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Rule Based Expert System Prototype Application for Crime Against Women Law in Indian Legislation System

Prof. J.S. Jadhav. Dr. K.M. Nalawade, Dr. M.M. Bapat
Asstt. Prof. S.G.M. College, Principal, Rajarshi Chatrapati Principal N.S. Law College, Karad, Dist. Satara, Shahu College, Kolhapur, Sangali, Maharashtra, INDIA Maharashtra, INDIA, Maharashtra, INDIA.

Abstract: *Law is a system of rules and guidelines which are enforced through social institutions or society to govern behavior.[http://en.wikipedia.org/wiki/Law]Laws can be made by legislatures through legislation, the execution of law through regulations, or judges through binding precedents (normally in common law jurisdictions). Criminal lawis also known as penal law, pertains to crimes and punishment. It thus regulates the definition of and penalties for offences found to have a sufficiently social impact but, it makes no moral judgment on an offender nor imposes restrictions on society that physically prevents people from committing a crime in the first place. The law of criminalprocedure regulated by Investigating, apprehending, charging, and trying suspected offenders' .Butknowledge of law is very complicated because it consists of variety of laws, sections and sub sections. From past few years, the application of law through computer has progressed very much. The research in artificial intelligence has given one area for applied research. The authors of the paper have an objective to use this legal knowledge and reasoning strategies in crimes against women in Indian judiciary system for quality decision making. The authors have developed a technique or a way of carrying out a particular taskto transmute rules of crimes against women laws given in IPC into legal expert systems prototype for proposal of rule based expert system of judiciary applied for crimes against women in satara district under Indian Penal Code.*

Keywords: *Expert system, Indian penal code (IPC), Artificial intelligence, Expert system shell, Expertise, prototype.*

I. Introduction

1.1 Statement of the problem:

In this paper the authors used law as knowledge. The paper consists of structure of legal knowledge in first part.And in second part, the use of this knowledge in the development of prototype of legal expert system in order to give legal reasoning by using expert system shell. Thus in this study, two disciplines are incorporated or combined hence it is also called as integrative study.

1.2 Purpose:-

To develop a prototype of rule based expert system in judiciary to beapplied for crime against women in Indian law is the main purpose of this research paper is. The prototype is first stage of the development of complete Rule Based Expert System, which will be of great helpful in process of crime analysis. This will help the every woman, in understanding the necessary information related to crime as well as it will save time of advocates and police when used in court, lawyer's offices and police stations .It will also help to take decisions in the case of crime against women.

II. Significance of The Study

The present study will provide legal information as well as decisions which is necessary to understand by women. The aim of study is not to replace a human advocate, but provide an advice or suggestion to a woman who requires it. At first view, if she is satisfied with this information, she can approach the advocate for final suggestion. This saves time and money. Alsoit saves extraction of money hence, authorsthought that this study will help to common woman and also provide decision making tool for a human legal expert for making better decisions.

I. Research Background:-

A. Legal Terminology:-

The criminal jurisprudent came into existence in India from the ancient time of Manu. After some time crime has revolutionized the concept of criminal law in 1600. It gave power to law. This Charter laws renewed as time passes. Accordingly, the first Indian law commission was constituted in 1834 under the charter Act of 1833 to investigate the jurisdiction powers, rules of the courts operated in British India. In preparing the penal code, they made not only the English and Indian laws and regulations but also other code like Napoleon etc. on 1860, the code i.e. Bill was passed as Indian Penal Code. It consists of all Rules, Regulations, and Orders

criminal law in India and provided uniform criminal law for all the people in the British India. It consists of anti – social acts, Economic offences, criminal law. It is modern branch of law. The criminal law of India had been codified in the penal code is the substantive law. This penal code consists of separate laws on crime against women. Although women may be victims of any of the general crimes such as murder, robberies, cheating etc. only the crimes which are directed specifically against women are known as "Crimes against Women". Various new legislations have been made in existing laws, with a view to handle these crimes effectively. These are broadly classified under two categories.

I) The crimes under the Indian Penal Code (IPC).

