),
       (   atom(C)
       -> debug(backtrace,
           'Got uncaught (guard = ~q) exception ~p (Ctx0=~p)',
[C, A, D]),
           stack_guard(C)
       ;   prolog_frame_attribute(C, predicate_indicator, E),
           debug(backtrace,
               'Got exception ~p (Ctx0=~p, Catcher=~p)',
           [A, D, E]),
           stack_guard(E)
       ),
       (   current_prolog_flag(backtrace_depth, F)
       -> F>0
       ;   F=20
       ),
       get_prolog_backtrace(G, F, H),
       debug(backtrace, 'Stack = ~p', [H]),
       clean_stack(H, I),
       join_stacks(D, I, J)
).
```

211

```prolog
:- dynamic prolog_load_file/2.

:- multifile prolog_load_file/2

bornAt(_, t_B57(_, _)).

bornAt(_, time4(_, _, _)).

bornAt(_, time5(_, _, _)).

bornAt(_, time6(_, _, _)).

bornAt(_, time6(_, _)).

isCtz(_, _, bornAt(_, _)).

isCtz(_, _, bornAt(_, _)).

isCtz(_, _, bornAt(_, _)).

:- dynamic prolog_event_hook/1.

:- multifile prolog_event_hook/1.

bornIn(_, _).

bornIn(parent(_, _), _).

bornIn(gparent(_, _), _).

bornIn(_, A) :-
    bornIn(parent(_, _), A).

bornIn(_, A) :-
    bornIn(gparent(_, _), A).

bornIn(A, B) :-
    bornIn(g_gparent(A, _), B).


time6(A, B, C) :-
    A>=B,
    A<C.


:- dynamic prolog_file_type/2.

:- multifile prolog_file_type/2.


prolog_file_type(pl, prolog).
```

212

```prolog
prolog_file_type(prolog, prolog).
prolog_file_type(qlf, prolog).
prolog_file_type(qlf, qlf).
prolog_file_type(A, executable) :-
      system:current_prolog_flag(shared_object_extension, A).


:- dynamic portray/1.
:- multifile portray/1.
:- dynamic library_directory/1.
:- multifile library_directory/1.

library_directory(B) :-
   '$parms':
   (  cached_library_directory(local, A=lib, A),
      B=A
   ).
library_directory(B) :-
   '$parms':
   (  cached_library_directory(user,
                 expand_file_name('~/lib/prolog', [A]),
                 A),
      B=A
   ).
library_directory(B) :-
   '$parms':
   (  cached_library_directory(system,
                 absolute_file_name(swi(library), A),
                 A),
      B=A
   ).
library_directory(B) :-
```

213

```
'$parms':
(   cached_library_directory(clp,
                absolute_file_name(swi('library/clp'), A),
                A),
    B=A
).
```

```
bornOut(_, _).
true.

?-
```
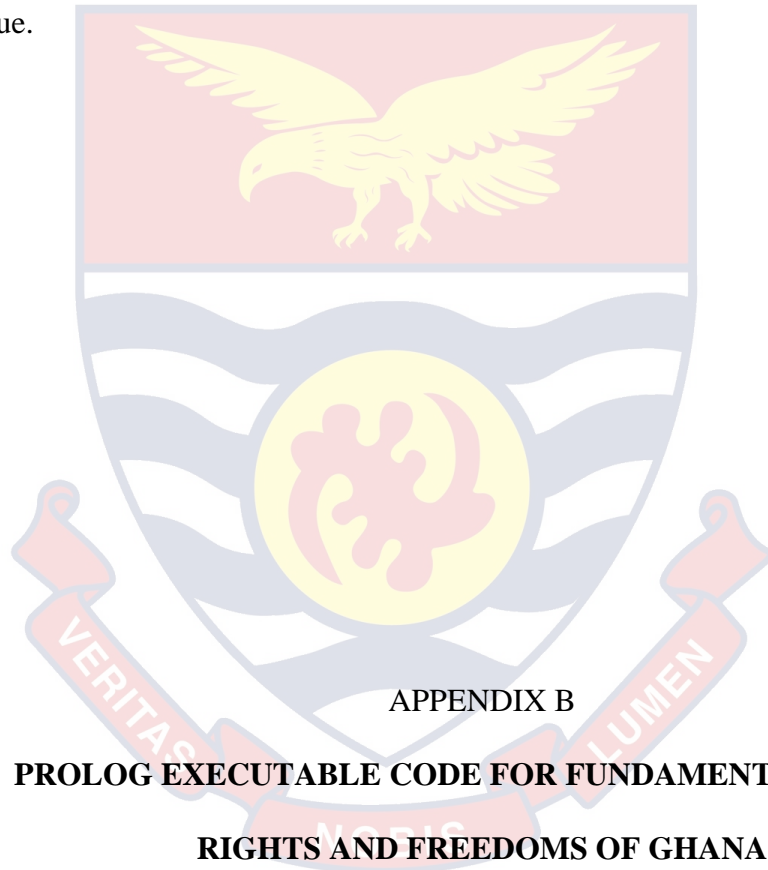
APPENDIX B

PROLOG EXECUTABLE CODE FOR FUNDAMENTAL HUMAN

RIGHTS AND FREEDOMS OF GHANA

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:161:

   Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:163:

214

Clauses of deprivedof/2 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:155

Current predicate: welfare/1

Use :- discontiguous deprivedof/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:166:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:167:

Singleton variables: [X,Ghana]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:168:

Singleton variables: [X,Ghana]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:168:

Clauses of prevent/1 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:69

Current predicate: into/2

Use :- discontiguous prevent/1. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:169:

Singleton variables: [X,Ghana]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:171:

Singleton variables: [Ghana]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:171:

Clauses of from/2 are not together in the source-file

215

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:64

Current predicate: lawful/1

Use :- discontiguous from/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:172:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:173:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:174:

Singleton variables: [X,Ghana]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:175:

Singleton variables: [X,Ghana]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:175:

Clauses of restrict/1 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:172

Current predicate: through/2

Use :- discontiguous restrict/1. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:176:

Singleton variables: [X,Ghana]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:177:

Singleton variables: [X,A,B]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:179:

216

Singleton variables: [A,B]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:179:

Clauses of deprivedof/2 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter

three & five_ modeled/chapter five.pl:155

Current predicate: removedFrom/2

Use :- discontiguous deprivedof/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:179:

Singleton variable in branch: Ghana

Singleton variable in branch: A

Singleton variable in branch: B

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:186:

Singleton variable in branch: Ghana

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:191:

Singleton variables: [X,LANGUAGE]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:192:

Singleton variables: [X,LANGUAGE]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:193:

Singleton variables: [X,LANGUAGE]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:195:

Singleton variables: [LANGUAGE]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:201:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:205:

   Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:206:

   Clauses of of/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:31

       Current predicate: bringingBefore/2

     Use :- discontiguous of/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:208:

   Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:212:

   Clauses of shallBe/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:195

       Current predicate: forThePurposeOf/1

     Use :- discontiguous shallBe/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:219:

   Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:220:

   Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:222:

   Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:222:

218

Clauses of of/2 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:31

Current predicate: beingAboutToCommit/2

Use :- discontiguous of/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:223:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:225:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:229:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:230:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:231:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:231:

Clauses of shallBe/2 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:195

Current predicate: not/1

Use :- discontiguous shallBe/2. to suppress this message

ERROR: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:241:62: Syntax error: Operator expected

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:249:

219

Clauses of reasonable/1 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:218

Current predicate: within/2

Use :- discontiguous reasonable/1. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:251:

Clauses of upon/1 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:225

Current predicate: reasonable/1

Use :- discontiguous upon/1. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:252:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:253:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:272:

Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:272:

Clauses of of/2 are not together in the source-file

Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:31

Current predicate: where/1

Use :- discontiguous of/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:273:

Singleton variables: [X]

220

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:278:

    Clauses of shallBe/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:195

    Current predicate: no_person/1

    Use :- discontiguous shallBe/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:285:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:287:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:287:

    Clauses of shallBe/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:195

    Current predicate: detracting/1

    Use :- discontiguous shallBe/2. to suppress this message

ERROR: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:291:1: Syntax error: Operator expected

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:293:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:294:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three & five_ modeled/chapter five.pl:295:

    Singleton variables: [X,Offence]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:295:

    Clauses of not/1 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d

research/chapter three & five_ modeled/chapter five.pl:230

    Current predicate: treatedAs/1

Use :- discontiguous not/1. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:299:

    Singleton variables: [Offence]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:299:

    Clauses of not/1 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d

research/chapter three & five_ modeled/chapter five.pl:230

    Current predicate: keptSaeparatelyFrom/2

    Use :- discontiguous not/1. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:300:

    Singleton variables: [Offence]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:300:

    Clauses of keptSaeparatelyFrom/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d

research/chapter three & five_ modeled/chapter five.pl:297

    Current predicate: not/1

    Use :- discontiguous keptSaeparatelyFrom/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &

five_ modeled/chapter five.pl:306:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/chapter five.pl:307:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/chapter five.pl:308:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/chapter five.pl:309:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/chapter five.pl:310:

    Singleton variables: [X]

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/chapter five.pl:310:

    Clauses of in/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/chapter five.pl:40

    Current predicate: offender/1

    Use :- discontiguous in/2. to suppress this message

Warning: c:/users/callitus/documents/awbc/ph. d research/chapter three &
five_ modeled/chapter five.pl:312:

    Clauses of keptSaeparatelyFrom/2 are not together in the source-file

    Earlier definition at c:/users/callitus/documents/awbc/ph. d
research/chapter three & five_ modeled/chapter five.pl:297

    Current predicate: in/2

    Use :- discontiguous keptSaeparatelyFrom/2. to suppress this message

Welcome to SWI-Prolog (threaded, 64 bits, version 7.4.1)

?-

person([_]).

person([_]).

223

reasonable(suspicion).

reasonable(condition).

reasonable(time).

juvinile(person([_])).

shallBe(a(person([A]), whoIs([arrested, restricted, detained])),

informedImmediatly(in(understands(person([A]), _)))).

shallBe(person([A]), broughtBefore(court)) :-

    forThePurposeOf(in(bringingBefore(a(person([A]),

                whoIs(

                  [arrested,

                    restricted,

                    detained

                  ])),

 court),

        of(execution, of(order, court))))).

shallBe(person([_]), broughtBefore(court)).

shallBe(no_person([]), subjectedTo(torture)).

shallBe(no_person([]), subjectedTo(otherCruel([treatment, punishment]))).

shallBe(no_person([]), subjectedTo(inhumane([treatment, punishment]))).

shallBe(no_person([]), subjectedTo(degrading([treatment, punishment]))).

shallBe(no_person([]),

subjectedTo(conditionThatDetracts(worthOf(person([_]), as(humanBeing))))).

:- dynamic message_hook/3.

:- multifile message_hook/3.

committed(person([_]), crime).

lawfullArrestOf(person([_])).

224

inTheCourseOfextraditionOf(restrict(through(lawfully(person([_]), convayed),
_))).

:- multifile prolog_clause_name/2.
proceedingsTo(priliminary, trial).

affecting(person([_]), [expultion, extradition, from(lawful(removal), _)]).

welfare(person([_])).

no(person([])).

:- dynamic exception/3.
:- multifile exception/3.

bringingBefore(person([_]), court).

as(humanBeing).
:- dynamic resource/3.
:- multifile resource/3.
effect(lawfullArrestOf(person([_]))).

where(withing(not(tried(a(person([A]), whoIs([arrested, restricted,
detained])))), reasonable(time))) :-
      (shallBeReleased(a(person([A]),
                      whoIs([arrested, restricted, detained])),
                  unconditionally)
      ;   shallBeReleased(a(person([A]),
                      whoIs([arrested, restricted, detained])),
                  upon(reasonable(condition)))

225

```
        ).


:- multifile prolog_predicate_name/2.

:- dynamic prolog_exception_hook/4.

:- multifile prolog_exception_hook/4.


prolog_exception_hook(error(A, context(D, B)), error(A,

context(prolog_stack(J), B)), G, C) :-

    prolog_stack:

    (  current_prolog_flag(backtrace, true),

        (   atom(C)

        ->  debug(backtrace,

                'Got uncaught (guard = ~q) exception ~p (Ctx0=~p)',

                [C, A, D]),

            stack_guard(C)

        ;   prolog_frame_attribute(C, predicate_indicator, E),

            debug(backtrace,

                'Got exception ~p (Ctx0=~p, Catcher=~p)',

                [A, D, E]),

            stack_guard(E)

        ),

        (   current_prolog_flag(backtrace_depth, F)

        ->  F>0

        ;   F=20

        ),

        get_prolog_backtrace(G, F, H),

        debug(backtrace, 'Stack = ~p', [H]),

        clean_stack(H, I),

        join_stacks(D, I, J)

    ).

educating(person([_])).
```

226

justifiable(useOfForce).

:- dynamic prolog_load_file/2.

:- multifile prolog_load_file/2.

of(laws, ghana).

of(sentence, court).

of(execution, of(sentence, court)).

of(life, person([_])).

of(sentence, court).

of(execution, of(sentence, court)).

of(order, court).

of(execution, of(order, court)).

of(execution, of(order, court)).

of(order, court).

of(execution, of(order, court)).

of(reasonable(suspicion), committed(person([_]), crime)).

of(reasonable(suspicion), beingAboutToCommit(person([_]),

criminal(offence))).

of(dignity, person([_])).

forThePurposeOf(in(bringingBefore(person([_]), court), of(execution,

of(order, court)))).

removedFrom(person([_]), to(country(_), country(_))).

lawfullydetained(person([_])).

lawfully(person([_]), convayed).

227

:- dynamic prolog_event_hook/1.

:- multifile prolog_event_hook/1.

appearsFor(person([_]), at(trial, later(date))).

convictedOf(person([_]), criminal(_)).

convictedOf(person([_]), criminal(offence)).

intentionally(deprivedOf(no(person([])), life)).

whoIs([arrested, restricted, detained]).

commissionBy(crime, person([_])).

escapeOf(lawfullydetained(person([_]))).

from(defenceof(person([_])), violence).

from(lawful(removal), _).

:- dynamic prolog_file_type/2.

:- multifile prolog_file_type/2.

prolog_file_type(pl, prolog).

prolog_file_type(prolog, prolog).

prolog_file_type(qlf, prolog).

prolog_file_type(qlf, qlf).

prolog_file_type(A, executable) :-

    system:current_prolog_flag(shared_object_extension, A).

:- dynamic portray/1.

:- multifile portray/1.

228

```prolog
:- dynamic library_directory/1.
:- multifile library_directory/1.

