CHAPTER 1

INTRODUCTION

1.1 THE SETTING

1.1.1 Computers and Intelligence

Advances in computer hardware and computer software in the 60's and 70's have led to an increased use of computers by people in all walks of life. The scientists and researchers involved in the design and development of these physical devices have relentlessly worked to find various applications for these machines. The idea of having intelligent assistants to human beings that was haunting many logicians, philosophers, novelists and futurists for quite a long time started getting crystallized with the availability of these machines. For example, George Boole (1815 - 1864), who invented boolean algebra, in the preface of his book titled An Investigation Of The Laws Of Thought On Which Are Founded The Mathematical Theories Of Logic And Probabilities (1854) writes: "The laws we have to examine are the laws of one of the most important of our mental faculties. The mathematics we have to construct are the mathematics of the human intellect". This reveals the fact that his concern was more in the direction of intelligent machines or the artificial intelligence rather than the mathematics alone. Perhaps the best citation that one can exert is that of Alan Turing who perspicaciously felt the possibility of computer intelligence. Turing, in his very widely accepted article Computing Machinery And Intelligence [1] has explicitly expressed that a computer could be programmed so as to exhibit intelligent behavior. Such thoughtful speculations have resulted in the
ascendancy of a new area of research called Artificial Intelligence (A.I.).

1.1.2 Knowledge-based Systems and Law

Artificial Intelligence deals with the development of cognitive models and computer programs to emulate the intelligence of human beings. In the initial early work in artificial intelligence, researchers and system developers attempted to develop general problem solvers. However, these efforts were met with a number of impediments. In the early 70's, Feigenbaum and associates suggested that the artificial intelligence techniques could be made more effective by adding domain knowledge. At this point it is worth to cite the following statement of Feigenbaum made in [2]:

"...general problem-solver's are too weak to be used as the basis for building high-performance systems. The behavior of the best problem-solvers we know, human problem-solvers, is observed to be weak and shallow, except in the areas in which the human problem-solver is a specialist. And it is observed that the transfer of expertise between speciality areas is slight. A chess master is unlikely to be an expert algebraist or an expert mass spectrum analyst, etc. In this view, the expert is the specialist, with a specialist's knowledge of his area and a specialist's method's and heuristics."

Efforts in this direction have proved tangible and as a result at present we have many knowledge-based systems that have been built which can diagnose diseases [3], evaluate potential ore deposits [4], suggest structures for complex organic chemicals [5], assist in configuring computer systems [6], etc. The idea of using computers in the legal realm to assist legal practitioners in drafting legal documents, legal research etc., and even the judges in the process of their decision making is not a new one. Such ideas of using computers to mechanize the professional activities of a legal practitioner was envisioned as early as in 1946 by
Lewis O. Kelso [7], in 1949 by Lee Loevinger [8] and in 1958 by Lucien Mehl [9]. For example, Kelso said:

"Today the lawyer works substantially as he worked before industrial revolution. Only automatic legal research will save him from playing one of the most confused, ill paid and unsatisfactory professions in the world of tomorrow."

Though the first serious proposal for research into the application of artificial intelligence techniques to law was made by Buchanan and Hedrick in an influential paper published in 1970 [10], the work that has been done is limited almost to the field of legal information retrieval systems with the exception of the recent works by Waterman et al. [11], MacCarthy and Sridharan [12], deBessonet and Cross [13] and Anne Gardner [14]. The emerging field of knowledge-based systems that has natural language understanding and common sense reasoning amalgamated into it provides an opportunity to adopt A.I. techniques for the legal reasoning.

Like all other professions legal profession also needs automation to improve its productivity and the quality of its product. The legal profession cannot afford to ignore the potential that technology offers. The rapid industrialization almost throughout the world in recent times and the inherently existing "war" between the profit makers and the wage earners have resulted in surmounting of very large number of disputes year after year. Advancement in technology, particularly in the field of micro-electronics, Artificial Intelligence and Knowledge-Based systems, can be utilized to automate the swift settlement of the industrial disputes and hence to pre-empt the industrial tensions and its after effects.
1.2 INDUSTRIALIZATION