II) The crimes under the Special and Local Laws (SSL)

I) The crimes under the Indian penal code (IPC) –

It consists in following criminal activity which are listed below –

1. Rape (Sec.376 IPC)
2. Kidnapping and abduction for specified purpose (Sec. 360-373 IPC).
3. Homicide for dowry, dowry death or their attempts (section 302/304 B IPC)
4. Torture both mental and physical (section 498 A IPC).
5. Molestation (sec. 354 IPC)
6. Sexual Harassment (sec. 509 IPC)
7. Importation of girls (up to 21 years of age C section 366 B IPC) .

II) The crimes under the Special and Local Laws (SSL*)* - It consists of all laws which are not gender specific, the provisions of law affecting women significantly and amendments carried out to keep pace with emerging requirements. The gender specific laws are

1. Immoral Traffic (Prevention Act 1956)
2. Dowry prohibition Act, 1961
3. Indecent presentation of women (prohibition) Act, 1986
4. Commission of sati (prevention) Act 1987

Above listed crimes have continuously increased day by day. The analysis of crime *rape* cases have been further categorized as incest Rape and other Rape cases. Incest Rape case has decreased in 2009 as compared to 2010.In 2010 increase in overall rape cases. Maharashtra state has accounted for highest cases .The rape victims are girls under 14 years of age, with teenage girls and women in the age group of 18-30 years. There is no age limitation to this crime. This crime occurs over 50 years age also parents and close family members are involved in these cases.

Kidnapping and abduction (Sec. 363-373 IPC).-These cases have also reported increasing continuously. Delhi has reported the highest rate.

Dowry Deaths (sec. 302-304 B IPC) -These cases have increased by 0.1% over the previous year.

Torture (Cruelty by husband and relatives) (sec. 498-A IPC) -Torture cases in the country have increased day by day.

Mole station (sec. 354 IPC) -According to section 354 of the IPC, whoever assaults or uses criminal force on any woman, intends outrage her modesty. An assault is something less than the use of criminal force. It consists of an attempt by a person having ability to do with force any hurt or violence.

Sexual Harassment (sec. 376 IPC) **-**Sexual harassment or according to section 375 of the IPC, a man is said to commit „rape" who expect sexual intercourse with a women under following circumstances.

1. Against her will
2. Without her consent
3. With her consent, when her consent obtained by putting her or any other person in whom she is interested in fear of death or of hurt.
4. With her consent, when the man knows that h is not her husband and that her consent is given because she believes that he is another man to whom she is or believes herself to be lawfully married.
5. *With her consent*, when at the time of giving such consent by reason of unsoundness of minor intoxication of the administration by him, personally or through another of any stupefying or unwholesome substance, she is unable to understand the nature and consequences of that to which she gives consent.
6. *With or without* her consent when she is under sixteen years of age. Also according to section 376 IPC punishments is provided by sub-sections like police officer commits rape, by superintendent of jail, or of remand home, etc by management staff of hospital with any woman in that, hospital, rape by man with his wife during separation, intercourse by man with woman in above sub-section can be punished with imprisonment of some years.
7. Importation of Girls (366-B IPC)- This includes whoever imports into India from any country outside India or from the state of Jammu and Kashmir any girl under the age of twenty one years with intent that she may be or knowing it to be likely that she will be forced or seduced to illicit intercourse with another person. The punishment for this offence shall be imprisonment for 10 years with fine. Other types of crimes are

crime head wise analysis i.e. special laws. It includes immoral traffic prevention cases were reported from Tamilnadu and Andhra Pradesh. Next special law is sati prevention Act. No case was registered under this act. The indecent representation of women (Prohibition) Act and Dowry prohibition Act. Are the special laws for women.

The researcher takes first type of crimes i.e. the crimes under the Indian Penal Code for study. In that, those crimes which are occurred in satara district in Maharashtra state, Indiaespecially studied. This is the procedure for verifying the title. There are many other features involved in this study but they are out of the scope of this paper.