library_directory(B) :-
   '$parms':
   (  cached_library_directory(local, A=lib, A),
      B=A
   ).
library_directory(B) :-
   '$parms':
   (  cached_library_directory(user,
                  expand_file_name('~/lib/prolog', [A]),
                  A),
      B=A
   ).
library_directory(B) :-
   '$parms':
   (  cached_library_directory(system,
                  absolute_file_name(swi(library), A),
                  A),
      B=A
   ).
library_directory(B) :-
   '$parms':
   (  cached_library_directory(clp,
                  absolute_file_name(swi('library/clp'), A),
                  A),
      B=A
   ).
```

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under(convictedOf(person([_]), criminal(_)), of(laws, ghana)).

true.

?-

APPENDIX C

CITIZENSHIP ACT, 2000 (ACT 591)

ARRANGEMENT OF SECTIONS

Section

PART I—EXISTING CITIZENSHIP; CITIZENSHIP BY BIRTH

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THE FIVE HUNDRED AND NINETY-FIRST

ACT

OF THE PARLIAMENT OF THE REPUBLIC OF GHANA

ENTITLED

THE CITIZENSHIP ACT, 2000

AN ACT to consolidate with amendments the law relating to citizenship of Ghana; to state in respect of citizenship by birth the legal conditions applicable at the given points in time; to bring the law in conformity with the Constitution as amended and to provide for related matters.

DATE OF ASSENT: 29th December, 2000

BE IT ENACTED by Parliament as follows—

PART I—EXISTING CITIZENSHIP; CITIZENSHIP BY BIRTH

Section 1—Continuation of Existing Citizenship

Every person who on the coming into force of the Constitution was a citizen of Ghana by law shall continue to be a citizen of Ghana.

Section 2—Ascertainment of the Law Applicable to Citizenship by Birth

For ease of ascertaining the law on Ghanaian citizenship by birth, the applicable provisions are in this Part restated.

Section 3—Persons Born before 6/3/57

(1) A person born before 6th March 1957 is a citizen of Ghana by birth if—

   (a) he was born in Ghana and at least one of his parents or grandparents was born in Ghana; or (b) he was born outside Ghana and one of his parents was born in Ghana.

Section 4—Persons Born on or after 6/3/57 but before 22/8/69

(1) A person born on or after 6th March 1957 and before 22nd August 1969 is
   a citizen of Ghana by birth if—

   (a) he was born in or outside Ghana and either of his parents, and also one at
      least of his grandparents or great-grandparents, was born in Ghana; or

   (b) in the case of a person born in Ghana neither of whose parents was born in
      Ghana, at least one of his grandparents was born in Ghana.

(2) A person is not a citizen of Ghana for the purposes of subsection (1) of this
   section if at the time of his birth the parent, grandparent or great-grandparent
   through whom the citizenship is claimed has lost his citizenship of Ghana.

(3) A person born on or after 6th March 1957 and before 22nd August 1969 is a
   citizen of Ghana by birth if—

   (a) he was born in Ghana and at the time of his birth either of his parents was
      a citizen of Ghana by registration or naturalisation; or

   (b) he was born outside Ghana and at the time of his birth both of his parents
      were citizens of Ghana by registration or naturalisation.

Section 5—Persons Born on or after 22/8/69—Constitution 1969

A person is a citizen of Ghana by birth if he was born in or outside Ghana on or after 22nd August 1969 and before 24th September 1979 and at the date of his birth either of his parents was a citizen of Ghana.

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Section 6—Persons Born on or after 24/9/79—Constitution 1979

A person born on or after 24th September 1979 and before 7th January 1993 is

a citizen of Ghana by birth if—

(a) he was born in Ghana and at the date of his birth either of his parents or one grandparent was a citizen of Ghana; or

(b) he was born outside Ghana and at the date of his birth either of his parents was a citizen of Ghana.

Section 7—Persons Born on or after 7/1/93—Constitution 1992

A person is a citizen of Ghana by birth if he was born on 7th January 1993 or born after that date in or outside Ghana and at the date of his birth either of his parents or one grandparent was or is a citizen of Ghana.

Section 8—Foundlings

A child of not more than seven years of age found in Ghana whose parents are

not known shall be presumed to be a citizen of Ghana by birth.

PART II—ACQUISITION OF GHANAIAN CITIZENSHIP
OTHERWISE THAN BY BIRTH

Section 9—Adopted Children

A child of not more than sixteen years of age neither of whose parents is a

citizen of Ghana who is adopted by a citizen of Ghana shall, by virtue of the

adoption, be a citizen of Ghana.

Section 10—Citizenship by Registration

(1) A citizen of age and capacity of any approved country may upon an

   application, and with the approval of the President, be registered as a citizen

   of Ghana if he satisfies the Minister that—

  (a) he is of good character;

  (b) he is ordinarily resident in Ghana;

  (c) he has been so resident throughout the period of five years or such shorter period as the Minister may in the special circumstances of any particular case accept, immediately before the application; and

  (d) he can speak and understand an indigenous language of Ghana.

(2) A person who is not a citizen and is or was married to a citizen may, upon an application in the prescribed manner, be registered as a citizen.

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(3) Subsection (2) applies to an applicant who was married to a person who was a citizen at the time of the death of that person.

(4) Where the marriage of a person registered as a citizen under subsection (2) is dissolved, the person shall continue to be a citizen unless the citizenship is renounced.

(5) A child of the marriage of a person registered as a citizen under subsection (2) shall continue to be a citizen unless the child renounces the citizenship.

(6) Where upon an application for registration under subsection (2) it appears to the Minister that the marriage had been entered into primarily for the purpose of obtaining the registration, the Minister shall request the applicant to establish that the marriage was entered into in good faith.

(7) In the case of a man seeking registration, subsection (1) applies only if the applicant is permanently resident in Ghana.

(8) A person shall not be registered as a citizen unless he has taken the oath of allegiance.

Section 11—Registration of Children

The Minister shall register as a citizen of Ghana a child of any person who

becomes a citizen of Ghana by registration or naturalisation upon application

of the parent or guardian of the child.

Section 12—Effective Date of Registration as Citizen

(1) A person registered under section 10 or 11 is a citizen by registration from the date stated on the certificate of registration

(2) The date stated on the certificate of registration shall be the date of the taking of the oath of allegiance.

Section 13—Naturalisation

(1) The Minister may with the approval of the President grant a certificate of naturalisation to a person of age and capacity who satisfies the Minister that he is qualified under section 14 of this Act for naturalisation.

(2) A person to whom a certificate of naturalisation is granted under subsection (1) shall take the oath of allegiance and become a citizen by naturalisation from the date on which the oath of allegiance is taken.

Section 14—Qualification for Naturalisation

(1) Subject to subsection (2) of this section, a person qualifies for

naturalisation if—

  (a) he has resided in Ghana throughout the period of twelve months immediately preceding the date of the application;

(b) during the seven years immediately preceding the period of twelve months, he has resided in Ghana for periods amounting in the aggregate to not less than five years;

(c) he is of good character as attested to in writing by two Ghanaians being notaries public, lawyers, or senior public officers;

(d) he has not been sentenced to any period of imprisonment in Ghana or anywhere for an offence recognised by law in Ghana;

(e) he is able to speak and understand an indigenous Ghanaian language;

(f) he is a person who has made or who is capable of making a substantial contribution to the progress or advancement in any area of national activity;

(g) he is a person who has been assimilated into the Ghanaian way of life or who can easily be so assimilated;

(h) he intends to reside permanently in Ghana in the event of a certificate being granted to him; and (i) he possessed a valid residence permit on the date of his application.

(2) The Minister, may in such special circumstances as he thinks fit and with the approval of the President—

(a) allow a continuous period of twelve months ending not more than six months before the date of the application to be reckoned for the purposes of subsection (1)(a) of this section as though it had immediately preceded the date of the application;

(b) allow residence in an approved country to be reckoned for the purposes of subsection (1)(b) of this section as if it has been residence in Ghana; and

(c) allow periods of residence earlier than seven years before the date of the application to be reckoned in computing the aggregate period mentioned in subsection (1)(b) of this section.

(3) The Minister, in other special circumstances as he thinks fit and with the approval of the President, may modify, vary or waive any one of the qualifications for naturalisation set out in this section except the qualification specified in subsection 1 (e) of this section.

Section 15—Gazette Publications

The Minister shall publish in the Gazette within three months of any application, registration or grant of a certificate of naturalisation, the names, particulars and other details of a person who— (a) applies to be registered as a citizen;
(b) has been registered as a citizen;

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(c) applies for the grant of a certificate of naturalisation; (d) has been granted a certificate of naturalisation as a citizen.

PART III—DUAL CITIZENSHIP, RENUNCIATION AND DEPRIVATION OF CITIZENSHIP

Section 16—Dual Citizenship

(1) A citizen of Ghana may hold the citizenship of any other country in addition to his citizenship of Ghana.

(2) Without prejudice to article 94(2)(a) of the Constitution, no citizen of Ghana shall qualify to be appointed as a holder of any office specified in this subsection if he holds the citizenship of any other country in addition to his citizenship of Ghana— (a) Chief Justice and Justices of the Supreme Court;

(b) Ambassador or High Commissioner;

(c) Secretary to the Cabinet;

(d) Chief of Defence Staff or any Service Chief;

(e) Inspector-General of Police;

(f) Commissioner, Custom, Excise and Preventive Service;

(g) Director of Immigration Service;

(h) Commissioner, Value Added Tax Service;

(i) Director-General, Prisons Service;

(j) Chief Fire Officer;

(k) Chief Director of a Ministry;

(l) the rank of a Colonel in the Army or its equivalent in the other security services; and (m) any other public office that the Minister may by legislative instrument prescribe.

(3) A citizen of Ghana who—

(a) loses his Ghanaian citizenship as a result of the acquisition or possession of the citizenship of another country shall on the renunciation of his citizenship of that country become a citizen of Ghana;

(b) acquires the citizenship of another country in addition to his Ghanaian citizenship shall notify in writing the acquisition of the additional citizenship to the Minister in such form and such manner as may be prescribed.

(4) A citizen of Ghana who is also a citizen of any other country shall whilst in Ghana be subject to the laws of Ghana as any other citizen.

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(5) A citizen who has lost his citizenship as a result of the law in Ghana which prohibited the holding of dual citizenship by a Ghanaian may on an application to the Minister be issued with a certificate of citizenship which shall be effective from the date of issue.

(6) A certificate issued under subsection (5) shall specify whether the citizenship is by birth, adoption, registration or naturalisation.

Section 17—Renunciation of Ghanaian Citizenship

(1) If any citizen of Ghana of age and capacity who is also a citizen of another country makes a declaration of renunciation of citizenship of Ghana, the Minister shall cause the declaration to be registered; and upon the registration, that person shall cease to be a citizen of Ghana.

(2) Where the law of a country requires a person who marries a citizen of that country to renounce the citizenship of his own country by virtue of that marriage, a citizen of Ghana who is deprived of his citizenship of Ghana by virtue of that marriage shall, on the dissolution of that marriage, become a citizen of Ghana.

Section 18—Deprivation of Citizenship

The High Court may on an application by the Attorney-General for the

purpose, deprive a person who is a citizen of Ghana, otherwise than by birth or

adoption of that citizenship on the ground—

(a) that the activities of that person are inimical to the security of the State or prejudicial to the public morality or the public interest; or

(b) that the citizenship was acquired by fraud, misrepresentation or any other improper or irregular practice.

PART IV—MISCELLANEOUS PROVISIONS

Section 19—Posthumous Children

A reference in this Act to the citizenship status of the parent of a person at the time of the birth of that person shall, in relation to a person born after the death of the parent, be construed as a reference to the citizenship status of the parent at the time of the parent's death.

Section 20—Certificate of Citizenship in Doubtful Cases

The Minister may, on an application made by or on behalf of any person with respect to whose citizenship of Ghana a doubt exists under Part I of this Act, certify that the person is a citizen of Ghana and a certificate issued under this section shall be prima facie evidence that the person was such a citizen at the date indicated in the certificate, but without prejudice to any evidence that he was such a citizen at an earlier date.

Section 21—Evidence

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(1) A document purporting to be a notice, certificate, order or declaration or an entry in a register, or a subscription to an oath of allegiance, given, granted or made under this Act shall be received in evidence.

(2) The evidence may be given by the production of a certified true copy of the document by the person.

(3) An entry in a register made under this Act shall be received as evidence of the matters stated in the entry.

Section 22—Offences

Any person who for the purpose of procuring anything to be done or not to be done under this Act makes any statement which he knows to be false in a material particular, or recklessly makes any statement which is false in a material particular, commits an offence and is liable on summary conviction to a fine of not less than ¢500,000 and not exceeding ¢5 million or a term of imprisonment not exceeding 12 months or to both.

Section 23—Regulations

The Minister may by legislative instrument make Regulations for—

(a) procedures relating to use of travel documents by holders of dual citizenship;
(b) form and manner of notification of acquisition of dual citizenship;

(c) fees chargeable in respect of anything to be done under this Act; and (d) generally for giving full effect to the provisions of this Act.

Section 24—Interpretation

(1) In this Act unless the context otherwise requires—

  "approved country" means any country declared by or under the authority

  of the President to be an approved country by a legislative instrument;

  "child" means a person who has not attained the age of

  eighteen years; **"Minister"** means the Minister

  responsible for the Interior;

  "prescribe" means prescribed by legislative instrument under this Act.

(2) A reference in this Act to Ghana in relation to a birth or residence before 6th March 1957 shall be read as a reference to the territories comprised in Ghana on that date.

(3) For the purposes of this Act, a person born aboard a registered ship or aircraft or aboard an unregistered ship or aircraft of the government of any country, shall be deemed to have been born in the place in which the ship or aircraft was registered or in that country.

(4) For the purposes of this Act, a person is of age if he has attained the age of eighteen years and is of capacity if he is of sound mind.

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Section 25—Repeal and Savings

(1) The Ghana Nationality Act, 1971 (Act 361)

as amended by the— (a) Ghana Nationality

(Amendment) Decree, 1972 (N.R.C.D. 134);

(b) Ghana Nationality (Amendment) Decree, 1978 (S.M.C.D. 172); and

(c) Ghana Nationality (Amendment) Decree, 1979 (A.F.R.C.D. 42) is hereby repealed.

(2) Notwithstanding the repeal in subsection (1) of this section any Regulations made under Act 361 or continued in force under that Act and in force immediately before the coming into force of this Act shall continue in force until amended or revoked under this Act.

(3) The repeal of the enactments specified in subsection (1) does not affect the validity of any action taken under any of the enactments before the repeal.

(4) Any person who immediately before the coming into force of this Act is a citizen by adoption, registration or naturalisation acquired validly under any enactment before the coming into force of this Act shall continue to hold the citizenship subject to the Constitution and the provisions of this Act.
Date of Gazette Notification: 5th January, 2001.

APPENDIX D

THE CONSTITUTION OF THE REPUBLIC OF GHANA: CHAPTER

FIVE- FUNDAMENTAL HUMAN RIGHTS AND FREEDOMS

The Constitution

CHAPTER FIVE

FUNDAMENTAL HUMAN RIGHTS AND FREEDOMS

12.

(1)   The fundamental human rights and freedoms enshrined in this chapter shall be respected and upheld by the Executive, Legislature and Judiciary and all other organs of government and its agencies and, where applicable to them, by all natural and legal persons in

Ghana, and shall be enforceable by the Courts as provided for in this Constitution.

(2)   Every person in Ghana, whatever his race, place of origin, political opinion, colour, religion, creed or gender shall be entitled to the fundamental human rights and freedoms of the individual contained in this Chapter but subject to respect for the rights and freedoms of others and for the public interest.

13.

(1)   No person shall be deprived of his life intentionally except in the exercise of the execution of a sentence of a court in respect of a criminal offence under the laws of Ghana of which he has been convicted.

(2)   A person shall not be held to have deprived another person of his life in contravention of clause (1) of this article if that other person dies as the result of a lawful act of war or if that other person dies as the result of the use of force to such an extent as is reasonably justifiable in the particular circumstances.-

(a) for the defence of any person from violence or for the defence of property; or

(b) in order to effect a lawful arrest or to prevent the escape of a person lawfully detained; or

(c) for the purposes of suppressing a riot, insurrection or mutiny; or

(d) in order to prevent the commission of a crime by that person.

14.

(1) Every person shall be entitled to his personal liberty and no person shall be deprived of his personal liberty except in the following cases and in accordance with procedure permitted by law -

(a) in execution of a sentence or order of a court in respect of a

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criminal offence of which he has been convicted; or

(b) in execution of an order of a court punishing him for contempt of court; or

(c) for the purpose of bringing him before a court in execution of an order of a court; or

(d) in the case of a person suffering from an infectious or contagious disease, a person of unsound mind, a person addicted to drugs or alcohol or a vagrant, for the purpose of his care or treatment or the protection of the community; or

(e) for the purpose of the education or welfare of a person who has not attained the age of eighteen years; or

(f) for the purpose of preventing the unlawful entry of that person into Ghana, or of effecting the expulsion, extradition or other lawful removal of that person from Ghana or for the purpose of restricting that person while he is being lawfully conveyed through Ghana in the course of his extradition or removal from one country to another; or

(g) upon reasonable suspicion of his having committed or being about to commit a criminal offence under the laws of Ghana.

(2) A person who is arrested, restricted or detained shall be informed immediately, in a language that he understands, of the reasons for his arrest, restriction or detention and of his right to a lawyer of his choice.

(3) A person who is arrested, restricted or detained -

