Intelligent Flowcharting Developmental Approach to Legal Knowledge Based System

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Abstract

The basic aim of this research, described in this paper is to develop a hybrid legal expert system/ knowledge based system, with specific reference to the transfer of property act, within the Indian legal system which is often in demand. In this paper the authors discuss an traditional approach to combining two types of reasoning methodologies, Rule Based Reasoning (RBR) and Case Based Reasoning (CBR). In RBR module we have interpreted and implemented rules that occur in legal statutes of the Transfer of property act. In the CBR module we have an implementation to find the related cases. The VisiRule software made available by Logic Programming Associates is used in the development of RBR part this expert system. The authors have used java Net Beans for development of CBR. VisiRule is a decision charting tool, in which the rules are defined by a combination of graphical shapes and pieces of text, and produces rules.

Keywords: Transfer of property act, Expert System, Rule Based System, VisiRule

1. Introduction

A property, movable or immovable, is transferred from one person to another under various different situations and circumstances and for different values. By its very existence, society mandates interaction, exchange or transfer. The transfer may be a gift, an inheritance or an asset acquired by paying full value. When a movable property is transferred inter-vivos (between two living persons), Sales of Goods Act, 1930 comes into play. When an immovable property is transferred from dead person to living person(s), the Transfer of Property Act, 1882 comes into play. In case, the property is transferred from a dead person to a living person(s), the law applied will be the Law of succession. Should a person die without leaving a will (intestate), the law of intestate succession is applicable and in cases where a person dies leaving a will, the law of testamentary succession is applicable.

Purpose

The authors have earlier developed a prototype (Bilgi & Kulkarni 2008 [7-9]) which is rule based in nature. In the this research paper we have consolidated most of the rules of Transfer of property act 1882 to form the comprehensive legal rule based system for the Indian legal domain. The implementation includes the amalgamation of both the Rule Based system and also Case-based reasoning part associated with it.

Significance of the Study

The goal of study is not to replace a human advocate, but to help him to take the decisions fast and also to provide expert legal help to non-law literates, who intends to purchase an immovable property. The user of this system can verify the title of the property and absence of any encumbrances on the same which he intends to purchase. The Case based reasoning part will help to understand related cases.

What the lawyer wants

Expert systems are used in many different subject domains. One of the domains that pose both difficult problems and interesting challenges is case law research. The lawyer wants authority for his point of view. He wants a viable argument that will support his claim from a binding case if he can get it, from a persuasive one if he cannot. Failing that, he will take any helpful argument he can find. He may even want some configuration of facts and legal concepts which, although it does not constitute an argument in itself, will help him to construct one. The following description of a lawyer's search shows the usual cognitive phenomenon.

> No lawyer ever thought out the case of a client in terms of the syllogism. He begins with a conclusion he intends to reach, favourable to his client of course, and then analyzes the facts of the situation to find material out of which to construct a favourable statement of facts, to 'form' a minor premise. At the same time he goes over recorded cases to find rules of law employed in cases which can be presented as similar, rules which will substantiate a certain way of looking at and interpreting the facts. And as his acquaintance with rules of law judged applicable widens, he probably alters perspective and emphasis in selection of the facts which are to form his evidential data. And as he learns more of the facts of the case he may modify his selection of rules of law upon which he bases his case. (Dewey 1927 [3])

In order to construct his argument, the lawyer will need to navigate among legal concepts with their related facts; and he will need to make associations among selected legal concepts. Finding information in law cases is challenging. Each case is unique. Patterns of literary similarity are not common among cases. There are many writers, and many styles. There are no generally accepted conventions as to how decisions ought to be constructed. The reasoning is diffuse, dense, and original. The language used in cases is formal and technical. However, the vocabulary is derived from everyday language.

2. Background

In India, the personal laws governed the transfer of property assisted by orders of Courts under civil procedure code before the transfer of property act, 1882 came into existence. Transfer of movable goods was regulated to an extent by the Indian contract act, 1872. For transfer of immovable property, the Anglo-Indian courts often turned to principles of justice, equity and good conscience as it prevailed in England at the time. This rarely did any good due to the vast differences in customs and society of the two countries. The rapidly growing commerce and infrastructure in the late nineteenth century lead to more conflicts even in business. Thus, an immediate need was felt for a clear and pragmatic law regarding property and transfers suited to India and its peculiar problems as well as to take care of the potential economic problems. The task of drafting such legislation fell upon the First Law Commission and was later referred to the Second Law Commission (Gour 1987) [4].