B. expert system components terminology-

Expert knowledge is valuable. Expert systems are computer programs that capture some of that expert knowledge and allow its dissemination to others. Expert systems are usually built for specific application areas called Domains. It is intelligent system developed to solve real life problems in a particular domain.It is a part of computer sciences i.e. artificial intelligence system. Artificial intelligence has been used in a wide range of fields including medical diagnosis, stock trading, robot control, law, remote sensing, scientific discovery and toys. AI has filtered into general applications. An expert system is a problem solving and decision making system based on specific knowledge, its task and rules. It is also known as Knowledge Based System. Both the knowledge and the logic are obtained from the experience of a specialist in the particular area. It simulates the judgment of human or organization that has expert knowledge and experience in particular field. It is a program that interacts with the user with a human expert to solve a problem. The end user provides input information by selecting one or many options from list or by entering data. Depending on that data, program check knowledge base, simulates data and takes decision. The knowledge which is used by expert system for decision making must be organized in an easily accessible format that distinguishes among data, knowledge and rules. Structure of expert system orComponents of an Expert Systemconsists of 3 levels or parts.

A. Knowledge base (Rule base)

is the collection of facts and rules which describe all the knowledge about the problem domain. isderived from the human expert person. Consists of problem solving knowledge .Rules are typically structured as If-Then statements of the form:

IF <antecedent> THEN <consequent>

i.e. Rules are IF(condition)THEN(action) format

B. Working memory: It refers to task specific data or that data of interest to the system for the problem under consideration. It might be used to store intermediate conclusions and any other information inferred by the system from the data.The actual data represented in the WM depends on the type ofapplication. The initial WM, for instance, can contain a prioriinformation known to the system.**{**Expert Systems: K S R Anjaneyulu,Research Scientist ,in Knowledge BasedComputer Systems Groupat NCST. }

C. Inference Engine: It is a general problem solving control mechanism or method. It analyses and processes the rules, searches next portion of rule base and arrives at some solution or conclusion. It is the brain of the expert systems that provides a methodology for reasoning about the information in the knowledge base, and for formulating conclusions. An inference engine tries to derive answers from a knowledge base (chooses which facts and rules to apply when trying to solve the user‘s query)

These three parts together form expert system. The knowledge base may be a specific diagnostic. Knowledge compiled by a consulting firm and the problem data may be given by user. The knowledge base is the nucleus or heart of expert system. A knowledge base is not data base but it is rule in IF-THEN format created by knowledge engineers, who translate the knowledge of real human experts into rule and strategies. These rules and strategies can change; they depend upon the problem of domain. It constitutes the rules, facts or intuition that human expert might use in problem solving in particular domain. Inference engine organizes problem data and searches knowledge base for applicable rules.The User Interface is the part of the system which takes in the user‘s query in a readable form and passes it to the inference engine. then displays the results to the user. Explanation facility is part of the expert system that allows a user or decision maker to understand how the expert systemarrivedat certain conclusions or results

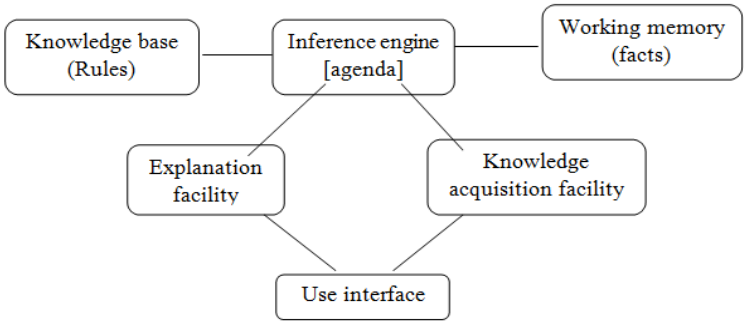

Fig 1 An Expert System Component

Expert system is computerized consulting service because the system do not get bored or tired or died or old. It preserves and propagates the knowledge so that it can be useful to others. The expert system uses this domain knowledge to solve problem in the knowledge base in the form of rules. Hence it is also called as rule based Expert System. It explains the expert system reasoning to the user. It uses the knowledge for reasoning to the user by global database of facts and these facts are used in the form of rules with highest priority as shown above in fig. 1.