(a)   for the purpose of bringing him before a court in execution of an order of a court; or

(b)   upon reasonable suspicion of his having committed or being about to commit a criminal offence under the laws of Ghana, and who is not released, shall be brought before a court within

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fortyeight hours after the arrest, restriction or detention.

(4) Where a person arrested, restricted or detained under paragraph (a) or (b) of clause (3) of this article is not tried within a reasonable time, then, without prejudice to any further proceedings that may be brought against him, he shall be released wither unconditionally or upon reasonable conditions, including in particular, conditions reasonably necessary to ensure that he appears at a later date for trial or for proceedings preliminary to trial.

(5) A person who is unlawfully arrested, restricted or detained by any other person shall be entitled to compensation from that other person.

(6) Where a person is convicted and sentenced to a term of imprisonment for an offence, any period he has spent in lawful custody in respect of that offence before the completion of his trial shall be taken into account in imposing the term of imprisonment.

(7) Where a person who has served the whole or a part of his sentence is acquitted on a appeal by a court, other than the Supreme Court, the court may certify tot he Supreme Court that the person acquitted be paid compensation; and the Supreme Court may, upon examination of all the facts and the certificate of the court concerned, award such compensation as it may think fit; or, where the acquittal is by the Supreme Court, it may order compensation to be paid to the person acquitted.

15.

(1) The dignity of all persons shall be inviolable.

(2) No person shall, whether or not he is arrested, restricted or retained, be subjected to -

    (a)   torture or other cruel, inhuman or degrading treatment or punishment;

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(b)   any other condition that detracts or is likely to detract from his dignity and worth as a human being.

(3)   A person who has not been convicted of a criminal offence shall not be treated as a convicted person and shall be kept separately from convicted persons.

(4)   A juvenile offender who is kept in lawful custody or detention shall be kept separately from an adult offender.

16.

(1) No person shall be held in slavery or servitude.

(2) No person shall be required to perform forced labour.

(3) For the purposes of this article, "forced labour" does not include -

(a)   any labour required as a result of a sentence or order of a court; or

(b)   any labour required of a member of a disciplined force or service as his duties or, in the case of a person who has conscientious objections to a service as a member of the Armed Forces of Ghana, any labour which that person is required by law to perform in place of such service; or

(c)   any labour required during any period when Ghana is at war or in the event of an emergency or calamity that threatens the life and well-being of the community, to the extent that the requirement of such labour is reasonably justifiable in the circumstances of any situation arising or existing during that period for the purposes of dealing with the situation; or

(d)   any labour reasonably required as part of normal communal or other civic obligations.

17.

(1) All persons shall be equal before the law.

(2) A person shall not be discriminated against on grounds of gender, race, colour, ethnic origin, religion, creed or social or economic status.

(3) For the purposes of this article, "discriminate" means to give different treatment to different persons attributable only or mainly to their respective descriptions by race, place of origin, political opinions, colour, gender, occupation, religion or creed, whereby persons of one description are subjected to disabilities or restrictions to which persons of another description are not made subject or are granted privileges or advantages which are not granted to persons of another description.

(4) Nothing in this article shall prevent Parliament from enacting laws that are reasonably necessary to provide -

(a)   for the implementation of policies and programmes aimed at redressing social, economic or educational imbalance in the Ghanaian society;

(b)   for matters relating to adoption, marriage, divorce, burial, and devolution of property on death or other matters of personal law;

(c)   for the imposition of restrictions on the acquisition of land by persons who are not citizens of Ghana or on the political and economic activities of such persons and for other matters relating to such persons; or

(d)   for making different provision for different communities having regard to their special circumstances not being provision which is inconsistent with the spirit of this Constitution.

(5) Nothing shall be taken to be inconsistent with this article which is allowed to be done under any provision of this Chapter.

18.

(1)   Every person has the right to own property either alone or in association with others.

(2)   No person shall be subjected to interference with the privacy of his home, property, correspondence or communication except in accordance with law and as may be necessary in a free and democratic society for public safety or the economic well-being of the country, for the protection of health or morals, for the prevention of disorder or crime or for the protection of the rights or freedoms of others.

19.

(1) A person charged with a criminal offence shall be given a fair hearing within a reasonable time by a court.

(2) A person charged with a criminal offence shall -

(a) in the case of an offence other than high treason or treason, the punishment for which is death or imprisonment for life, be tried by a judge and jury and -

(i)   where the punishment is death, the verdict of the jury shall be unanimous; and

(ii)   in the case of life imprisonment, the verdict of the jury shall be by such majority as Parliament may by law prescribe;

(b)   in the case of an offence tribal by a Regional Tribunal the penalty for which is death, the decision of the Chairman and the other panel members shall be unanimous;

(c)   be presumed to be innocent until he is proved or has pleaded guilty;

(d)   be informed immediately in a language that he understands, and in detail; of the nature of the offence charged;

(e)   be given adequate time and facilities for the preparation of this defence;

(f)   be permitted to defend himself before the court in person or by a lawyer of his choice;

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(g)   be afforded facilities to examine, in person or by his lawyer, the witnesses called by the prosecution before the court, and to obtain the attendance and carry out the examination of witnesses to testify on the same conditions as those applicable to witnesses called by the prosecution;

(h)   be permitted to have, without payment by him, the assistance of an interpreter where he cannot understand the language used at the trial; and

(i)   in the case of the offence of high treason or treason, be tried by the High Court duly constituted by three Justices of that Court and the decision of the Justices shall be unanimous.

(3) The trial of a person charged with a criminal offence shall take place in his presence unless;-

(a) he refuses to appear before the court for the trial to be

conducted in his presence after he has been duly

notified of the trial; or

(b) he conducts himself in such a manner as to render the continuation of the proceedings in his presence impracticable and the court orders him to be removed for the trial to proceed in his absence.

(4) Whenever a person is tried for a criminal offence the accused person or a person authorised by him shall, if he so requires, be given, within a reasonable time not exceeding six months after judgement, a copy of any record of the proceedings made by or on behalf of the court for the use of the accused person.

(5) A person shall not be charged with or held to be guilty of a criminal offence which is founded on an act or omission that did not at the time it took place constitute an offence.

(6) No penalty shall be imposed for a criminal offence that is severer in degree or description than the maximum

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penalty that could have been imposed for that offence at the time when it was committed.

(7) No person who shows that he has been tried by a competent court for a criminal offence and either convicted or acquitted, shall again be tried for that offence or for any other criminal offence of which he could have been convicted at the trial for the offence, except on the order of a superior court in the course of appeal or review proceedings relating to the conviction or acquittal.

(8) Notwithstanding clause (7) of this article, an acquittal of a person on a trial for high treason or treason shall not be a bar to the institution of proceedings for any other offence against that person.

(9) Paragraphs (a) and (b) of clause (2) of this article shall not apply in the case of a trial by a court-martial or other military tribunal.

(10) No person who is tried for a criminal offence shall be compelled to give evidence at the trial.

(11) No person shall be convicted of a criminal offence unless the offence is defined and the penalty for it is prescribed in a written law.

(12) Clause (11) of this article shall not prevent a Superior Court from punishing a person for contempt of itself notwithstanding that the act or omission constitution the contempt is not defined in a written law and the penalty is not so prescribed.

(13) An adjudicating authority for the determination of the existence or extent of a civil right or obligation shall, subject to the provisions of this Constitution, be established by law and shall be independent and impartial; and where proceedings for determination are instituted by a person before such an adjudicating authority, the case shall be given a fair hearing within a reasonable time.

(14) Except as may be otherwise ordered by the adjudicating authority in the interest of public

morality, public safety, or public order the proceedings of any such adjudicating authority shall be in public.

(15) Nothing in this article shall prevent an adjudicating authority from excluding from the proceeding persons, other than the parties to the proceedings and their lawyers, to such an extent as the authority-

    (a) may consider necessary or expedient in circumstances where publicity would prejudice the interests of justice; or

    (b) may be empowered by law to do in the interest of defence, public safety, public order, public morality, the welfare of persons under the age of eighteen or the protection of the private lives of persons concerned in the proceedings.

(16) Nothing in, or done under the authority of, any law shall be held to be inconsistent with or in contravention of, the following provisions

    (a) paragraph (c) of clause (2) of this article, to the extent that the law in question imposes upon a person charged with a criminal offence, the burden of providing particular facts; or

    (b) clause (7) of this article, to the extent that the law in question authorises a court to try a member of a disciplined force for a criminal offence notwithstanding any trial and conviction or acquittal of that member under the disciplinary law of the force, except that any court which tries that member and convicts him shall, in sentencing him to any punishment, take into account any punishment imposed on him under that disciplinary law.

(17) Subject to clause (18) of this article, treason shall consist only-

    (a) in levying war against Ghana or assisting any state or person or inciting or conspiring with any person to levy war against Ghana; or

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(b) in attempting by force of arms or other violent means to overthrow the organs of government established by or under this Constitution; or

(c) in taking part or being concerned in or inciting or conspiring with any person to make or take part or be concerned in, any such attempt.

(18) An act which aims at procuring by constitutional means an alteration of the law or of the policies of the Government shall not be considered as an act calculated to overthrow the organs of government.

(19) Notwithstanding any other provision of this article, but subject to clause (20) of this article, Parliament may, by or under an Act of Parliament, establish military courts or tribunals for the trial of offences against military law committed by persons subject to military law.

(20) Where a person subject to military law, who is not in active service, commits an offence which is within the jurisdiction of a civil court, he shall not be tried by a court-martial or military tribunal for the offence unless the offence is within the jurisdiction of a court-martial or other military tribunals under any law for the enforcement of military discipline.

(21) For the purposes of this article, "criminal offence" means a criminal offence under the laws of Ghana.

20.

(1) No property of any description or interest in or right over any property shall be compulsorily taken possession of or acquired by the State unless the following conditions are satisfied.

(a) the taking of possession or acquisition if necessary in the interest of defence, public safety, public order, public morality, public health, town and country planning or the development or utilization of property in such a manner as to promote the public benefit; and

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(b)   the necessity for the acquisition is clearly stated and is such as to provide reasonable justification for causing any hardship that may result to any person who has an interest in or right over the property.

(2) Compulsory acquisition of property by the State shall only be made under a law which makes provision for.

(a) the prompt payment of fair and adequate compensation; and

(b) a right of access to the High Court by any person who has an interest in or right over the property whether direct or on appeal from other authority, for the determination of his interest or right and the amount of compensation to which he is entitled.

(3)   Where a compulsory acquisition or possession of land effected by the State in accordance with clause (1) of this article involves displacement of any inhabitants, the State shall resettle the displaced inhabitants on suitable alternative land with due regard for their economic well-being and social and cultural values.

(4)   Nothing in this article shall be construed as affecting the operation of any general law so far as it provides for the taking of possession or acquisition of property.

(a) by way of vesting or administration of trust property, enemy property or the property of persons adjudged or otherwise declared bankrupt or insolvent, persons of unsafe mind, deceased persons or bodies corporate or unincorporated in the course of bent wound up; or

(b) in the execution of a judgement or order of a court; or

(c) by reason of its being in a dangerous state or injurious to the health of human beings, animals or plants; or

(d) in consequence of any law with respect to the limitation of actions; or

(e) for so long only as may be necessary for the purpose of any examination, investigation, trial or inquiry; or

(f) for so long as may be necessary for the carrying out of work on any land for the purpose of the provision of public facilities or utilities, except that where any damage results from any such work there shall be paid appropriate compensation.

(5)   Any property compulsorily taken possession of or acquired in the public interest or for a public purpose shall be used only in the public interest or for the public purpose for which it was acquired.

(6)   Where the property is not used in the public interest or for the purpose for which it was acquired, the owner of the property immediately before the compulsory acquisition, shall be given the first option for acquiring the property and shall, on such reacquisition refund the whole or part of the compensation paid to him as provided for by law or such other amount as is commensurate with the value of the property at the time of the reacquisition.

21.

(1) All persons shall have the right to -

(a) freedom of speech and expression, which shall include freedom of the press and other media;

(b) freedom of thought, conscience and belief, which shall include academic freedom;

(c) freedom to practice any religion and to manifest such practice;

(d) freedom of assembly including freedom to take part in processions and demonstrations;

(e) freedom of association, which shall include freedom to form or join trade unions or other

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associations, national or international, for the protection of their interest;

(f) information, subject to such qualifications and laws as are necessary in a democratic society;

(g) freedom of movement which means the right to move freely in Ghana, the right to leave and to enter Ghana and immunity from expulsion from Ghana.

(2)   A restriction on a person's freedom of movement by his lawful detention shall not be held to be inconsistent with or in contravention of this article.

(3)   All citizens shall have the right and freedom to form or join political parties and to participate in political activities subject to such qualifications and laws as are necessary in a free and democratic society and are consistent with this Constitution.

(4)   Nothing in, or done under the authority of, a law shall be held to be inconsistent with, or in contravention of, this article to the extent that the law in question makes provision-

(a)   for the imposition of restrictions by order of a court, that are required in the interest of defence, public safety or public order, on the movement or residence within Ghana of any person; or

(b)   for the imposition of restrictions, by order of a court, on the movement or residence within Ghana of any person either as a result of his having been found guilty of a criminal offence under the laws of Ghana or for the purposes of ensuring that he appears before a court at a later date for trial for a criminal offence or for proceedings relating to his extradition or lawful removal from Ghana; or

(c)   for the imposition of restrictions that are reasonably required in the interest of defence, public safety, pubic health or the running of essential services, on the movement or residence within Ghana of any person or persons generally, or any class of persons; or

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(d)   for the imposition of restrictions on the freedom of entry into Ghana, or of movement in Ghana, if a person who is not a citizen of Ghana; or

(e)   that is reasonably required for the purpose of safeguarding the people of Ghana against the teaching or encourages disrespect for the nationhood of Ghana, the national symbols and emblems, or incites hatred against other members of the community except so far as that provision or , as the case may be, the thing done under the authority of that law is shown not to be reasonably justifiable in terms of the spirit of this Constitution.

(5)   Whenever a person, whose freedom of movement has been restricted by the order of a court under paragraph (a) of clause (4) of this article, requests at any time during the period of that restriction not earlier than seven days after the order was made, or three months after he last made such request, as the case may be, his case shall be reviewed by that court.

(6)   On a review by a court under clause (5) of this article, the court may, subject to the right of appeal from its decision, make such order for the continuation or termination of the restriction as it considers necessary or expedient.

22.

(1)   A spouse shall not be deprived of a reasonable provision out of the estate of a spouse whether or not the spouse died having made a will.

(2)   Parliament shall, as soon as practicable after the coming into force of this Constitution, enact legislation regulating the property rights of spouses.

(3)   With a view to achieving the full realisation of the rights referred to in clause (2) of this article -

(a)   spouses shall have equal access to property jointly acquired during marriage;

(b)   assets which are jointly acquired during marriage shall be distributed equitably between the spouses upon dissolution of the marriage.

23.

Administrative bodies and administrative officials shall act fairly and reasonably and comply with the requirements imposed on them by law and persons aggrieved by the exercise of such acts and decisions shall have the right to seek redress before a court or other tribunal.

24.

(1)   Every person has the right to work under satisfactory, safe and healthy conditions, and shall receive equal pay for equal work without distinction of any kind.