2.1 The Act

A Bill finally presented to the legislative council became a law on the 17th of February 1882 and came into force from 1st July of the same year. The transfer of property act, 1882 mainly deals with transfer of immovable property. It does not apply to transfers by the operation of law such as transfer of immovable property necessitated by order of court for insolvency or forfeiture among others. The 137 sections contained within have been divided into 8 chapters (Gour 1987) [4].

2.2 **Objective**

The transfer of property act, 1882 (hereinafter referred to as the 'T P Act, 1882') was intended to define and amend the existing laws and not to introduce any new principle. It applies only to voluntary transfers. The following may be enumerated as the objectives of the act:As per the preamble of the Act, the T P Act, 1882 is to amend or regulate the law relating to transfer of property by the acts of the parties. The Act provides a clear, systematic and uniform law for the transfer of immovable property. The Act completes the Code of Contract since it is an enacted law for transfers that take place in furtherance of a contract.

3. Research Methodology: Integrating Rule-Based Reasoning and Case-Based Reasoning

The first reasoning modality to be successfully integrated with CBR was rule-based reasoning. The earliest CBR/RBR systems were built for statutory legal domains, where statutes naturally correspond to rules and legal precedents naturally correspond to cases. CABARET used a rule-based agenda mechanism to integrate past cases with legal regulations in the domain of United States tax law (Rissland & Skalak, 1991 [2]). CABARET pioneered a domain-independent architecture in which there are independent CBR and RBR co-reasoners, each of which monitors and communicates its own processing and results, and an agenda-based controller that proposes and prioritizes tasks for the two co-reasoners. Another early legal system, GREBE, integrated CBR and RBR to determine and justify legal conclusions for cases in the area of Texas employment law (Branting, 1991). IKBALS operated in the domains of Australian worker disability law and lending by financial institutions (Zeleznikow et al., 1994). CBR/RBR hybrids have since proliferated, in diverse domains and applications, ranging from planning nutritional menus (Marling et al., 1999) to harmonizing melodies (Sabater et al., 1998). ANAPRON integrated CBR and RBR for speech synthesis in pronouncing American surnames (Golding & Rosenbloom, 1991). This system used CBR to increase the accuracy of a primarily RBR system by handling exceptions to pronunciation rules. SaxEx integrated background musical knowledge into a primarily CBR system for generating expressive musical performances (López deMántaras & Arcos, 2002). In SaxEx, cases are musical scores with their associated expressive parameters, and rules are used to retrieve and adapt cases (Stranieri 1999 [13]).

3.1 Hybrid Knowledge Based System: Our approach

In order to explicate traditional approach, we proceed as follows. Firstly, we introduce some definitions. Secondly, we describe the implementation of the hybrid expert system using RBR and CBR reasoning methodologies. Finally we analyse the results.

3.1.1. Rule based reasoning (RBR)

In the development of RBR we used the intelligent flowcharting approach. VisiRule is a tool for creating decision support software purely by drawing flowcharts. The end result is Flex or Prolog code which is automatically generated, compiled and ready to run, but which can also be copied and used in a separate program. Not only can VisiRule be used by people with minimal programming skills. VisiRule also enhances productivity by considerably reducing the time it takes to produce a decision support system. VisiRule is an intelligent flowcharting tool in two senses. Firstly, it is used to create knowledge-based systems and, secondly, it intelligently guides the construction process by constraining what you can and can't do on the basis of the semantic content of the emerging program. VisiRule provides the automatic construction of menu dialogues from questions. These are populated by items inferred from expression boxes throughout the flowchart tree which have a path to the question.

VisiRule also offers:

- A wide variety of question types including single and multiple choice, numeric and integer entry, text and set entry

- A powerful expression handling logic
- Statement boxes for computable answers which are not decided by questioning the user
- Code boxes for procedural code and external functions
- Modularity allowing multiple charts to define one executable program

In particular we can build decision trees, classifiers and diagnostic systems of arbitrary complexity using these simple tools (Charles Langley & Clive Spenser 2007) [1].