1.2.1 A General Perspective

The rapid industrialization of many nations since the last three decades of the nineteenth century has resulted in the surfacing of two groups of people called Capitalists or Employers and Labourers or Employees. With regard to the functioning of the industries and the relation between these two groups of people the principle of "Laissez faire" was adopted by the concerned governments initially. According to this principle, allowing individuals to pursue their own self-interest in free markets, relying on the "invisible hand" of competition within producer groups and on free bargaining between these groups, will do a better job of achieving the greatest good for the greatest number than the most enlightened government could ever do. This principle also expected proper levels of product prices, labour wages and proper allocation of resources. However, historical experience in modern democratic societies has shown that "Laissez faire" has not only been overthrown by social security but also has been contemptuously repudiated thus causing an unequilibrium between the groups that must deal with each other. As justice Cardozo has said, "danger invites rescue", a need was present for the concerned governments to step in, either to regulate the terms of the transactions between the groups or to build up the strength of the weaker group (i.e., the smaller firms, employees). Thus came into existence a new branch of jurisprudence called the Industrial Law.

1.2.2 The Indian Scene

Industrial law in India is of recent vintage. In this country the Industrial Disputes Act of India, 1947, is the charter to the Industrial Law. This Act and other analogous
state statutes provide the machinery for regulating the rights
of the employers and employees to strike and lock-outs and
foster investigation and settlement of industrial disputes in
peaceful and harmonious atmosphere and hence to mitigate the
disequilibrium in the employment relation, which inherently
exists because of, in the words of justice Higgins [15], "the
War between the profit maker and the Wage earner". Industrial
relations embrace a complex of relationships between the
workers, employers and Government, basically concerned with
the determination of the terms of employment and conditions of
labour of the workers. Escalating expectations of the
workers, the hopes extended by Welfare State, uncertainties
caused by tremendous Structural developments in industry,
diminishing work ethics and political activism in the
industrial field have all resulted in surmounting of a very
large number of industrial disputes year after year. For
example, in India, during 1985 there were 1716 industrial
disputes in which 10,69,376 workers were involved and
29,370,846 man days were lost [16]. The corresponding figures
for the nine months period from January to September 1987 are
1052, 1,445,252 and 18,193,779 respectively [17]. This
undoubtedly has an effect on the living conditions of the
people involved and the Country's economy as well as its
political stability as any attempt to resolve such huge number
of disputes manually takes a lot of time.

1.3 THE TASK

The task chosen for this research is that of providing
a line of argument that yields one or more plausible solutions
that one may get by interpreting and analyzing a "facts
situation", drawn particularly from the industrial disputes
domain. A facts situation includes various information like
the dates on which the person involved was retrenched, got
into the service, service conditions etc. Such fact
situations or cases will be available in the form of a legal
brief. Figure 1.1 provides an example of such a legal brief. The principle task of the system developed, named TIDA [18], is to understand a given facts situation, retrieve the facts available in such briefs both explicitly as well as implicitly (Figure 1.2), interpret and analyze the legal situation that arises out of it by selecting and using appropriate statutory rules as well as case laws and then arriving at one or more plausible conclusions (Figure 1.3) by determining the legality of the action or actions taken by the parties involved.

T L Rajamani was appointed by the Standard Packaging Ltd., Madras, on 1st February, 1982 as an accounts assistant in its cardboard box manufacturing department. He was retrenched from the service on 8th January 1985. Neither the required notice nor the compensation was given to him. Following the orders made by the Industrial Tribunal he was taken back into the service on 22nd March, 1986. The claim is for the retrenchment compensation.

Figure 1.1 A legal brief.
NAME DISPUTE
REGARDING  (RETRENCHMENT COMPENSATION)
RETRENCHMENT-DATE  8/1/85
EMPLOYEE  T L RAJAMANI
EMPLOYER  STANDARD PACKAGING LTD
           MADRAS
ENTRY-DATE   1/2/82
APPOINTMENT-CATEGORY  PERMANENT
BREAK-IN-SERVICE  NO
NOTICE-GIVEN  NO

Figure 1.2 Facts retrieved.

Assumptions:
(1) Permanently appointed.
(2) Works above the ground level.
(3) Activity is not building construction.

Conclusion/s:
The petitioner is eligible for the retrenchment compensation.

Figure 1.3 Conclusion.