(2)   Every worker shall be assured of rest, leisure and reasonable limitation of working hours and periods of holidays with pay, as well as remuneration for public holidays.

(3)   Every worker has a right to form or join a trade union of his choice for the promotion and protection of his economic and social interests.

(4)   Restrictions shall not be placed on the exercise of the right conferred by clause (3) of this article except restrictions prescribed by law and reasonably necessary in the interest of national security or public order or for the protection of the rights and freedoms of others.

25.

(1) All persons shall have the right to equal educational opportunities and facilities and with a view to achieving the full realisation of that right - (a) basic education shall be free, compulsory and available to all;

(b)   secondary education in its different forms, including technical and vocational education, shall be made generally available and accessible to all by every appropriate means, and in particular, by the progressive introduction of free education;

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(c)   higher education shall be made equally accessible to all, on the basis of capacity, by every appropriate means, and in particular, by progressive introduction of free education;

(d)   functional literacy shall be encouraged or intensified as far as possible;

(e)   the development of a system of schools with adequate facilities at all levels shall be actively pursued.

(2) Every person shall have the right, at his own expense, to establish and maintain a private school or schools at all levels and of such categories and in accordance with such conditions as may be provided by law.

26.

(1)   Every person is entitled to enjoy, practice, profess, maintain and promote any culture, language, tradition or religion subject to the provisions of this Constitution.

(2)   All customary practices which dehumanise or are injurious to the physical and mental well being of a person are prohibited.

27.

(1)   Special care shall be accorded to mothers during a reasonable period before and after childbirth; and during those periods, working mothers shall be accorded paid leave.

(2)   Facilities shall be provided for the care of children below school-going age to enable women, who have the traditional care for children, realise their full potential.

(3)   Women shall be guaranteed equal rights to training and promotion without any impediments from any person.

28.

(1) Parliament shall enact such laws as are necessary to ensure that -

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(a)   every child has the right to the same measure of special care, assistance and maintenance as is necessary for its development from its natural parents, except where those parents have effectively surrendered their rights and responsibilities in respect of the child in accordance with law;

(b)   every child, whether or not born in wedlock, shall be entitled to reasonable provision out of the estate of its parents;

(c)   parents undertake their natural right and obligation of care, maintenance and upbringing of their children in co-operation with such institutions as Parliament may, by law, prescribe in such manner that in all cases the interest of the children are paramount;

(d)   children and young persons receive special protection against exposure to physical and moral hazards; and

(e)   the protection and advancement of the family as the unit of society are safeguarded in promotion of the interest of children.

(2)   Every child has the right to be protected from engaging in work that constitutes a threat to his health, education or development.

(3)   A child shall not be subjected to torture or other cruel, inhuman or degrading treatment or punishment.

(4)   No child shall be deprived by any other person of medical treatment, education or any other social or economic benefit by reason only of religious or other beliefs.

(5)   For the purposes of this article, "child" means a person below the age of eighteen years.

29.

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(1)   Disabled persons have the right to live with their families or with foster parents and to participate in social, creative or recreational activities.

(2)   A disabled person shall not be subjected to differential treatment in respect of his residence other than that required by his condition or by the improvement which he may derive from the treatment.

(3)   If the stay of a disabled person in a specialised establishment is indispensable, the environment and living conditions there shall be as close as possible to those of the normal life of a person of his age.

(4)   Disabled persons shall be protected against all exploitation, all regulations and all treatment of a discriminatory, abusive or degrading nature.

(5)   In any Judicial proceedings in which a disabled person is a party, the legal procedure applied shall take his physical and mental condition into account.

(6)   As far as practicable, every place to which the public have access shall have appropriate facilities for disabled persons.

(7)   Special incentive shall be given to disabled persons engaged in business and also to business organisations that employ disabled persons in significant numbers.

(8)   Parliament shall enact such laws as are necessary to ensure the enforcement of the provisions of this article.

30.

A person who by reason of sickness or any other cause is unable to give his consent shall not be deprived by any other person of medical treatment, education or any other social or economic benefit by reason only of religious or other beliefs.

Emergency Powers

31.

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(1)   The President may, acting in accordance with the advice of the Council of State, by Proclamation published in the Gazette, declare that a state of emergency exists in Ghana or in any part of Ghana for the purposes of the provisions of this Constitution.

(2)   Notwithstanding any other provision of this article, where a proclamation is published under clause (1) of this article, the President shall place immediately before Parliament, the facts and circumstances leading to the declaration of the state of emergency.

(3)   Parliament shall, within seventy-two hours after being so notified, decide whether the proclamation should remain in force or should be revoked; and the President shall act in accordance with the decision of Parliament.

(4)   A declaration of a state of emergency shall cease to have effect at the expiration of a period of seven days beginning with the date of publication of the declaration, unless, before the expiration of that period, it is approved by a resolution passed for that purpose by a majority of all the members of Parliament.

(5)   Subject to clause (7) of this article, a declaration of a state of emergency approved by a resolution of Parliament under clause (4) of this article shall continue in force until the expiration of a period of three months beginning with the date of its being so approved or until such earlier date as many be specified in the resolution.

(6)   Parliament may, by resolution passed by a majority of all members of Parliament, extend its approval of the declaration for periods of not more than one month at a time.

(7)   Parliament may, by a resolution passed by a majority of all the members of Parliament, at any time, revoke a declaration of a state of emergency approved by Parliament under this article.

(8)   For the avoidance of doubt, it is hereby declared that the provisions of any enactment, other than an Act of Parliament, dealing with a state of emergency declared under clause (1) of this article shall apply only to that part of Ghana where the emergency exists.

(9)   The circumstances under which a state of emergency may be declared under this article include a natural disaster and any situation in which any action is taken or is immediately threatened to be taken by any person or body of persons which -

(a)   is calculated or likely to deprive the community of the essentials of life; or

(b)   renders necessary the taking of measures which are required for securing the public safety, the defence of Ghana and the maintenance of public order and of supplies and services essential to the life of the community.

(10)   Nothing in, or done under the authority of, an Act of Parliament shall be held to be inconsistent with, or in contravention of, articles 12 to 30 of this Constitution to the period when a state of emergency is in force, of measures that are reasonably justifiable for the purposes of dealing with the situation that exists during that period.

32.

(1)   Where a person is restricted or detained by virtue of a law made pursuant to a declaration of a state of emergency, the following provisions shall apply

(a)   he shall as soon as practicable, and in any case not later than twenty-four hours after the commencement of the restriction or detention, be furnished with a statement in writing specifying in detail the grounds upon which he is restricted or detained and the statement shall be read or interpreted to the person restricted or detained;

(b)   the spouse, parent, child or other available next of kin of the person restricted or detained shall be informed of the detention or restriction within twenty-four hours after the commencement of the detention or restriction and be permitted access to the person at the earliest practicable opportunity, and in any case within twenty-four hours after the commencement of the restriction or detention;

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(c)   not more than ten days after the commencement of his restriction or detention, a notification shall be published in the Gazette and in the media stating that he had been restricted or detained and giving particulars of the provision of law under which his restriction or detention is authorized and the grounds of his restriction or detention;

(d)   not more than ten days after commencement of his restriction or detention, and after that, during his restriction or detention, at intervals of not more than three months, his case shall be reviewed by a tribunal composed of not less than three Justices of the Superior Court of Judicature appointed by the Chief Justice; except that the same tribunal shall not review more than once the case of a person restricted or detained;

(e)   he shall be afforded every possible facility to consult a lawyer of his choice who shall be permitted to make representations to the tribunal appointed for the review of the case of the restricted or detained person;

(f)   at the hearing of his case, he shall be permitted to appear in person or by a lawyer of his choice.

(2)   On a review by a tribunal of the case of a restricted or detained person, the tribunal may order the release of the person and the payment to him of adequate compensation or uphold the grounds of his restriction or detention; and the authority by which the restriction or detention was ordered shall act accordingly.

(3)   In every month in which there is a sitting of parliament, a Minister of State authorised by the President, shall make report to Parliament of the number of persons restricted or detained by virtue of such a law as is referred to in clause (10) of article 31 of this Constitution and the number of cases in which the authority that ordered the restriction or detention has acted in accordance with the decisions of the tribunal appointed under this article.

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(4)   Notwithstanding clause (3) of this article, the Minister referred to in that clause shall publish every month in the Gazette and in the media.

> (a) the number and the names and addresses of the persons restricted or detained;
>
> (b) the number of cases reviewed by the tribunal; and
>
> (c) the number of cases in which the authority which ordered the restriction or detention has acted in accordance with the decisions of the tribunal appointed under this article.

(5)   For the avoidance of doubt, it is hereby declared that at the end of an emergency declared under clause (1) of article 31 of this Constitution, a person in restriction or detention or in custody as a result of the declaration of the emergency shall be released immediately.

Protection of Rights by the Court

33.

(1)   Where a person alleges that a provision of this Constitution on the fundamental human rights and freedoms has been, or is being or is likely to be contravened in relation to him, then, without prejudice to any other action that is lawfully available, that person may apply to the High Court for redress.

(2)   The High Court may, under clause (1) of this article, issue such directions or orders or writs including rites or orders in the nature of herbs as corpus, certiorari, mandamus, prohibition, and quo warrant as it may consider appropriate for the purposes of enforcing or securing the enforcement of any of the provisions on the fundamental human rights and freedoms to the protection of which the person concerned is entitled.

(3)   A person aggrieved by a determination of the High Court may appeal to the Court of Appeal with the right of a further appeal to the Supreme Court.

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(4)   The Rules of Court Committee may make rules of court with respect to the practice and procedure of the Superior Courts for the purposes of this article.

The rights, duties, declarations and guarantees relating to the fundamental human rights and freedoms specifically mentioned in this Chapter shall not be regarded as excluding others not specifically mentioned which are considered to be inherent in a democracy and intended to secure the freedom and dignity of man.

APPENDIX E

GHANA LAW REPORT: BILSON V RAWLINGS AND ANOTHER

[1993-4] 2 GLR 413—428.

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High Court, Accra, 21 October, 1992.

ESSILFIE-BONDZIE J.

Nationality—Dual nationality—Onus of proof—Plaintiff alleging that first defendant unqualified to stand for or hold office as President because he held citizenships of Ghana and another country—Allegation denied by first defendant—Plaintiff failing to give particulars in pleadings of how first defendant acquired dual nationality—Whether onus of proof discharged—Whether plaintiff to succeed in his claim.

Nationality—Renunciation—Proof of —Plaintiff alleging that first defendant a non-citizen of Ghana because he held citizenships of Ghana and another country when he attained age of 21 years but failed to renounce citizenship of other country—First defendant formerly a member of Ghana Armed Forces and currently head of state and commander-in-chief of Ghana Armed Forces—First defendant expected to swear several oaths of allegiance to Ghana in capacities as member of Ghana Armed Forces and head of state—Whether court can infer in circumstances that first defendant did not owe allegiance to any foreign power.

Electoral provisions—Presidential elections—Candidates—Validity of nomination—Statutory declaration by nominated candidates under PNDCL 285—Acceptance of statutory declaration and contents thereof by the Interim National Electoral Commission (INEC)—Effect of—Whether court can subsequently question validity of contents of statutory declaration—Criminal Code, 1960 (Act 29), s 251—Interim National Electoral Commission Law, 1991 (PNDCL 271)—Presidential Elections Law, 1992 (PNDCL 285), s 3(2).

Constitutional law—President—Proceedings against—President granted immunity from personal suits under provisions of Constitution, 1979—Action by plaintiff against [p.414] first defendant, head of state, on ground that he was a non-citizen and therefore unqualified to stand for or hold office as President of Ghana—Status of first defendant as head of government, head of state and commander-in-chief of Ghana Armed Forces equivalent to President

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envisaged under Constitution, 1979—Validity of action by plaintiff—

Constitution, 1979, art 44(1), (9) and (10)—Provisional National Defence

Council (Establishment) Proclamation, 1981, s 9(1) (a).

Injuction—Interim injunction—Factors for consideration—Plaintiff failing to

establish strong prima facie case by pleadings—Facts showing greater

hardships and inconvenience to first defendant if application granted—

Whether plaintiff entitled to be granted injuction in circumstances.

HEADNOTES

It is provided under sections 1(a) and 2(a) respectively of the Presidential

Elections Law, 1992 (PNDCL 285) that:

"(1) A person is not qualified to be a candidate for the office of President of

Ghana unless—

(a) he is a citizen of Ghana by birth.

(2) A person is not qualified to be a candidate for the office of President of

Ghana if he—

(a) owes allegiance to a country other than Ghana.

It is also provided under section 8(1) and (2) of the Ghana Nationality Act,

1971 (Act 361) that:

"8. (1) Any person who, upon the attainment of the age of 21 years, is a

citizen of Ghana and also a citizen of some country other than Ghana shall,

subject to the provisions of subsection (7) of this section, cease to be a citizen

of Ghana upon the specified date unless— (a) he has renounced his

citizenship of that other country; and

(b) he has, in the case of a citizen of Ghana born outside Ghana, made and
registered with the Minister a declaration of his intention to reside in Ghana.

(2) Any person who—

(a) has attained the age of 21 years on the coming into force of the Constitution;
and

(b) becomes a citizen of Ghana on that day by virtue of the provisions of article
5 of the Constitution; and

(c) is on or after that day also a citizen of some country other than Ghana,

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shall, subject to the provisions of subsection (7) of this section cease to be a citizen of Ghana upon the specified date unless he has renounced his citizenship of that other country and taken the oath of allegiance."

In the wake of the 1992 presidential election R, the then chairman of the Provisional National Defence Council (PNDC), was nominated by the National Democratic Congress (NDC) as their presidential candidate. In compliance with section 1 of the Presidential Elections Law, 1992 (PNDCL 285), he filed with the [p.415] Interim National Electoral Commission (INEC) his nomination papers which included a statutory declaration to the effect that he was a citizen of Ghana by birth and did not owe allegiance to any foreign country. The statutory declaration was accepted by INEC. Whereupon the plaintiff instituted an action in the High Court, Accra against R and INEC claiming, inter alia, (a) a declaration that he was not a citizen of Ghana, and (b) an order of injuction against R and INEC restraining them from taking any further steps in connection with the nomination of R. Pending the final determination of the dispute, the plaintiff filed a motion for an interim injunction to restrain the defendants from processing the nomination. In his pleadings and affidavit in support of his case, the plaintiff contended that the first defendant was unfit and disqualified under PNDCL 285 from standing for or holding office as President of the Republic of Ghana because he had a dual nationality, namely citizenship of Ghana and a foreign country or the UK or both but had not renounced the latter when he attained 21 years of age. The plaintiff however failed to give particulars in his pleadings of how the first defendant acquired the dual nationality.

Held:

(1)   the law was that he who alleged had to prove the allegation. In the instant case, where the plaintiff alleged that the first defendant had dual nationality, namely citizenship of Ghana and a foreign country or the United Kingdom or both which he had not renounced upon the attainment of age 21 years, the law placed on him the burden of proof. Since the plaintiff failed to give particulars in his pleadings as to how the first defendant acquired his citizenship of the foreign country or the United Kingdom or both, his assertion the the first defendant held dual nationality was speculative and would be dismissed.

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(2)   Judicial notice was to be taken of the notorious fact that until September 1992, the first defendant was a member of the Ghana Armed Forces; and that as head of state he was the commander-in-chief of the Ghana Armed Forces. The first defendant had been a member of two governments of the Republic of Ghana and was the current head of state. It was therefore to be expected that in those capacities he had on several occasions sworn oath of allegiance to the Republic of Ghana. Accordingly, the irresistible inference was that the first defendant did not owe allegiance to any country other than Ghana.

(3)   The decision by INEC to accept the statutory declaration which the first defendant submitted to it when he was nominated for the presidential elections as the candidate of the NDC, in which he had declared that he was a citizen of Ghana and that he owed allegiance to no other country other than Ghana, had the force of a