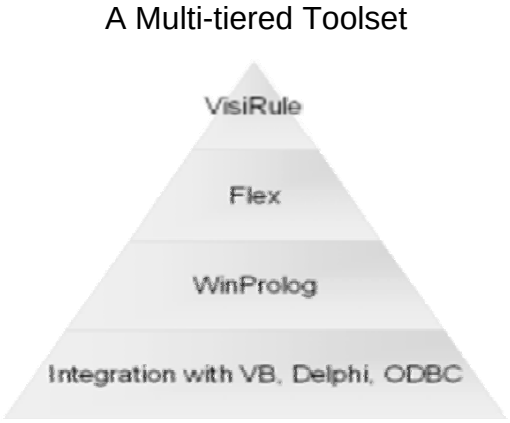

Figure 1 - VisiRule architecture

VisiRule lets you generate code in Flex which in turn gives you access to Prolog.

3.1.2 Simple Chart in VisiRule

The simplest VisiRule charts consist of a start box, one or more question boxes, some expression boxes and some end boxes which are the conclusions drawn from the answers to the questions.

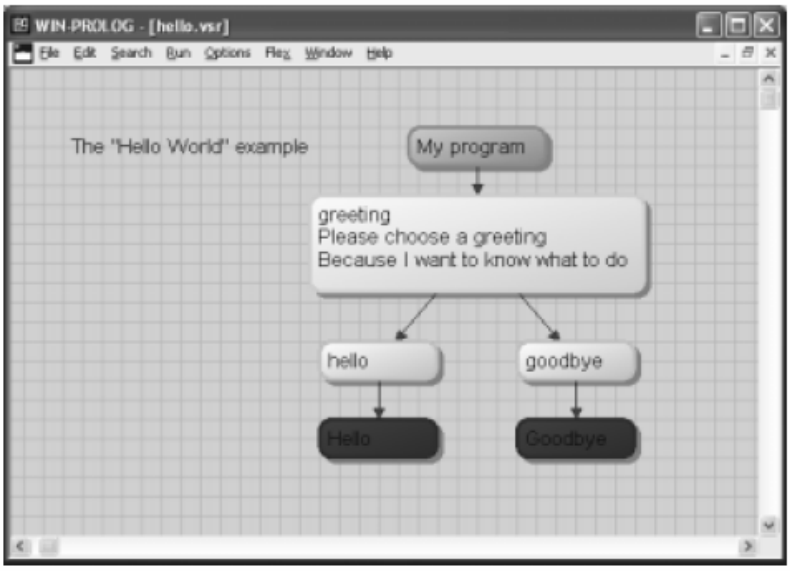

Figure 2. Simple Chart

3.1.3. Case based reasoning (CBR) using Java Net Beans

The **Net Beans IDE** is an open-source integrated development environment. Net Beans IDE supports development of all Java application types (Java SE including Java FX, (Java ME, web, EJB and mobile applications) out of the box. Among other features are an Ant-based project system, Maven support, refactoring, version control (supporting CVS, Subversion, Mercurial and Clear case). Net Beans refers to both a platform framework for Java desktop applications, and an

integrated development environment (IDE) for developing with Java, JavaScript, PHP, Python, Ruby, Groovy, C, C++ and others. The Net Beans IDE is written in Java and can run anywhere a JVM is installed, including Windows, Mac OS, Linux, and Solaris. A JDK is required for Java development functionality, but is not required for development in other programming languages. The Net Beans platform allows applications to be developed from a set of modular software components called *modules*. Applications based on the Net Beans platform (including the Net Beans IDE) can be extended by third party developers.

3.1.4. Microsoft Office Access

The Microsoft office Access is used to store the cases. Previously known as Microsoft Access, is a relational database management system from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the Professional and higher editions or sold separately.