1.3.1 Decision makers or Decision making aids

One of the very important characteristics of the legal domain is that by its very nature, the law is well documented; its provisions are written down, and where they are not, recorded decisions in previous cases are helpful. This nature of the legal domain entirely eliminates the task of "knowledge elicitation" that has been referred to as "the most important of the central problems of artificial intelligence research" by Feigenbaum and McCorduck [19]. With this one gets tempted
to conclude that intelligent legal decision making systems or legal expert systems can be constructed very easily. However, this is not the case practically because, as discussion in chapter two reveals, legislation is often imprecise, and that it is essentially open textured. The role of the judiciary is to resolve questions of law as they arise. Fundamentally, the resolution of these questions is a matter of choice that is constrained by many factors like natural justice, the existing political situation, the social environment, etc. A judge will decide one way or the other, not because there is a right answer, but because he is forced to make decision, and because he will find the arguments presented for one decision more persuasive than the arguments for the other. If one accepts that the law is open textured (which this thesis does) it is impossible to anticipate all the arguments that could be presented in a court of law and hence there cannot be really a right answer until the judge has pronounced his verdict, especially in the case of cases that are not routine. It is in the department of producing plausible arguments which are put forth before the decision making authority that the knowledge-based legal systems can find more wide applications rather than in actually making the decision itself.

Though judges at higher level courts are well qualified and are experienced, so that they can be considered as experts in themselves, in practice important cases are not decided by a single judge but is done by a 'bench of judges' consisting of more than two judges. This practice very clearly indicates that there can not be just a 'single view' on legal issues or concepts and no one could be just taken as an expert. The 'full bench' could be seen as a 'decision maker' that is aided by the 'members of the bench'. As such this work supposes that the knowledge-based systems in the legal realm could be decision making aids only which are used by both legal practitioners as well as para legal persons like Bank Managers, Office administrators, Employee Union members,
1.4 OBJECTIVES OF THE STUDY

The analysis of a facts situation or a case starts with a need for a plausible solution and ends with one or more solutions, rather suggestions, depending upon the type and the intricacies of the case at hand. This is because the words and phrases using which the statutes are framed has inherent indeterminacy associated with them and the intention of any legal researcher is to introspect all the possible outcomes and to employ the best line of argument to protect the interest of his or her client, who could be either the petitioner or the defendant.

The primary objective of this study are to:

1. identify the requirements of a technique to represent the legal knowledge and to propose a knowledge representation technique that satisfies the identified requirements.

2. discuss a method for processing the data that will be in the form of a legal brief and hence to elicit the underlying facts of the case.

3. develop a system utilizing the proposed knowledge representation and facts elicitation techniques employing multiple agendas in its control structure.

The required domain knowledge for the demonstration of the proposed techniques has been gathered from the chapter V-A of the Industrial Disputes Act of India (as amended up to
1985) that deals with the determination of the eligibility and payment of retrenchment and lay-off compensations.

1.5 ORGANIZATION OF THE REPORT

Chapter 2 provides an astute basis for the work reported in this thesis. The chapter opens with defining what is meant by 'legal rules' and 'law' and then adopts: the law as a body of legal rules. Further, this chapter presents a discussion on two important legal point of views namely legal positivism and nominalism along with conceptualism, one of the important factors based on which the positivism and nominalism theories are compared and classified. Along the way in this chapter the concept of open texture or fury edges of the legal concepts and its effect on the final outcome of the analysis of a facts situation or case has been discussed.

Chapter 3 discusses some important projects which chiefly deal with legal reasoning based on Artificial Intelligence techniques. A review of two of the most acknowledged Rule-Based Knowledge-Based systems, MYCIN and R1, is also presented. The discussion on MYCIN and R1 is limited only to the use of contexts which was employed to mitigate the problems associated with the unstructured rule bases.

Chapter 4 deals with the knowledge representation technique that has been proposed by this work. This chapter starts with a discussion on the representational requirements of the legal knowledge and identifies that the chief characteristic of the legal domain is that the "legal knowledge is dynamic in nature". Then in this chapter is presented a discussion on a knowledge representation technique that employs modified production rules, modified so as to include the source references, and frame like structures called FORMS, that aid in proper organization and management of the knowledge.
Chapter 5 of the report deals with the issues associated with the understanding of legal facts situations or cases and extends a method for generating the 'internal representation' of a given input data.

Chapter 6 discusses the control mechanism that employs multiple agendas using which and "FORMS and modified production rules" knowledge representation technique a system called TIDA has been developed. Also this chapter presents an "annotated case analysis" session with the TIDA system.

Chapter 7 is conclusory in nature and presents conclusions resulting from this study. At the end, in addition to a references section, three appendices have been included to provide additional details of possible interest.