judicial decision within the powers conferred on INEC by the Interim National Electoral Commission Law, 1991 (PNDCL 271) and the Presidential Elections Law, 1992 (PNDCL 285). Hence, the implication of the plaintiff's complains that the contents of the statutory declaration were false was that the first defendant had committed the criminal offence of deceit of a public officer [p.416] under section 251 of the Criminal Code, 1960 (Act 29); and in that case, the plaintiff could not in law prosecute the civil case until he had first prosecuted the first defendant for the criminal office. Moreover, so long as INEC had taken a decision and accepted the contents of the statutory declaration submitted to it by the first defendant as true, and the said decision had not been set aside, the court should not question its validity.

(4)   As the current head of government of the PNDC, the first defendant was also the head of state and commander-in-chief of the Ghana Armed Forces and consequently occupied a position which was analogous to that of the President contemplated by the Constitution, 1979. In the circumstances, the first defendant, so long as he remained in office, enjoyed immunity from civil or criminal suits against him personally by virtue of the provisions of article 44(10) of the Constitution, 1979 which stripped all courts of Ghana of any power to entertain any proceedings, civil or criminal, against the President as the head of government in his personal capacity while in office. Although the Provisional National Defence Council (Establishment) Proclamation, 1981 suspended the Constitution, 1979, it reserved and provided for the continuance of all courts in Ghana existing before 31 December 1981 together with the same powers, duties and functions which they enjoyed under the suspended Constitution, 1979 subject to the Proclamation or any other law. Hence, the

court had no power to entertain the instant civil proceedings against the first defendant in his personal capacity.

(5)   The guiding principle for the grant of an application for interim injunction was whether the applicant had established a strong prima facie case by his pleadings or affidavit. Accordingly, in the instant case, since the plaintiff had failed by his pleadings to raise a strong prima facie case that the first defendant owed allegiance to a country other than Ghana, the court would refuse the application for interim injunction. Moreover, since on the facts, greater hardship wold be caused to the first defendant if he was prevented from contesting the presidential election, it was the duty of the court to refuse the interim injunction. Dictum of Sarkodee-Adoo J (as he then was) in Punjabi Bros v Namih (1958) 3 WALR 381 applied.

CASES REFERRED TO

Punjabi Bros v Namih (1958) 3 WALR 381.

NATURE OF PROCEEDINGS

AN APPLICATION for interim injunction to restrain the first defendant, the Chairman of the Provisional National Defence Council, from contesting the presidential elections of 1992. The facts are sufficiently stated in the judgment.

COUNSEL

Obeng-Manu for the plaintiff-applicant

Joe Reindorf for the first defendant-respondent.

[p.417]

Martin Amidu, Deputy Attorney-General (with him Avah, Principal State Attorney and Afrifa Gyasi, Principal State Attorney) for the second defendant-respondent.

JUDGMENT OF ESSILFIE-BONDZIE J.

This is an application made on behalf of the plaintiff for an order of interim injunction:

"(1) To restrain the first defendant-respondent herein from holding himself out and/or campaigning on any platform or at any public forum as presidential candidate of the National Democratic Congress (NDC) in any part of Ghana pending the hearing and final determination of the suit.

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(2) To restrain the second defendant-respondent from including the name and particulars of the first defendant-respondent in the performance of its functions in relation to the conduct and supervision of the 3 November 1992 presidential election."

On 12 October 1992 the plaintiff sued the defendants, as indorsed on the amended writ of summons and amended statement of claim, for the following reliefs:

"(i) A declaration that the first defendant, Jerry John Rawlings, is a person unfit and disqualified from standing for or holding the office of President of the Republic of Ghana.

(ii)   A declaration that the second defendant, the Interim National Electoral Commission (INEC), grievously erred in accepting the candidature of the first defendant as President of the Republic of Ghana for the 3 November 1992 presidential election, thus disabling it of conducting a free and fair presidential election.

(iii)   A declaration that the wrongful and improper acceptance of the presidential candidacy of the first defendant by the second defendant contravened the Directive Principles of State Policy set out in section 1(1) (a) and 1(1) (b) of the Provisional National Defence Council (Establishment) Proclamation (Supplementary and Consequential Provisions) Law, 1982 (PNDCL 42) by facilitating, encouraging or otherwise assisting the first defendant to obtain unfair advantage and unequal opportunity over and above other presidential contestants.

(iv)   An order of this honourable court striking out the name of the first defendant from the list of persons contesting for the high office of President in the 3 November 1992 presidential election.

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(v)   An order restraining the first defendant from holding himself out or campaigning on any platform or at any public forum whatsoever as presidential candidate for the 3 November 1992 presidential election.

(vi)   An order restraining the second defendant from any further conduct and supervision of the 3 November 1992 presidential election until the name and particulars of the first defendant have been struck out from the list of contestants for the high office of President of the Republic of Ghana.

(vii)   Any other relief or reliefs incidental to or in connection with the aforesaid that in equity the justice of the case would allow this honourable court to."

On 21 October 1992, Mr Obeng-Manu, counsel for the plaintiff, raised a preliminary objection to the representation of the second defendant, the Interim National Electoral Commission (INEC), in this case by the Attorney-General, his deputy and staff. The court heard arguments from both sides on the said preliminary issue and on 22 October 1992 in a written ruling the said objection was overruled. The court held that INEC is a public office and therefore its members and employees are servants of the Republic. In the circumstances, the court ruled that when the commission or its employees are sued for offences allegedly committed by them in the performance of their official duties, the Attorney-General and his staff are obliged not only to defend them but also to offer them the necessary advice.

After the said written ruling, Mr. Obeng-Manu, learned counsel for the plaintiff, was called upon to argue the motion for interim injunction against the first defendant only, since a motion filed on behalf of the second defendant to set aside the writ of summons against the second defendant had not been heard.

The plaintiff filed two affidavits, one being supplementary to the other, in support of his application for interim injunction. After he had recited the facts contained in the said affidavits, counsel submitted that one of the plaintiff's main grounds for seeking the interim injunction against the first defendant is that the latter is a noncitizen of Ghana and therefore disqualified under the Presidential Elections Law, 1992 (PNDCL 285). Learned counsel referred the court to the statutory declaration, exhibit "1A 1", sworn to by the first defendant and submitted to INEC upon the former's nomination for the presidential election. In the said statutory declaration required by section 3(2) of PNDCL 285, the first defendant declared that he is a citizen by birth and does not owe allegiance to any country other than Ghana. In his argument, counsel for the plaintiff [p.419] asserted that the contents of the statutory declaration sworn to by the first defendant were false because he is a

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nonGhanaian and also owes allegiance to a foreign country. For this assertion learned counsel for the plaintiff relied mainly on sections 1 and 8 of the Ghana Nationality Act, 1971 (Act 361).

Section (1) of Act 361 provides:

"1.(1) A person born before the 6th day of March, 1957, is a

citizen of Ghana by birth if— (a) he was born in Ghana and one

at least of his parents or grandparents was born in Ghana; or

(b) he was born outside Ghana and either of his parents was born in Ghana. Section 8(1) and (2) of Act 361 also provide:

""8.(1) Any person who, upon the attainment of the age of 21 years, is a citizen of Ghana and also a citizen of some country other than Ghana shall, subject to the provisions of subsection (7) of this section, cease to be a citizen of Ghana upon the specified date unless— (a) he has renounced his citizenship of that other country; and

(b) he has, in the case of a citizen of Ghana born outside Ghana, made and

registered with the Minister a declaration of his intention to reside in Ghana.

(2) Any person who—

(a) has attained the age of 21 years on the coming into force of the Constitution; and

(b) becomes a citizen of Ghana on that day by virtue of the provisions of article 5 of the Constitution; and

(c) is on or after that day also a citizen of some country other than Ghana,

shall, subject to the provisions of subsection (7) of this section cease to be a

citizen of Ghana upon the specified date un less he has renounced his

citizenship of that other country and taken the oath of allegiance." In

paragraph (4) of his amended statement of claim the plaintiff pleaded as

follows:

"(4) The plaintiff says that the first defendant had at the age of 21 years dual

nationality. He then owed allegiance to the Republic [p.420] of Ghana and

also to a foreign country and/or the United Kingdom. He has not renounced

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his citizenship since attaining the age of 21 and he thus still owes allegiance to the foreign country and/or the British crown. In the circumstances by the laws of Ghana he ceased to be a Ghanaian citizen after attaining the age of 21 years."

Learned counsel for the plaintiff submitted that since on attaining the age of 21, the first defendant did not renounce his foreign citizenship he cannot be a citizen of Ghana. And until he satisfies the court that he has renounced his foreign citizenship and therefore he is a Ghanaian by birth, he should be restrained from offering himself as a presidential candidate. He argued that as the first defendant owes allegiance to a foreign country, his declaration in the statutory declaration submitted to the effect that he did not owe allegiance to a foreign country was false.

Mr. Joe Reindorf, learned counsel for the first defendant, reacting to the assertion of the counsel for the plaintiff, submitted that the plaintiff's pleadings, particularly paragraph (4) of the amended statement of claim, does not contain any particulars which if considered, the court can say that the first defendant is a nonGhanaian. According to him, the plaintiff has failed to give particulars as to how the first defendant acquired the dual nationality. He argued that if the plaintiff was claiming that the first defendant owes allegiance to some other foreign country, the said country must be identified. He added that the plaintiff should be able to show by his pleadings, not by evidence, how the first defendant acquired his Ghanaian citizenship and which kind of Ghanaian citizenship. Learned counsel argued that whether or not the first defendant had a United Kingdom citizenship is to be determined by the law of the United Kingdom and not by Ghanaian law. In other words, the plaintiff's pleadings should show that under a particular law of the United Kingdom, the first defendant is a citizen of the United Kingdom either by registration, by descent or by birth. He submitted that since the plaintiff's pleadings lack the particulars mentioned, the pleadings are vague and should be dismissed for lack of particularity.

Counsel further maintained that the averment that the first defendant owes allegiance to "a foreign country and/or the United Kingdom" without specifying the foreign country involved is also vague and vexatious and should be struck out. He said that there is an onus of strict proof on the plaintiff and as his pleadings indicate that he has not got the intention and means of discharging the said onus, it is very unlikely that the plaintiff will [p.421] establish a prima facie case for the declaration sought by him.

In the plea that the first defendant should be restrained from holding himself up as a presidential candidate, learned counsel for the plaintiff also referred to paragraph (5) of the plaintiff's amended statement of claim and submitted that since criminal charges against the first defendant are still pending before a military courtmartial and since the charges have not been disposed of, he should not be made to stand for the presidential election. Counsel contended that the first defendant has so many question marks hanging on him and unless these question marks are cleared, he should be restrained from standing for the presidential election. He maintained that the first defendant's present campaign for the presidential election is unfair and offends against the Directive Principles of State Policy. Again, he contended that the first defendant is disqualified under PNDCL 285 because as chairman of the PNDC he holds an office which has connection with the conduct of the election.

Mr. Joe Reindorf responded to the above submissions of counsel for the plaintiff by arguing that the issue whether or not a person is qualified or disqualified from standing election can be decided solely by reference to PNDCL 285 and that the pleadings of the plaintiff does not disclose that the first defendant is disqualified from standing election under PNDCL 285. Counsel further refers to PNDCL 285 and submits that the plaintiff has not been able to establish by his pleadings that the first defendant has been convicted of any criminal offence. That the plaintiff's claim that there are charges pending against the first defendant does not disqualify him from contesting the election under PNDCL 285.

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Mr Joe Reindorf also submitted that as head of state the first defendant could have asked the court to dismiss the plaintiff's claim in limine because the first defendant is personally immune from any civil proceedings in any court. Counsel referred to article 4(1) of the suspended Constitution, 1979 which exempted the President from civil or criminal proceedings in any court. By article 4(10) of the Constitution, 1979 the President shall not personally be liable to any civil or criminal proceedings in any court. Learned counsel deposed that the first defendant did not rely solely on his rights under article 4 of the Constitution, 1979 because he intended the matter before the court to be fought also on its merits.

Under Order 50, r 7 of the High Court (Civil Procedure) Rules, 1954 (LN 140A) the court may grant an injunction in all cases where upon the facts before it, it is just and convenient to do so. In granting the interim injunction the following factors are considered: (a) hardship that would be caused if the application is granted or refused; and (b) the applicant must be able to show on his pleadings a strong prima facie case in support [p.422] of his claim and must make out a probability of the respondent's case failing.

In the case of Punjabi Bros v Namih (1958) 3 WALR 381 at 383—384 Sarkodee-Adoo J (as he then was) stated that:

"The court must, before disturbing a respondent's legal right, or stripping him of any of the rights with which the law has clothed him, be satisfied that the probability is in favour of his case ultimately failing in the final issue of the substantive suit. . ."

An interim injunction being an equitable relief, will however not be granted if it will cause unnecessary hardship to the respondent.

It is evident from the affidavits filed by the plaintiff that the main ground for seeking the order of the court to restrain the first defendant from holding himself out and/or campaigning as a presidential candidate for the National Democratic Congress (NDC) in any part of Ghana pending the final determination of the suit filed against him (the first defendant) is that he is a

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non-Ghanaian. In paragraph (14)(iii) of the plaintiff's affidavit he alleged as follows:

"The first defendant-respondent being a person of a doubtful parentage (his father is unknown and his known mother's nationality is questionable) cannot be said (without strict proof, the onus of which is on him) to be a Ghanaian by any definition and this factor straightway disqualifies him and renders him unfit for consideration as President of Ghana."

The affidavit quoted above reveals that although the plaintiff has alleged that the first defendant is a nonGhanaian, he has not given facts in the pleadings to support the allegation. It appears from the affidavit that at the trial he intends to rely on the first defendant to prove his nationality although the latter has not admitted that he is a non-Ghanaian. I must point out that the law has always been that he who alleges that certain state of facts exist, must prove it. In this case, the plaintiff being the one who has in the suit before the court averred that the first defendant is a non-Ghanaian, the law places on him the burden of proof. And if he failed to discharge the onus on him, he cannot rely on any weakness in the first defendant's case.

It is significant to note that although in paragraph (4)(iii) of his original affidavit he appeared ignorant of the nationality of the first defendant, in paragraph (7) of his supplementary affidavit, the plaintiff claimed that at the age of 21 the first defendant had dual nationality and therefore owed allegiance to the Republic of Ghana and to another foreign power.
[p.423]
Paragraph (7) of the plaintiff's supplementary affidavit reads:

"(7) That the first defendant had at the age of 21 years dual nationality and owed allegiance to the Republic of Ghana and another foreign country or the United Kingdom or both. He has never renounced his citizenship of the said foreign country or the United Kingdom or both, he therefore owed and still owes allegiance to either that foreign country or the British Crown or both and thus ceased to be a Ghanaian citizen."

It is noticeable from the said affidavit that the plaintiff again failed to provide particulars that would, if established by evidence, prove the truth of the allegations made. This means that the plaintiff has made the averments that the first defendant is a citizen of Ghana and a citizen of the United Kingdom without stating how these citizenships were acquired. It is well-known that citizenship is acquired by birth, by registration and by descent and yet the plaintiff could not say by his pleadings how the first defendant acquired his United Kingdom citizenship. I share the view of learned counsel for the first defendant that the plaintiff ought to have been able to plead the particular law of the Untied Kingdom on which he intends to rely to prove that the first defendant is a citizen of the United Kingdom.

In his submission before this court, Mr Obeng-Manu, counsel for the plaintiff, admitted that the first defendant was before the Constitution, 1957 a Ghanaian by birth but since on the attainment of the age of 21 he failed to renounce his United Kingdom citizenship in accordance with the provisions of section 3(1) (a) of Act 361 he ceased to ba Ghanaian.

As indicated above, the plaintiff has failed to provide in his pleadings particulars from which this court can infer that the first defendant is also a citizen of the United Kingdom. In the present condition of the plaintiff's pleadings therefore, I hold that the plaintiff's assertion that the first defendant held dual nationality at the age of 21 is purely speculative.

I take a judicial notice of the fact that until September 1992 the first defendant was a member of the Ghana Armed Forces. Also as head of state he is the commander-in-chief of the Ghana Armed Forces. He had been a member of two governments of the Republic of Ghana. Currently, he is the head of state of Ghana. It is therefore to be expected that in these capacities he had on several occasions sworn allegiance to the Republic of Ghana. So that even if on attaining the age of 21 then he had dual citizenship (which is not admitted) the irresistible inference which this court draws from the oaths of allegiance he took on these several occasions, is that the first defendant does not owe allegiance to any foreign [p.424] government. This must be so especially as