Advantages Of Expert System

1. **Reliable**:-Human experts are not 100% reliable or consistent. But with expert system similar transactions can be handled in the same way and in many times as it is reliable.
2. **Documentation**:-Human experts may not be good at explaining decisions for some time but expert system can provide permanent documentation of the decision process.
3. **Faster:-**It is faster than human expertise.
4. **Consistency**:-It has consistency in decision making.
5. **Reduce risk**:-It reduces risk of doing business.
6. **Completeness**:-An expert system can review all transaction.
7. **Timeliness:-**Fraud can be prevented. Information is available sooner for decision making.
8. **Breadth**:-The knowledge of multiple human experts can be used to give system more breadth than Single person.
9. **Cloning or reproductively**:-Many copies or clones of expert system can be made rather it is affordable or possible but cloning of expertise person is not easily possible. The training to new human is time consuming and expensive.
10. **Permanence:-**Expert system does not forget the way human expert does.
11. It is cost effective.
12. It provides high potential.
13. It provides expertise needed at a number of locations at the same time.

III. Methodology

3.1 Expert System Designing:-

Problem solving with identifying the knowledge used is one of the most important parts of expert system design in our case. The task of acquiring the knowledge used in decision making in the process of evaluation of proposal of crime against women law involved survey of literature available and close interaction in the form of interviews and questionnaires, discussing with criminal lawyers, women etc.The authors have to select expert system shells and from that development of expert system is carried out.

Expert System Shell:-

The part of an expert system that does not contain any domain specific or case specific knowledge is the expert system shell. A single expert system shell can be used to build a number of different expert systems. The expert system shells are the main choice for building expert system.They provide a framework to produce an expert system. So the knowledge baseand rules are simply added to this framework.They allow multiple knowledge representation schemes to be used and allow knowledge bases.

Web-Builder 3.0:-

ES-Builder is an Expert System Shell application. The software is used to design expert systems that may be accessed dynamically as web pages and incorporated as a knowledge base in any web site. ES-Builder features a decision tree modeling process for developing the logic of the expert system (ES).The purpose of the ES-Builder program is to assist expert system developers by providing a simple interface to implement model expert systems that may have been pre-designed using a suitable design process.This type of expert system is developed using a process of deductive reasoning. Thus, the expert system provides an interface to test a series of attributes, which through the process of deduction allows the user to arrive at a conclusion which is logically correct based on the values chosen by the user for each attribute. The user constructs the expert system using a decision tree interface here attributes, values and conclusions are added as leaf nodes on the tree. Each attribute consists of actual facts of domain area. Each node has a small integrated data set which is used to form the content of the expert system when it is accessed online.ES-Buildersimplifies the implementation of such an expert system, but relies on the correct specification of the logic of the system using a decision tree. This allows the user the flexibility to both edit the expert system and to test it within the one application.

Implementation:–

The detail analysis of domain area was carried out. After going through the analysis following procedure takes place. The work was carried out under the main steps mentioned below. Each of these steps will be deals subsequently.

1. Expert system shell concepts i.e. Web-Builder 3.0 concepts which need to be used.
2. Discussions/interviews with the Legal experts i.e. criminal lawyers in field and academicians in Law need to use.
3. The rules are framed using the legal knowledgeandincorporates into Web-Builder
4. Testing and Implementation
5. After going through series of discussions and the interviews were held with the practicing advocates, who are experts in crime against women law. The discussions consist of understanding the concept of laws of crime against women. The rules are then framed. We had also discussions and interviews with academicians who are teaching law. The discussion makes great help in framing of the rules.

Concepts which need to be used-

The Web-Builder3.0 supports both the Forward Chaining and Backward Chaining, which are also termed as Data-driven Rule-based Expert Systems and Goal-driven Rule-based Expert Systems.

1Forward Chaining (Data-driven):-

The forward chaining inference engine takes rule, and if its conditions i.e. facts are true, adds its conclusion to working memory, until no more rules can be applied. In forward chaining the system simply test the rules in the order that occurs, therefore rule order is important.i.e.

if the conditions of the rule _if A and B

then C' are true,

then C is added to working memory.

2 Backward Chaining (Goal-driven):-

The backward chaining inference engines tries to prove a goal by establishing the truth of its conditions; i.e. the rule _if A and B then C',

the backward chaining engine will try to prove C by first proving A and then proving B.

Proving these conditions to be true, may well invoke further calls to the engine and so on.

Before expert systems can be created in the ES-Builder3.0 expert system shell, the user first needs to:

- plan and design the expert system efficiently using a clearly defined Universe of Discourse (UofD)
- have identified all the conclusions to be included in the expert system
- have determined all of the attributes i.e facts that will be tested by the expert system
- have researched the UofD thoroughly and have identified all appropriate values for each attribute.