3.1.5. Implementation of Rule Based Reasoning

The author of this research work carried out the development of the rule based reasoning prototype as mentioned earlier in Clips and Jess. The development of the prototype was done with proper verification and validation by the legal experts. The extensive developmental study of the modules was conceived and the VisiRule software was selected for the development purpose. The authors have developed 10 modules covering all aspects of transfer of property act in Indian legal domain using the Rule Based Reasoning concept. The modules consist of nearly 75 rules.
The module which have been developed by the author are a follows

1) Main Module
2) Individual Module
3) Authority Module
4) Document Module
5) Government Module
6) Guardian Module
7) Company Module
8) Free-Consent Module
9) Consideration Module
10) Karta Module

VisiRule implementation of the modules mentioned above is given below.

i) The **GREEEN** boxes indicate the **START,**
ii) The **YELLOW** boxes indicate the **QUESTION**
iii) The **RED** box indicates the **CONCLUSION** (i.e. either the property can be purchased or not) drawn after series of inferences.
iv) The **WHITE** boxes indicate **OPTIONS** to be selected by the questions.
v) The **BLUE** boxes indicate the **STATEMENT**
vi) The **BROWN** boxes indicate the **NEXT MODULE** for execution

The main module developed by the authors is presented as VisiRule chart the following fig.1.0.

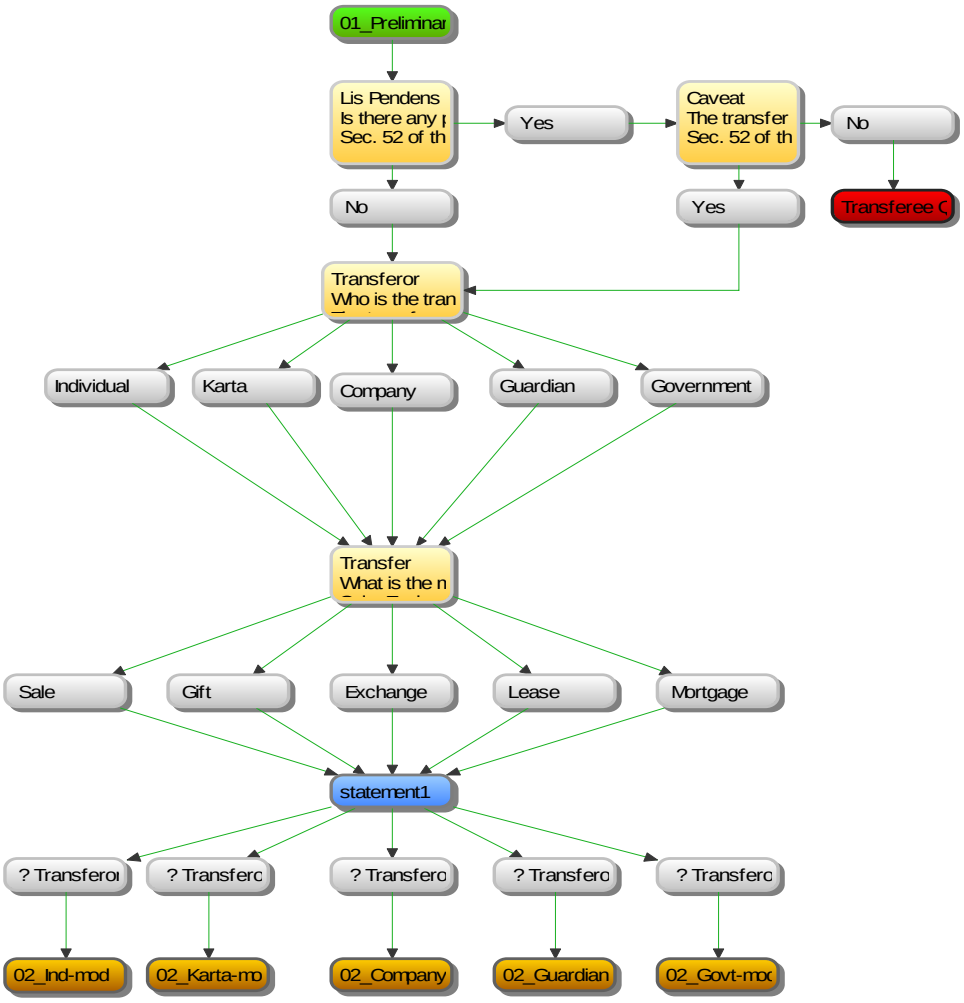

Fig 3 : VisiRule Implementation Module-1

The code of this flowchart is developed by the VisiRule in FLEX/ Prolog. As the source code very huge it has not be incorporated in the paper.