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he is still the head of state and a member of the Government of the Republic of Ghana.

Learned counsel for the plaintiff has argued in his submission that if he had renounced his citizenship of the Untied Kingdom the first defendant would have produced a certificate from the United Kingdom Government to that effect. According to him, that certificate or document would be the only evidence to show that the first defendant has renounced his foreign citizenship. I must say that although there is a legal maxim that ignorance of the law is no excuse, it must be noted that there are very few Ghanaians who on attaining the age of 21 years get to know the ramifications of the laws of Ghana. So that at the age of 21years, even if he knew that he had dual nationality, the first defendant should not be expected to have the awareness that unless he went to the office of he British High Commission, Accra to obtain a certificate of renunciation he would cease to be a citizen of Ghana. It is my view that his conduct in enlisting in the Ghana Armed Forces and taking the oath of allegiance to the Government of Ghana should be construed as a clear evidence of renunciation of any other allegiance he might owe to a foreign country.

Again, in the statutory declaration (exhibit 1A 1) which the first defendant submitted to INEC when he was nominated for the presidential elections, the first defendant declared on oath: "(a) that he is a citizen of Ghana by birth; and (b) he does not owe allegiance to any country other than Ghana." This was obviously in compliance with section 3(2) of PNDCL 285. There is no dispute that the statutory declaration was accepted by INEC. This decision of INEC to accept the statutory declaration and its sworn contents, in my view, has the force of a judicial decision within the powers conferred on INEC by the Interim National Electoral Commission Law, 1991 (PNDCL 271) and PNDCL 285. If therefore the plaintiff complains that the declarations in exhibit 1A 1 are false, then the implication is that the first defendant has committed the offence of deceit of a public officer under section 251 of the Criminal Code, 1960 (Act 29). And the law is that where a plaintiff in a civil

case had a criminal remedy for the same offence he could not prosecute his civil action until the defendant has been prosecuted, convicted and sentenced. This means that the plaintiff cannot prosecute the civil case before this court until he had prosecuted the first defendant for the criminal offence of deceit of public officer. It is to be observed, however, that so long as INEC has taken a decision and accepted the contents of exhibit 1A 1 as true and the said decision has not been set aside, this court should not question its validity.

As has been mentioned above Mr. Obeng-Manu, counsel for the [p.425] plaintiff, further attacked the qualification of the first defendant to stand as a presidential candidate on the ground that there are criminal charges pending against him before a military court martial and since the charges have not been disposed of he should not be made to stand for the presidential election. I must remark here that whether or not a candidate is disqualified from standing for the presidential election is a question of law. PNDCL 285 makes provision for persons who are disqualified from standing for the presidential election. In section 1(2)(c) of PNDCL 285 only persons convicted of one or more of various offences and not a person who at one time or the other has been charged with any such offence who are disqualified. Now, as the plaintiff is merely complaining of criminal charges pending against the first defendant before a military court martial, his claim that the former should be disqualified from standing for the presidential election is misconceived.

The plaintiff has also made other charges which I do not consider to be relevant as far as the qualification and disqualification of the first defendant to stand for the presidential election are concerned. One of these charges is that the first defendant holds an office the functions of which involve a responsibility for or in connection with the conduct of the election by virtue of his chairmanship of the PNDC. It is clear from the provisions of PNDCL 271 that INEC is the body solely charged with the conduct of the elections. It is my view that by appointing persons on to the commission and passing a law as to when the election should be held, the first defendant cannot be held to be conducting the elections. Sections 3 and 4 of PNDCL 271 clearly show that

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INEC is the sole body charged with the conduct of the parliamentary and presidential elections. Sections 4 of PNDCL 271 provides that: "In the performance of its functions, the Commission shall not be subject to the direction or control of any person or authority." This provision explicitly gives INEC complete independence from government interference in its duties. Indeed, it is to be assumed that by accepting the first defendant's statutory declaration (exhibit 1A 1) and his presidential nomination papers, INEC has demonstrated that the first defendant is qualified to exercise his legal right as a Ghanaian citizen to stand for the presidential election. Before concluding my ruling, I will deal with the question whether or not the first defendant as chairman of the PNDC is immune from civil or criminal proceedings before this court. This matter was raised for the first defendant. Article 44(1) of the suspended Constitution, 1979 of the Republic of Ghana provides: "44.(1) There shall be a President of the Republic of Ghana who shall be the Head of State and Head of Government and Commander-in-Chief of the Armed Forces of Ghana."

[p.426]

(The emphasis is mine.) Currently the first defendant is the chairman of the PNDC which is the present Government of Ghana. It is my view that he is the head of state as well as the head of the PNDC Government. Although he resigned from the Ghana Armed Forces, he is the commander-in-chief of the Ghana Armed

Forces. It is my judgment that although the position of the first defendant is designated as chairman of the PNDC, that position held by him is analogous with that of the President of Ghana. The position of the President contemplated by article 44 of the Constitution, 1979 is the same as that of the first defendant.

By article 44(9) it is provided that:

"(9) Without prejudice to the provisions of article 2 of this Constitution, and subject to the operation of the prerogative writs, the President shall not, while in office, be liable to proceedings in any Court for the performance of his

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functions, or for any act done or omitted to be done, or purported to have been done or purporting to be done, in the performance of his functions. . ."

Article 44(10) of the Constitution, 1979 also provides: "Subject to the provisions of clause (9) of this article, the President shall not, while in office, be personally liable to any civil or criminal proceedings whatsoever in any Court."

It is clear from article 44(10) of the Constitution, 1979 which was suspended by the Provisional National Defence Council (Establishment) Proclamation, 1981 that all the courts of Ghana were stripped of any power to entertain any proceedings, civil or cirminal, against the President or the head of government in his personal capacity whilst he is in office. Section 9(1)(a) of the Provisional National Defence Council (Establishment) Proclamation, 1981 however made the following provisions:

"9.(1) Notwithstanding the suspension of the 1979 Constitution and until provision is otherwise made by law—

(a) all courts in existence immediately before the 31st day of December, 1981, shall continue in existence with the same powers, duties and functions under the existing law subject to this Proclamation and Laws issued thereunder."

It is significant to note that from the above provisions of the Provisional National Defence Council (Establishment) Proclamation, 1981 that although the Proclamation suspended the Constitution, 1979, it reserved and provided for the continuance of all the courts in Ghana [p.427] existing before 31 December 1981 together with the same powers, duties and functions which they enjoyed under the suspended Constitution, 1979 subject to the Proclamation and Laws issued thereunder.

In my view, therefore, since the courts existing under the Constitution, 1979 were debarred from entertaining civil and criminal proceedings against the head of the Government of Ghana in his personal capacity, this court has no power to entertain the instant civil proceedings against the first defendant, he being the head of the PNDC Government, in his personal capacity so long as

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he remains in office. I hold therefore that the first defendant as the head of the PNDC Government is immune from civil proceedings in this court.

I have already alluded to the fact that nomination papers of the first defendant as a candidate in the forthcoming presidential elections and the statutory declaration required by law under section 3(2) of PNDCL 285 in which he declared before a magistrate that he is a citizen of Ghana and that he owes allegiance to no country other than Ghana has been accepted by INEC. As already indicated, the acceptance of the statutory declaration by INEC without objection amounts to a judicial decision which this court must consider valid until it is set aside. Besides, in paragraph (5) of the first defendant's statement of defence filed on 23 October 1992 he pleaded as follows:

"(5) The first defendant is a citizen of Ghana by birth, born in Accra in 1947 of a mother who was born in Keta in 1919. The first defendant was therefore at birth a British subject who in January 1949 became a citizen of the United Kingdom and Colonies by operation of the British Nationality Act, 1948 (11 & 12 Geo 11, c 56) (of the British imperial legislature), in particular section 4 thereof, and in May 1957 became a citizen of Ghana by birth operation of Act No 1 of the Ghanaian legislature, the Ghana Nationality and Citizenship Act, 1957, in particular section 4 thereof."

I want to reiterate that the court can grant an interim injunction to restrain the first defendant from standing for the forthcoming presidential election where upon the facts before me, it is found just and convenient to do so. The question is, of the two parties in the case who would suffer irreparable loss if the injunction is granted rather than refused. As already indicated, before stripping or depriving the first defendant of the legal right with which the law has clothed him, I must be satisfied that the probability is in favour of his claim ultimately failing in the final issues of the substantive trial. And though it is not for the court at this stage to [p.428] decide the merits of the case, it is a factor that in granting the plaintiff's application for the interim injunction against the first defendant, the plaintiff must be able to show on his pleadings a strong prima facie case in support of the reliefs listed in his amended

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statement of claim. I must say that in the light of the matters I have canvassed above, it is safe to say that the plaintiff has failed to show a prima facie case in support of his claim. I think it will be unjust to deprive the first defendant of his lawful right to present himself as a candidate for the presidency upon the suspicious allegations appearing in the plaintiff's pleadings which failed to show that this court is likely to hold him, upon the substantive trial, in any way disqualified in law from exercising that right.

Although the plaintiff has contended in his affidavit that irreparable loss and damage will be occasioned to him and to the public interest at large if the application for interim injunction is not granted, he failed to demonstrate in his pleadings the nature of the said loss and damage. It is however obvious that if the application is granted, the first defendant would not be able to stand for the election on 3 November 1992. In such circumstances, I share the view of learned counsel for the first defendant that no amount of compensation would be adequate to satisfy him if the first defendant later won the substantive suit. On the other hand, if the first defendant later won the substantive suit. On the other hand, if the application is refused, the first defendant can stand for the election and if he won, the plaintiff could take out an election petition, if he is so advised, at the Supreme Court to challenge his election. On the balance of convenience and hardship therefore, I am of the opinion that the application should be refused. I hereby dismiss the plaintiff's motion for interim injunction against the first defendant.

DECISION

Application refused.

P K T

APPENDIX F

GLADDYS MENSAH V STEPHEN MENSAH

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IN THE SUPERIOR COURT OF JUDICATURE
IN THE SUPREME COURT
ACCRA, A.D.2012

**Civil Appeal
No. J4/20/2011**

22ND February, 2012

CORAM: AKUFFO (MS) JSC (PRESIDING)

DATE-BAH JSC

ADINYIRA (MRS) JSC

DOTSE JSC

AKOTO-BAMFO (MRS) JSC

**GLADYS MENSAH   -
      PETITIONER/RESPONDENT/**

RESPONDENT VRS

**STEPHEN MENSAH   -
      RESPONDENT/APPELLANT
      /APPELLANT**

JUDGMENT

JONES DOTSE JSC

Lord Denning in his book, "Landmarks in the Law" Butterworths,

1954, writes at page 176 "on change in attitude of the British

people to Divorce" as follows:

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> "There is no longer any binding knot for marriage. There is only a loose piece of string which the parties can untie at will. Divorce is not a stigma. It has become respectable. One parent families abound."

The above quotation can equally be said to be applicable to the Ghanaian society as well.

In the instant case since the parties are not contesting the issue of divorce, but only devolution of property acquired during the subsistence of the marriage upon divorce, we will focus our attention to those issues.

What then are the facts in this case? In view of the importance that this court attaches to the legal and constitutional issues determinable in this case, we have considered it worthwhile to narrate in great detail, not only the facts of the case, but the reasons behind the trial court decision as well as the dismissal of the appeal by the Court of Appeal.

This will necessarily lead to a discussion of the principles upon which concurrent findings of fact by a trial and first appellate court can be set aside or departed from by this court, i.e. second appellate court, as we have indeed being requested to do.

FACTS

This is an appeal from the judgment of the Court of Appeal dated 23/7/2009 which affirmed the judgment of the High Court dated the 31st January 2003. In a petition filed on the 20th of April 2000, the Petitioner/Respondent/Respondent (hereinafter Petitioner) averred that she and the Respondent/Appellant/Appellant (hereinafter Respondent) were married under customary law in March of 1989 and converted to a marriage under the Ordinance in June of 1989. It however emerged from the evidence that the parities got married in 1987. About a decade after the celebration of this union, cracks started appearing in the marriage with the Petitioner accusing the Respondent of acts of infidelity which culminated in the Respondent moving into their jointly acquired

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home in Adenta with his illicit lover giving credence to the Petitioner's allegations. After diligent efforts at reconciliation had failed, the Petitioner filed her petition for divorce at the High Court.

That the parties also acquired substantial assets during the subsistence of the marriage cannot be under emphasised. These the Petitioner listed in her petition as follows;

1. Unnumbered three bedroom house at Kasoa

2. Unnumbered six bedroom house at Adenta

3. Unnumbered four bedroom house at Krobo Odumasi

4. Unnumbered three bedroom house on Spintex Road

5. Vacant plots of land at Adenta

6. One and half vacant plot of land at Krobo Odumasi

7. Shares in Guidem Company Ltd.

8. Shares in shop on the Airport El-Wak Road

9. Nissan Patrol GT 618 E

10. Nissan Sunny GT 1073 D

11. Pick-Up GT 3240 P

12. Opel GT 9414 Q

13. 20 feet Container

14. SSB Tudu Branch Current Account No. 120769006.

The Petitioner therefore prayed for a dissolution of the marriage and for the assets jointly acquired to be shared equally. It is the distribution of these assets, which the trial Court found to have been jointly acquired that has led to the present appeal.

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EVALUATION OF EVIDENCE AND DECISION OF TRIAL COURT

Before coming to that conclusion, the trial judge painstakingly set out the evidence she had received and after reviewing the evidence determined that the issue to be resolved was whether or not the petitioner is a joint owner of the property and is therefore entitled to her claim of 50% share in them.

The evidence was that before the Petitioner married the Respondent, she used to trade in rice, sugar and groundnuts at the Odumase Krobo Market. After marriage she moved to Accra with the Respondent, then a junior accounts officer at the Controller and Accountant General's Department.

They both did not own any properties and lived in rented premises at La. At the weekends, they would go to Krobo to farm and plant cassava. After processing the harvested cassava into gari, the petitioner realised 600,000 cedis which she used as capital for trading. She traded in palm oil and travelled to various towns and villages to buy palm oil. Aside from this, she also traded in cooking oil, rice and sugar from their house at La. Respondent also sold some of these items to his co-workers in the office. She also at a point in time took some money from her father to reinvest in their business. Gradually, they built up their business and from the proceeds, bought their first landed property at Kasoa, on which they put up a three bedroom house. As the business expanded, they acquired a shop at the Ministries and petitioner managed the shop whilst the Respondent continued working at the Controller and Account-General's Department. As the business continued to boom, the parties diversified to other products, including electrical appliances like fridges, TV, deep freezers etc. They also sold cloth, vegetable oil and bicycles. The Respondent arranged for these items from their suppliers on credit.

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They also got their customers from the Respondent's co-workers, mostly on credit basis. This was deducted at source from their salaries. **All cash which was realised from sales was recorded into a book by the sales assistants, which the petitioner took home to the Respondent. He would check the cash and if it tallies with the amount in the book, he would sign against it. It was the Respondent who handled the accounts of the business. He also paid himself 500,000 cedis and paid the petitioner nothing**.

Both the Petitioner and the Respondent were members of a susu group and Petitioner bought her personal items with the returns from the susu contribution. They also invested in Pyram and made healthy profits from there which they ploughed back into their business.

At the peak of their business, they were making between 150 million and 300 million a month. The Petitioner therefore advised the Respondent to acquire landed properties as an investment. The Respondent agreed and allowed the Petitioner to keep a third of all cash deposits towards this acquisition.

The Petitioner it seems was very astute and acquired the Adenta and Krobo Odumase properties on which she built houses. They also acquired a number of vehicles and the first vehicle, a pick-up was bought with part of her susu contributions and part of the business proceeds. Subsequent vehicles and properties were acquired from the proceeds of the business they run together.

The Respondent however denied that the Petitioner made any contribution to the business. According to him the Petitioner was a housewife and never worked to make a living. She had also embezzled money from him which resulted in the loss of his capital and he was compelled to go for a bank loan to recapitalise his business.

The Petitioner called no witnesses in support of her case but the Respondent called five witnesses. The trial judge however found the evidence of the petitioner more convincing than that of the Respondent and the reason she alluded to for so finding were that even **though the Respondent had maintained throughout**