The framing of rules using the Legal knowledgeof Laws for Crime against Women and integrated in the**Web-Builder 3.0.**A rule consists of a bunch of variables, together with some logical operators (if, then, and, or, not, mathematical operators, etc.). Rules are chained together to form a rule base, which is basically a database of rules. "Chained together" means that the rules connect to each other: a condition in one rule is the consequent or conclusion in another rule.

Following are the some sample examples of rules which are used in the development of the prototype

Rule 1:

If Whoever Voluntarily Causes A Woman With Child To Miscarry,

And If Such Miscarriage Be Not Caused In Good Faith For The Purpose Of Saving The Life Of The Woman,

And Be Punished Under Section 312,With Imprisonment Of Either Description For A Term Which May Extend To Three Years, Or With Fine, Or With Both.

RULE 2:

If Whoever Voluntarily Causes A Woman With Child To Miscarry,

Andif The Woman Be Quick With Child,

Then Shall Be Punished Under Section 312, With Imprisonment Of Either Description For A Term Which May Extend To Seven Years, And Shall Also Be Liable To Fine.

Testing And Implementation

This type of rulescovered onecrimewith its subsections i.e. section 312 to section 318 were framed andthoroughly checked by the legal experts, after which the implementation in the WEB-BUILDER 3.0 was taken up. Weused WEB-BUILDER 3.0shells syntax in the form of 'IF-THEN' form and developed a '*decision tree'*. Afterthat we tocross check the findings. The testing of the rules was done by authors and then again verified bythe Legal Experts and scholars in field of Law.

IV. Results

The sample decision tree which was used in implementation of prototype is shown as follows—

Section 312 on Miscarriage—

U of D - Expert System of Miscarriage

|

|

+---**A -** Whoever voluntarily causes a woman with child to miscarry.

|
|---**V -** Yes
| |
| +---**A -** If such miscarriage be not caused in good faith for the purpose of savingthe life of the woman.

| |---**V -** Yes
| | |
| | +---**C - Under section 312,Be punished with imprisonment of either description for a term which may extend to three years, or withfine, or with both.**

| +---**V -** No
| |
| +---**C - Under section 312,Be punished with imprisonment of either description for a term which may extend to three years, or withfine,or with both.**
|
+---**V -** No
|
+---**A -** If such miscarriage be not caused in good faith for the purpose of saving
| the life of the woman.

|---**V -** Yes
| |
| +---**C - Under section 312,Bepunished with imprisonment of eitherdescription for a term which may extend to three years, or withfine,or with both.**

+---**V -** No
|
+---**A -** Causing miscarriage without woman's consent whether woman isquick with child or not

|---**V -** Yes
| |
| +---**C - Under section 313,shall be punished with 1[imprisonment for life] or with imprisonment of either description for a term which may extend to ten years, and shall also be liable to fine.and punishment under section 34**
|
+---**V -** No
|
+---**A -** Whoever, with intent to cause the miscarriage of a woman
| with child,

|---**V -** Yes
| |
| +---**A -** Or does any act which causes the death of such woman,
| |
| |---**V -** Yes
| | |
| | +---**C - Under section 314, Death caused by act donewith intent to cause miscarriage and shallbe punished, with imprisonment of either description for a term which may extendto ten years, and shall also be liable to fine;**

| |
| +---**V -** No
| |
| +---**C -** Under section 314, Death caused by act done with intent to cause miscarriage and shall be punished,with imprisonment of either description for a term which may extend to ten years, and shall also be liable to fine;
|

Sample Decision Tree of Protype

The different conditions i.e causes were tested. It was seen that all rules and under all conditions or causes were seen that are fired. This gives the authors the confidence about continuing the development of the next stage of the research work.

Future Scope of the Study:-

In next stage of the research work the authors undertake the complete development of Rule Based Expert system of judiciary to be applied for crime against women.

V. Conclusion

The authors have developed a Rule Based Expert System prototype for crime against women consist of many rules. It is tested successfully from expert person i.e. expertise criminal lawyers. Hence authors' opinion is that it is possible to develop a comprehensive Rule Based Expert system for crime against women which can act as great tool for experts in the field of law.

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