3.2. Implementation of Case Based Reasoning

The development of the case based reasoning module is in done in java net-beans. Proper verification and validation of this module was done by the legal experts. The cases related to Transfer of property act were collected from different legal databases and compiled. The necessary keywords were framed, which were used in searching for the related cases. The following Fig 2.0 gives the screen shot of the CBR module develoed in Java Net beans.

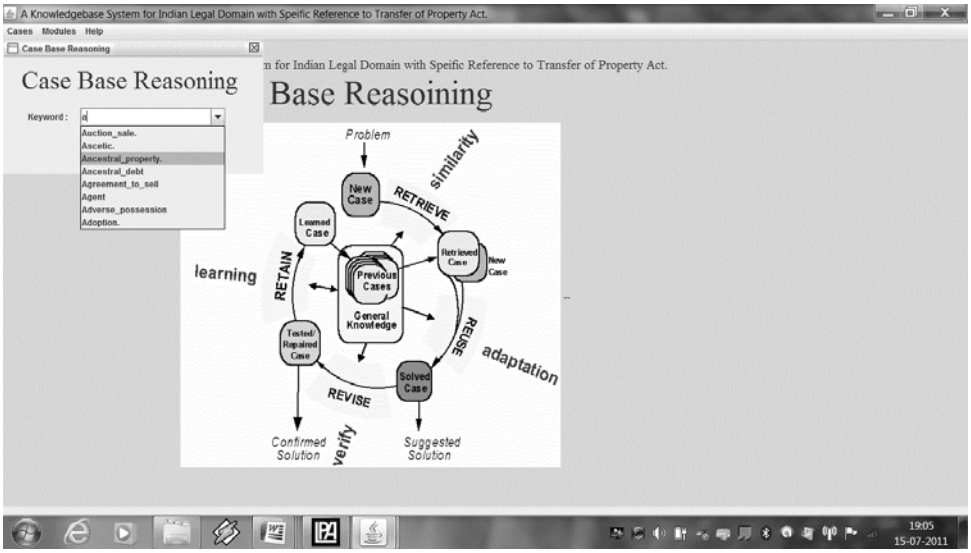

Figure 4. CBR Implementation

4. Discussion and Observations

In this paper we have used both the reasoning methodologies CBR and RBR. We found that legal knowledge based systems (LKBS) research aims at a broader and more ambitious type of support for legal professionals, and non-law literate part of the society. The expressed ambition leads to unrealistic expectations from intended users, and the researchers themselves are never satisfied with their products. Moreover, the ambition of intelligent automated legal reasoning introduces a need for intricate coding schemes, which makes that legal expert systems are limited to relatively very small and structured knowledge domains.

In our observations in the development of expert system, we arrived at the following points:

1. LKBS include not only traditional expert systems but also systems for communicating about knowledge, storing and retrieving knowledge, and organising knowledge. Hence the user has to look at *all* the benefits that LKBS can offer to the professionals and to non-law literate.
2. LKBS development offer simple but sufficient coding schemes for rule-based systems which will allow more people to work on them for their practical use.
3. Development of LKBS techniques make the best use of the enormous amount of legal information which is now becoming available on the Net and make it available for non-law literate.

Finally, LKBS researchers should concentrate on the specific added value of LKBS in field of automated legal reasoning. The internet is now leading to a real information explosion, but it gives the user few tools to handle the information overload it presents. As Simon [15] (1976) and Silver (1991) [14] argue, an increase in the amount of information available to a decision maker does not eliminate the information problem. It rather leads to a shift in needs. Instead of more information, people will want systems which support their selection of information and systems which really support decision making. LKBS research may provide these systems also with increasing amount of legal information available; it also increases the demand for real LKBS.

5. Conclusion.

The goal of the research work is to develop an integrated knowledge based system which incorporates the rule based and case based reasoning for transfer of property act of Indian legal domain using VisiRule and Java. VisiRule provides a graphical decision charting logic for representing rules, which makes application development easy. The authors have already developed the prototype of this expert system, which has been tested and validated by the legal experts. The authors have taken up the development of comprehensive legal expert system, and have built 10 modules which cover all the aspects of transfer of property act. The authors have also developed the

module for case based reasoning related to cases of transfer of property act which a user can refer to. This work can be of great help to both the non-law-literates and also for experts in the field of law for productive and fast decision making.

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