the trial that the Petitioner never worked during the decade the marriage lasted, his own witnesses contradicted him. The judge also made the finding that the Respondent's own evidence supported the fact that the Petitioner supervised the running of the shop and also worked in the shop. The judge further made the finding that the Respondents 4th and 5th witnesses were "serious liars" bent on throwing dust into the court's eyes. Besides, when the Respondent claimed that he took a loan to recapitalise the business after the Petitioner had drained off all the monies, the judge made the finding that the loan was applied for long after the petition had been filed. Further, the Respondent claimed he had acquired the Spintex property with the bank loan. Again the judge found that the property had been acquired long before the loan was contracted and concluded that the property was acquired with proceeds from the business. The judge further found that the Respondent had not been entirely honest when he stated that he did not sign Exhibit C2 which was the document on the Krobo Property.

He had indeed appended his signature on the document and this led the trial judge to conclude that the parties intended the property to be joint property.

Based on the above facts and findings, the learned trial Judge delivered judgment in favor of the Petitioner. Aggrieved by the decision of the trial High Court, the Respondent filed an appeal to the Court of Appeal. As was to be expected, the Court of Appeal in a unanimous decision dismissed the Respondent's appeal.

It is against this Court of Appeal decision that the Respondent has appealed to this court based on the following grounds of appeal.

GROUNDS OF APPEAL

The Respondent's grounds of Appeal are stated as follows:

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a. The Court of Appeal failed to consider adequately the evidence of the Respondent and placed unnecessary weight on the evidence of the Petitioner.

b. Exhibits 7 and 7A having been admitted, the court erred in assessing the amount to be paid to the Petitioner as her share of the profits.

c. Since the Respondent's company was a limited liability company and thus a legal entity, the court erred in ordering payment out of its profits without regard to the interests of the other shareholders of the company.

ISSUES FOR DETERMINATION

We have perused the statement of case of the parties. From the arguments contained in the Statements of case by the parties, the following issue stands out as the main issue for determination, although there are some other ancillary issues. This is:

i. Whether the equality principle used by the trial and appellate courts in the distribution of the marital property acquired during the marriage following the dissolution of the marriage between the parties is sustainable under the current state of the laws in Ghana based on the available evidence on record.

In determining this issue, matters as to whether the trial and appellate court correctly evaluated the evidence of the Petitioner by applying to it the proper rules of the Evidence Act, 1975 NRCD 323 and whether the courts below correctly awarded the lump sum payments out of accounts of a limited liability company on statement of accounts that are not as healthy as the Petitioner made the court to believe, reference exhibits 7 and 7a are consistent with the evidence on record.

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CONSTITUTIONAL PROVISIONS OF SHARING MARITAL PROPERTIES ON DIVORCE

In view of the effect some provisions of the Constitution 1992 will have on this case, we deem it expedient to set out these provisions in extenso.

1.   **Article 22 (2)**

(2)   "Parliament shall, as soon as practicable after the coming into force of this Constitution, enact legislation regulating the property rights of spouses." and

(3)   "With a view to achieving the full realization of the rights referred to in clause (2) of this article

(a)   **Spouses shall have equal access to property jointly acquired during marriage.**

(b)   **Assets which are jointly acquired during marriage shall be distributed equitably between the spouses upon dissolution of the marriage."**

2.   **Article 33(5)**

"The rights, duties, declarations and guarantees relating to the fundamental human rights and freedoms specifically mentioned in this Chapter shall not be regarded as excluding others not specifically mentioned which are considered to be inherent in a democracy and intended to secure the freedom and dignity of man."

From the above provisions of the Constitution, it means that, the framers of the Constitution mandated the Parliament to enact relevant legislation to regulate the property rights of spouses. It is a sad reflection that since 7th January 1993 when this 4th Republican Constitution came into force, the above directive has as yet not been complied with.

Suffice it to be that, there is now before Parliament, a Bill in fulfillment of this article 22 (2) of the Constitution.

It is also important to note that article 22 (3) (a) & (b) give an inkling of what the said legislation should contain. **For instance it is quite clear from these provisions that the principle of having equal access to property acquired during marriage and that of equitable distribution of property upon dissolution of the marriage have been espoused.**

In view of the pride of place that our Constitution has in the sources of law in Ghana, reference article 11 (1) of the Constitution 1992, such fundamental philosophical principles which underpin distribution of marital property acquired during the subsistence of a marriage upon its dissolution should not be glossed over. This constitutional principle is similar to the emerging principle of "Jurisprudence of Equality" which is now applicable in issues concerning gender affairs. We will revert to this principle of Jurisprudence of Equality later.

Furthermore, the provisions spelt out in article 33 (5) re-enforce the guarantee and protection of all the fundamental human rights contained in chapter 5 of the Constitution 1992 including the property rights of women, economic rights, cultural rights and practices and general fundamental freedoms and others.

There is this proviso also in article 33 (5) which enjoins the courts in Ghana to look at other rights not specifically mentioned but which are considered to be part and parcel of an emerging democratic state intended to secure the freedom and dignity of man, and this includes the opposite, woman.

APPLICABLE GUIDELINES ON SHARING MARITAL PROPERTIES

This judgment will accordingly be discussed in line with these and other international laws and conventions which give or are

designed to bring honour and dignity to spouses in cases of dissolution of the marriage.

Why did the framers of the Constitution envisage a situation where spouses shall have equal access to property jointly acquired during marriage and also the principle of equitable distribution of assets acquired during marriage upon the dissolution of the marriage?

We believe that, common sense, and principles of general fundamental human rights requires that a person who is married to another, **and performs various household chores for the other partner like keeping the home, washing and keeping the laundry generally clean, cooking and taking care of the partner's catering needs as well as those of visitors, raising up of the children in a congenial atmosphere and generally supervising the home such that the other partner, has a free hand to engage in economic activities must not be discriminated against in the distribution of properties acquired during the marriage when the marriage is dissolved.** This is so because, it can safely be argued that, the acquisition of the properties were facilitated by the massive assistance that the other spouse derived from the other.

In such circumstances, it will not only be inequitable, but also unconstitutional as we have just discussed to state that because of the principle of substantial contribution which had been the principle used to determine the distribution of marital property upon dissolution of marriage in the earlier cases decided by the law courts, then the spouse will be denied any share in marital property, when it is ascertained that he or she did not make any substantial contributions thereof.

It was because of the inequalities in the older judicial decisions that we believe informed the Consultative Assembly to include article 22 in the Constitution of the 4th Republic.

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We shall revert to a discussion of some of the older cases spanning the period 1959 to 2005 i.e. from the cases of **Quartey v Martey [1959] GLR 377** to **Boafo v Boafo [2005-2006] SCGLR 705** which to me is to be regarded as the locus classicus and a restatement of the law on distribution of marital property acquired during the subsistence of the marriage upon divorce.

HISTORICAL CASE LAW DEVELOPMENT

Before we embark upon this historical discourse of the cases, let us refresh ourselves with these words of encouragement from Lord Denning in the case of **Packer v Packer [1953-54]** Law Reports, Probate Division 15.

In this case, Lord Denning in characteristic fashion, stated that, not having done something before should not hinder a court from doing it for the first time. He stated thus:-

> **"What is the argument on the other side. Only this, that no case has been found in which it has been done before. That argument does not appeal to me in the least. If we never do anything, which has not been done before we shall never act anywhere. The law will stand still whilst the rest of the world goes on and that will be bad for both.**
>
> **There is no decision of this court that an order cannot be made for custody of an illegitimate child and in the absence of direct decision preventing us, I think that we should follow the course which is permitted by statute and prescribed by good service".**

Like most of the decisions of Lord Denning at the material time, it was a dissenting opinion in a matrimonial case. But with the passage of time his opinions have become accepted as the correct statement of the law.

What we take note of is that, from the above opinion, it is clear that the fact that there is no precedent to support a decision of a

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court is now no bar to prevent a court from arriving at a decision provided the decision will not be contrary to constitutional or statutory provisions or in conflict with the doctrine of stare decisis if the court is bound by its own decision or by a decision of a Superior court.

Fortunately, we do not find any such impediment or inhibition in this situation. This is because, the Supreme Court has given the green light in its previous decisions in the cases of **Mensah v Mensah [1998-99] SCGLR 350** and **Boafo v Boafo** already referred to supra.

This court is of the view that the time is ripe for improvements to be made to the far reaching decisions in the cases just referred to.

DEVELOPMENT OF RELEVANT GHANAIAN CASE LAW

Let us now go on our historical journey on the development of case law on the distribution of marital property acquired during marriage upon divorce. This exercise is important as it will enable us to explain the rationale for the

improvements being made and the introduction of the "principles of jurisprudence of equality."

JOINT PROPERTY

Property acquired with the assistance of a wife was regarded as the sole property of the husband. The customary law position was that the wife and children had a domestic responsibility of assisting the husband/father with his business and as such the wife could not claim any interest in any property she assisted her husband to acquire. Thus, in Quartey v. Martey [1959] GLR 377, HC Ollennu J. (as he then was) held at 380 that:

> **"The proceeds of this joint effort of a man and his wife and/or children, and any property which the man acquires with such proceeds, are by customary law the individual property of the**

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> **man. It is not the joint property of the man and the wife and/or the children. The right of the wife and the children is a right to maintenance and support from the husband and father."**

SUBSTANTIAL CONTRIBUTION PRINCIPLE

Clearly this position has since been eroded by changes in the traditional roles of men and women and the economic empowerment of women. In **Yeboah v. Yeboah [1974] 2 GLR 114 HC**, Hayfron-Benjamin J (as he then was) held that there was no positive customary law preventing the creation of joint interest by persons not related by blood.

The current position of the law regarding joint property is that substantial contribution by a spouse to the acquisition of property during the subsistence of the marriage would entitle that spouse to an interest in the property.

In the Yeboah case, supra the husband and wife were married under the Marriage Ordinance, Cap. 127. Before the marriage, the wife had applied for a house from the Housing Corporation. She was allocated a plot of land for which she paid a deposit. After the marriage, she had the plot of land transferred into the name of her husband and the deposit was refunded to her by the corporation. The husband then took a loan from his employers to put up a house on the plot. Just as he was about to start constructing the building, the husband was transferred to London where he was later joined by the wife. The construction of the building started while the couple were resident in London. According to the wife, during the construction of the house she flew to Ghana at the request of her husband to supervise the construction. She stated that she paid the fare herself. She alleged

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that she made several structural alterations to the building with the knowledge and consent of her husband. The parties returned to Ghana and thereafter the marriage broke down. The husband then served a notice on the wife to quit the matrimonial home on the ground that he required the premises for his own occupation. When the wife failed to quit the premises, the husband then brought an action to eject the wife from the house. Headnote 3 of the court's holding stated thus:

"The wife was a joint owner of the house with the husband because judging from the factors attending the acquisition of the house and the conduct of the parties subsequent to the acquisition, it was clear that they intended to own jointly the matrimonial home. Where the matrimonial home was held to be held jointly by husband and wife as joint owners, it would be improper to treat the property as a subject of mathematical division of the supposed value of the house. What the court could do in such a case was to make what would seem to be a fair agreement for the parties."

Similarly in **Abebrese v. Kaah and Others [1976] 2 GLR 46** HC, the wife contributed substantially to building the matrimonial home. The husband had provided the purchase money for the land. She paid for the timber, and contributed to buying sand and iron sheets. She also supervised work done by labourers and helped to carry water to the site. However, she had not kept account of her contribution. The husband died intestate and his successor purported to sell the house. **The court held**

that although the wife could not state in terms of cash how much her contribution towards the building was, it was clearly substantial. The court pointed out that the ordinary incidents of commerce had no application in the ordinary relations between husband and wife and the wife's evidence as to the size of her contribution and her intention in so contributing would be accepted.

Further in **Anang v. Tagoe [1989 -90] 2 GLR 8 HC**, it was held at 11 that:

> " … where a wife made contributions towards the requirements of a matrimonial home in the belief that the contribution was to assist in the joint acquisition of property, the court of equity would take steps to ensure that belief materialised. That would prevent husbands from unjustly enriching themselves at the expense of innocent wives, particularly where there was evidence of some agreement for joint acquisition of property."

MATRIMONIAL CAUSES ACT, 1971 ACT 367

The cases cited supra give an indication that the courts seek to provide some protection, especially to wives, when there is evidence that a spouse has made a substantial contribution to acquire property. What amounts to substantial contribution is determined by looking at the facts surrounding the acquisition of the property. The facts would lead to an inference that there was

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intention by the parties to own the property jointly. Section 20 (1) of the Matrimonial Causes Act, 1971 (Act 367) provides that

> " 20(1) The court may order either party to the marriage to pay to the other party such sum of money or convey to the other party such movable or immovable property as settlement of property rights or in lieu thereof as part of a financial provision as the court thinks just and equitable." (e.s)

Even though it has been held that the ordinary incidents of commerce do not apply in marital relations and that the courts will not employ mathematical division to determine each spouse's share in the property, the courts currently apply the equality is equity principle. This principle is backed by Constitutional force in article 22(3) (b) of the 1992 Constitution referred to supra.

EQUALITY IS EQUITY PRINCIPLE OF SHARING OF MARTIAL PROPERTY

Thus in **Mensah v. Mensah** already referred to supra, the court applied the equality is equity principle to determine which proportions the couple's joint property would be shared. Bamford-Addo JSC held at 355 thus:

> "… the principle that property jointly acquired during marriage becomes joint property of the parties applies and such property should be shared equally on divorce; because the ordinary incidents of commerce has no application in marital relations between husband and wife who jointly acquired property during marriage." (e.s.)

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It would appear from **Mensah v. Mensah**, supra that the court favoured equal sharing of **joint property** in all circumstances. However, this position has been modified and clarified subsequently in the case of **Boafo v. Boafo** referred to supra.

In that case, the husband petitioned for divorce and the wife cross-petitioned for divorce. The marriage was dissolved. On the issue of distribution of properties, the trial judge found that the properties had been jointly acquired; that the couple had operated their finances jointly, but that the degree of financial contribution by the wife to the acquisition of the joint properties was not clear.

The trial Judge then made distribution orders which were not on a half and half (equal) basis. The wife appealed to the Court of Appeal on the ground, inter alia, that the trial judge failed to distribute the property in accordance with article 22(3) (b) of the 1992 Constitution.
The Court of Appeal held that the properties should have been distributed equally on a half and half basis and allowed the appeal. The husband appealed to the Supreme Court.

In delivering the judgment of the court dismissing the appeal, Dr. Date-Bah JSC referred to the decision in **Mensah v. Mensah** and further explained the position of the court. At 711, he said:

> "On the facts of Mensah v. Mensah (supra), the Supreme Court (per Bamford-Addo JSC) held that equal sharing was what would amount to a "just and equitable" sharing. The view of Denning LJ (as he then was), in

Rimmer v. Rimmer [1952] 1 QB 63 at 73

that on the facts of that case equality is equity seems to have inspired the learned Supreme Court Judge's approach. … Denning LJ's view was that where it is clear that the matrimonial home or furniture common use belongs to one or the other of the married couple, then the courts would respect the proprietary rights of the particular spouse. But where it not clear to whom the beneficial interest belongs or in what proportions, then the equitable maxim of equality is equity would be applied. The spirit of Bamford-Addo JSC's judgment in Mensah v. Mensah appears to be that the principle of the equitable sharing of joint property would ordinarily entail applying the equitable principle, unless one spouse can prove separate proprietorship or agreement or a different proportion of ownership.

This interpretation of Mensah v. Mensah as laying down the principle of equitable sharing of joint property, accords with my perception of the contemporary social mores …"

The learned judge also underscored the essence of section 20(1) of the Matrimonial Causes Act, 1971 Act 367 and article 22(3) (b). At 713 he said of article 22(3) (b):

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> "… Thus article 22 firmly places within the domain of social human rights the distribution of the property of spouses, on divorce… It was meant to right the imbalance that women have historically suffered in the distribution of assets jointly acquired during marriage. An equal division will often, though not invariably, be a solution to this imbalance."

Then at 714, he said of section 20(1) of Act 367:

> "The question of what is "equitable", in essence, what is just, reasonable and accords with common sense and fair play , is a pure question of fact, dependent purely on the particular circumstances of each case. The proportions are, therefore, fixed in accordance with the equities of any given case." (e.s.)

Therefore even though **Boafo v. Boafo** affirmed the equality is equity principle as used in **Mensah v. Mensah**, it gave further meaning to section 20(1) of Act 367 and article 22(3)(b) of the 1992 Constitution. Consequently, the issue of proportions are to be fixed in accordance with the equities of each case.

The court duly recognized the fact that an equal (half and half) distribution, though usually a suitable solution to correct imbalances in property rights against women, may not necessarily lead to a just and equitable distribution as the Constitution and Act 367 envisages. It is submitted that the court made room for some flexibility in the application of the equality is equity principle by

favouring a case by case approach as opposed to a wholesale application of the principle.

The above notwithstanding, it must be noted that the paramount goal of the court would be to achieve equality. Thus, the court endorsed the Court of Appeal's position to the effect that an inability or difficulty to identify clearly distinct contributions in the acquisition of the joint property would not in itself preclude a half and half sharing. At 716 Date Bah JSC quoted with approval a passage from the judgment of Wood JA (as she then was) :

> " …Indeed in cases where the evidence clearly
> points to a joint ownership, I found no inflexible rule
> stipulating that a spouse's inability to identify clearly
> contribution automatically disentitles him or her
> from a half share. To the contrary, it does appear that
> the courts have been quick to apply the equality is
> equity rule, and so lean towards a half and half share,
> if from all the circumstances, such an approach
> would be justifiable."…
> Again, we consider this passage a sound statement of
> the law. … Where there is substantial contribution
> by both spouses, the respective shares of the spouses
> will not be delineated proportionally like a
> shareholding in a company. For, the marriage
> relationship is not a commercial relationship…
> equality is equity will usually be an equitable
> solution to the distribution issue. The Court of
> Appeal was therefore within its rights in intervening
> to achieve equality."

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It is therefore apparent that the Ghanaian Courts have accepted this equality is equity principle in the sharing of marital properties upon divorce. We believe that the death knell has been sung to the substantial contribution principle, making way for the equitable distribution as provided for under article 22 (3) of the Constitution 1992.

Let us now examine the invitation being made to us in this appeal to set aside the judgment of the Court of Appeal, and by necessary implication, that of the High Court in view of the concurrent findings by the two lower courts. Is there any sound legal basis for this request?

CONCURRENT FINDINGS OF FACT

The Supreme Court has in the following cases laid down the criteria that will enable a second appellate court, like this Supreme Court to depart from concurrent findings of fact by the trial court and concurred in by the first appellate court, the Court of Appeal.

> **1.** **Gregory v Tandoh IV & Anr. [2010] SCGLR 971 and**
>
> **2.** **Obeng v Assemblies of God, Church Ghana [2010] SCGLR 300**

The principle is therefore firmly established that where findings of fact have been made by a trial court and concurred in by the first appellate court, then the second appellate court like this court must be slow in coming to different conclusions unless it was satisfied that there were strong pieces of evidence on record which made it manifestly clear that the findings by the trial court were perverse. In the instant case, there being no such evidence that the findings of fact are perverse, this court is unable to depart from the findings of fact as they are indeed supported by evidence on record.

EVALUATION OF EVIDENCE ON RECORD

In the circumstances of this case, even though the Petitioner did not call any witnesses, there were pieces of corroborative evidence from the Respondents witnesses which supported the Petitioner's case that she and the Respondent took part in the trading activities. For example, DWI, Ellen Dzifa Amugie contrary to Respondent's assertion that the Petitioner did not play any role in the business activities stated on oath that she saw the petitioner once in the premises where the Respondent was selling the items to the Civil Servants in the Ministries.

Secondly, in answer to a question from Counsel for the Petitioner, requesting explanation as to the business deals or negotiations that she DWI went out with the Petitioner to conclude, DWI answered thus:-

> "Yes, but the woman she led me to was not ready to give us credit and so we did not take anything from her."

These pieces of evidence at least shows that the Petitioner was not the type of lazy housewife that the Petitioner was portrayed to be. The truth of the matter is that, the Petitioner played a pivotal role in the management of the business before and after Guidem was registered as a business entity at the Registrar General's Department.

DW2 – Michael Nii Amarh Ahuloo a colleague of the Respondent at the Controller and Accountant General's Department, testified that he had ever met the Petitioner in the House of the Respondent at La. According to DW2, he went to their house at La, very early in the morning at the invitation of the Respondent. In answer to a question during cross-examination, DW2 answered that when he got to the house of the parties at La, he saw Palm oil in drums as well as tomatoes, but he could not tell who sold those items. The same witness also testified that he ever saw the Petitioner in the

store of the Respondent in the Ministries but cannot tell exactly what she was doing at the material time. All these go to confirm that the Petitioner was really engaged in trading in the house at La and also took part in the business.

Finally, DW4, Isaac kwao, a close blood relation of the Respondent who later came to work with him also testified that, the procedure in the management of the store was that, "at the end of each day's sales Sister Gladys that is the petitioner comes to collect the cash. The respondent then was working with the Accountant Generals 'Department".

This particular piece of evidence is consistent with the evidence of the petitioner under cross-examination that she kept a record of the daily sales and gave it to the Respondent. This particular record has been tendered as exhibit E.

It has to be noted that, DW4 is also a Carpenter by profession and was the one who worked on the couple's Adenta property. He confirmed that it was the Petitioner who took him to the Adenta house and also that when he first met the Petitioner, she was a table top trader, dealing in the sale of rice, cooking oil and other consumables in their house at La.

The combined effect of all these pieces of evidence is that, even though learned Counsel for the Petitioner was careless in not calling evidence to support the contentions of the Petitioner, by the evidence of the Defence witnesses referred to supra, the necessary corroborative linkages had been established to enable this court draw the necessary inferences. In this respect therefore, we are of the considered view that, once the Respondent and his witnesses have corroborated in material particulars the evidence of the Petitioner on the core issues involved in this trial, the failure by her to call evidence of her own in support thereof is immaterial.

We are therefore of the considered view that, in law the burden that is cast on the Petitioner to lead sufficient evidence to enable a finding of those facts to be made in her favour has been established as required by sections 10 and 14 of the Evidence Act, 1975, already referred to supra.

We accordingly hold and rule that taking all the above pieces of evidence from Petitioner, respondent and his witnesses into consideration and on the authority of the following Supreme Court decisions, the Petitioner must be deemed to have discharged the burden cast on her by and under the Evidence Act, 1975 NRCD 323.

1.   **Dzaisu v Ghana Breweries Limited [2007-2008] SCGLR 539** where the Court spoke with one voice through our esteemed Sister Sophia Adinyira JSC on application of section 14 of NRCD 323 at holding 1 thereof and

2.   **Ackah v Pergah Transport Limited [2010] SCGLR 728** where the Supreme Court again speaking through our respected Sister Sophia Adinyira JSC espoused section 10 of NRCD 323 of the Evidence Act.

This means that, since it was the Petitioner's duty as required by law to produce the evidence of the facts in issue and that duty has been satisfactorily discharged, that burden has been performed and the trial and appellate courts were thus right in coming to the conclusions reached by them.

From the above, it would appear certain that all the lower courts correctly applied the principles of evaluating the evidence and the probative values attached to the party who has the burden of proof. Under these circumstances, it is our considered view that this court does not see it's way clear in interfering with the findings of fact made by the trial court which was concurred in by the Court of Appeal.

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We are therefore of the very considered view that the Court of Appeal did not err in affirming the findings of fact made by the trial court.

Indeed, the Court of Appeal correctly applied the principles of evidence in this case and satisfied itself that the standard of proof required in law had been met.

Secondly, it has to be considered that, the facts of this case require that the veil of incorporation be lifted to enable the court determine the real persons who are managing the business of Guidem.

This is a situation where the respondent cleverly explored the illiteracy of the Petitioner and abused the trust reposed in him by the Petitioner. Since the primary duty of courts of law is to do substantial justice, the decision of the lower courts to be objective and consider all the surrounding circumstances of the case supports the decision arrived at.

Having reviewed the evidence on record in great detail as well as the constitutional provisions dealing with devolution of marital properties upon divorce, it is appropriate at this stage to consider the principle of Jurisprudence of Equality.

Even though the decision of this court in effect is that, the Petitioner, from the evidence on record, must be reputed to have made and contributed substantially to the acquisition of the matrimonial properties and assets on offer for sharing in this case and therefore entitled to an equal share, the constitutional provisions in article 22 (3) of the Constitution, 1992 cannot be overlooked.

This is because, as a final appellate and constitutional court, this Supreme Court has a duty to make its views clearly known on the relevance and applicability of constitutional provisions whenever these arise or call for interpretation in cases that come up before it for adjudication.

Our comments as a court, on the constitutional interpretation and applicability of the equality is equity principle contained in article

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22 (3) of the Constitution 1992, in the sharing of marital properties acquired during the subsistence of a marriage and the Principle of Jurisprudence of equality, (yet to be discussed) are to be understood in that context.

Thus, even if this court had held that the petitioner had not made any substantial contributions to the acquisition of the matrimonial properties, it would still have come to the same conclusion that the petitioner is entitled to an equal share in the properties so acquired during the subsistence of the marriage. This is because this court recognises the valuable contributions made by her in the marriage like the performance of household chores referred to supra, and the maintenance of a congenial domestic environment for the respondent to operate and acquire properties. Besides, the constitutional provisions in article 22(3) of the Constitution 1992, must be construed to achieve the desired results which the framers of the Constitution intended.

In coming to this conclusion, we are not unaware of complications that may arise in the application of the principle of equality in the context of polygamous marriages.

We are however of the view that those complications can be tackled on a case by case basis in subsequent case law development, or by direct statutory intervention by the Legislature.

Finally, such an interpretation and decision would be consistent with earlier decisions of this court in Mensah v Mensah and Boafo v Boafo already referred to supra.

JURISPRUDENCE OF EQUALITY PRINCIPLE (JEP)

The Jurisprudence of Equality Principle, has been defined by the International

Association of Women Judges in their November, 2006 USAID

Rule of Law Project in Jordan as "the application of

international human rights treaties and laws to national and local domestic cases alleging discrimination and violence against women." Such that the rights of women will no longer be discriminated against and there will be equal application of laws to the determination of women issues in all aspects of social, legal, economic and cultural affairs.

It is to be understood that discrimination and violence against women differ from country to country and each situation has to be considered on a case by case basis.

For example, whilst in Ghana, it is perfectly legitimate for issues such as inhuman widowhood rites, trokosi system and the inability of the courts to apply all the human rights provisions in the Constitution 1992 in favour of women so as to empower them in their quest for equality in the devolution of marital property upon divorce may be considered as discrimination and violence against women, in other countries, it may be the prohibition on female students wearing headscarves at university campuses, or the unequal payment of pensions to widows as compared to widowers that may be considered as such.

In our Ghanaian context, we have referred to the provisions of article 33 (5) of the Constitution which guarantee's other rights, duties, declarations not specifically mentioned in the Constitution as applicable by our courts in order to ensure the dignity of the human race.

For example, Article (1) of the Universal Declaration of Human Rights provides as follows:

> **"All human beings are born free and equal in dignity and rights.** They are endowed with reason and conscience, and should act towards one another in a spirit of brotherhood."

Article 12 (1) and (2) of the Constitution 1992 give the scope and content of the fundamental Human Rights and Freedoms which the individual is entitled to enjoy.

As a matter of fact, even though the Universal Declaration of Human Rights is not a binding treaty, its principles and underpinning philosophy has been incorporated into national constitutions and referred to by several national courts. This is the context into which our national Constitution 1992 has to be understood in relation to this principle of Jurisprudence of Equality.

Ghana is also a signatory to the Convention on the Elimination of all forms of Discrimination Against Women (CEDAW).

For example, article 1 of CEDAW, provides a definition of discrimination as follows:-

> "For the purposes of the present convention, the term "discrimination against women" shall mean any distinction, exclusion or restriction made on the basis of sex which has the effect or purpose of impairing or nullifying the recognition, enjoyment or exercise by women, irrespective of their marital status, on the basis of equality of men and women of human rights and fundamental freedoms in the political, economic, social, cultural, civil or any other field."

Furthermore, article 5 of CEDAW adds a key concept to international equal protection analysis; the need to eradicate customary and all other practices which are based on the idea of the inferiority or the superiority of the sexes or on stereotyped roles for men and women.

On the basis of the above conventions and treaties and drawing a linkage between them and the Constitution 1992, it is our considered view that the time has indeed come for the integration of this principle of "Jurisprudence of Equality" into our rules

of interpretation such that meaning will be given to the contents of the Constitution 1992, especially on the devolution of property to spouses after divorce.

Using this principle as a guide we are of the view that it is unconstitutional for the courts in Ghana to discriminate against women in particular whenever issues pertaining to distribution of property acquired during marriage come up during divorce. There should in all appropriate cases be sharing of property on equality basis.

We therefore endorse the Kenya Court of Appeals decision in the case of **Tabitha Wangeci Nderitu v Simon Nderitu Kariuki, Civil Appeal No. 203 of 1997** where the **Court of Appeal ruled for the wife, finding that the Married Women Property Act, superseded the customary law, that the husband had failed to show that the caesarian sections had disabled her sufficiently to warrant a reduction to 30 percent, and that a housewife's contribution to the family in raising children counted as a contribution to the marriage.**

What are the facts of the above case?

In the said case both parties appealed from a lower court decision dividing marital property on divorce. The lower court found that both of the parties had contributed equally to the marital assets and ruled that the proceeds from the sale of the matrimonial home should be divided equally.

The husband discounted the wife's share of the remaining assets to only 30%, based on what he termed the "common sense notion" that the three caesarian sections the woman had endured to deliver the couple's children had diminished her ability to fully exert himself for the benefit of the household.

The decision arrived by the Kenya Court of Appeals is not only in tandem with common sense and international human rights

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conventions and principles, but also in tune with our articles 22 (3) (a) and (b) of the Constitution 1992.

Coming home to the instant case and applying the above constitutional provisions, relevant case laws enunciated in decisions such as **Mensah v Mensah** and **Boafo v Boafo** already referred to supra and international conventions and Principles of Jurisprudence of Equality, (JEP) this court is of the considered view that the Petitioners contribution even as a housewife, in maintaining the house and creating a congenial atmosphere for the respondent to create the economic empire he has built are enough to earn for her an equal share in the marital properties on offer for distribution upon the decree of divorce. From the evidence on record, this court will not permit the respondent to use the petitioner as a donkey and after offering useful and valuable service dump her without any regard for her rights as a human being.

CONCLUSION

We are therefore of the considered view that the time has come for this court to institutionalise this principle of equality in the sharing of marital property by spouses, after divorce, of all property acquired during the subsistence of a marriage in appropriate cases. This is based on the constitutional provisions in article 22 (3) and 33 (5) of the Constitution 1992, the principle of Jurisprudence of Equality and the need to follow, apply and improve our previous decisions in **Mensah v Mensah** and **Boafo v Boafo** already referred to supra. The Petitioner should be treated as an equal partner even after divorce in the devolution of the properties. The Petitioner must not be bruised by the conduct of the respondent and made to be in a worse situation than she would have been had the divorce not been granted. The tendency to consider women (spouses) in particular as appendages to the marriage relationship,

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used and dumped at will by their male spouses must cease.
Divorce as Lord Denning stated long ago, should not be
considered as a stigma.

In the premises, the appeal herein is dismissed as being without
any merit and the Court of Appeal decision of 23rd July 2009 is
hereby affirmed.

(SGD)   J.V.M DOTSE
JUSTICE OF THE SUPREME COURT

(SGD)   S.A.B AKUFFO (MS)
JUSTICE OF THE SUPREME COURT

(SGD)   DR. S.K. DATE-BAH
JUSTICE OF THE SUPREME COURT

(SGD)   S.O.A ADINYIRA (MRS)
JUSTICE OF THE SUPREME COURT

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