DIGITAL REVOLUTION AND ARTIFICIAL INTELLIGENCE: CHALLENGES TO LEGAL EDUCATION AND LEGAL RESEARCH

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Introduction

The quest for innovation marks the growth of human civilization. Ingenuity manifests itself in numerous ways, sometimes leading to spectacular revolutions. The transition from the era of the "idiot box" to that of the "thinking machine" as a consequence of the digital revolution is an instance of such a phenomenon. Unfortunately, there exists a dichotomy between the use of technology and even its access to different categories of people with the consequence that the advantages of information technology are not equally availed by all. This has led to a situation which is popularly known as the "digital divide", the implications of which are too obvious to be ignored. This concern is particularly relevant because the application of the software technology to serve the ends of justice can present an effective alternative to the beleaguered justice-delivery system and may be of significant assistance in achieving the merits of an ideal adjudication mechanism, which include, inter alia, timeliness, affordability and transparency of the judicial procedure.

The paper proposes a model legal counseling/judgment prediction system designed in such a manner so as to predict with considerable precision, the ends of a judgment. The model so designed, uses a system of scientific classification and a comprehensive catalogue of case details as its basic inputs and an inbuilt artificial intelligence-based programming to process the same. The paper further illustrates the idea and procedure underlying the same through schematic diagrams and sample cases.

The prospects are bright both for teaching and research in the application of computers. Inter-disciplinary studies in the area of the law and computers would provide a meaningful interaction between the legal academicians and technologists. Computers can be best used in two ways to assist the legal profession. One is the information

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retrieval system which can be developed with the help of law faculty and the computer science department. The second area in which computers can very usefully be employed is artificial intelligence system with which several types of stereotype cases can be decided with the help of computer programs to arrive at more objective and quicker decisions. The law faculty should actively engage in collaborative research with the computer science department. This needs to be pursued vigorously to design meaningful computerized programs as alternative dispute settlement mechanism.

Access to Justice

Access to justice, includes the meaningful opportunity, directly or through other persons:

1. to assert or defend a claim and to create, enforce, modify, or discharge a legal obligation in any forum;
2. to acquire the procedural or other information necessary:
   - **i.** to assert or defend a claim, or
   - **ii.** to create, enforce, modify, or discharge an obligation in any forum, or
   - **iii.** to otherwise improve the likelihood of a just result;
3. to participate in the conduct of proceedings as witness or juror; and
4. to acquire information about the activities of courts or other dispute resolution bodies.

Further, access to justice requires of courts or other dispute resolution bodies. Further, access to justice requires a just process, which includes, among other things, timeliness and affordability. A just process also has "transparency", which means that the system allows the public to see not just the outside but through to the inside of the justice system, its rules and standards, procedures and processes, and its other operational characteristics and patterns so as to evaluate all aspects of its operations, particularly its fairness, effectiveness, and efficiency.

Cornerstones for access to justice include lawyers, free dissemination of law and the judiciary. Now, lawyers are not practically accessible to all individuals in the society owing to structural failure of the legal system. Law develops its complexity with the society; nonetheless, dissemination technology of law is not as developed as sufficiently to satisfy demands of the society. The court is in a limbo in which impartiality and fairness to all parties constrain its role to assist unrepresented litigants.

Disruptive legal information technology and emerging Electronic Legal Information (ELI) may arise as the 4th cornerstone in face of the challenges; the other three being are lawyer, dissemination of law and judiciary. ELI refers to:

1. an integrated Electronic Law governing civil procedures and other areas of substantive law,
2. electronic legal document filings and evidence and
3. electronic court case status information.

ELI is transforming the existing cornerstones to their virtual existences, which take on new capability to face the challenges of high costs, delay and complexity.

To promote access to civil justice, disruptive legal information technology should be adopted and a positive right to access ELI be established. For unrepresented litigants, the use of ELI will put them in a better position to assess if legal assistance should be sought or it would be better to remain unrepresented. Should they choose to be unrepresented, ELI provides ease of reference of law and integrates law from their perspective. For represented litigants, they will have a greater access to information concerning activity of court proceedings and they will be in a better position to push progress with the availability of case status information and electronic court document filings.

Digital Revolution

The digital revolution offers significant opportunities to those who provide legal assistance and education to low-income people and communities. New technologies enable us to create higher quality work product, conduct better research, work more collaboratively, learn more readily, and–most important–serve clients more effectively. Clients and advocates alike can find relevant information on the Internet; programs can use a variety of new management and evaluation tools, and everyone can communicate more easily.

In the past ten years, our society has experienced a "digital revolution", the implications of which are as stunning as those of the industrial revolution, yet are even more remarkable because these changes are happening in a fraction of time.

Beginning with the affordable personal computer and taking a giant leap forward with the creation of the Internet and the web browser, this revolution has changed how we work, play, communicate, learn, and obtain goods and services.

Yet, the pace of change has not been the same in all sectors of society. Use of technology by the middle and upper class and by the West is significantly ahead of use by poorer people and people of colour, a gap that some observers have termed the "digital divide". On a corporate level, this gap looms equally large between the private sector and the non-profit sector. These technological advances have:

1. Enabled greatly expanded access to legal information for both advocates and clients through internet and e-mail technologies
2. Expanded access for clients by using telephones for screening, obtaining basic client information, referrals, and providing brief advice and services, and also by posting information on the Internet
3. Enabled better case management and data collection, along with automated templates for document creation
4. Improved communication between lawyers and clients through new telephone technologies, cell phones, and video conferencing
5. Facilitated staff and volunteer recruitment through e-mail and the Internet
6. Provided new avenues for outreach to clients and the public
7. Increased training opportunities for advocates
8. Created a greater sense of community through e-mail and the Internet

The uses of new technologies by the equal justice community in three functional categories can be discussed as follows:

1. Improving program and office management
2. Increasing access to assistance and information for advocates
3. Improving client education, preventing legal problems, and assisting prospective litigants

In addition to educating clients and communities about resources, the Internet can also provide people with information about their legal rights and about how to solve legal problems on their own when they are unable or unwilling to obtain an attorney. At the most basic level, brochures and manuals can be posted on websites, which is an efficient distribution and production mechanism.

Moreover, the potential of web technology exceeds simply improving access to what otherwise might be available in print. Computer can help *pro se* litigants[1] create attractive, properly formatted and

[1] Courts in American states on the East Coast, the Midwest, and the South generally refer to SRLs (self-represented litigants) as *pro se* litigants, from Latin meaning for oneself, or on one's own behalf. BLACK'S LAW DICTIONARY 1236 (7th ed. 1999).

persuasive court forms and pleadings. Computerized templates can use branching logic to take clients through the process of analyzing their case and providing the appropriate information to the court. Video screens can be used to show clients how to navigate through the courthouse, or even how to present their case. Audio files can present information in spoken form for clients who can't read (due to illiteracy or disability). These programs can be made available at courthouse kiosks, libraries, and anywhere a client can obtain access to the Internet. A multifaceted effort, including education, scholarship, resource development, and collaboration, can serve as a powerful catalyst for change, even when the total amount of resources available is relatively small.

Digital Revolution and Artificial Legal Intelligence

The gizmos of the digital age owe a part of their numeric souls to Dennis Ritchie (1941-2011) and John McCarthy (1927-2011), the machine whisperers. When Mr. McCarthy and Mr. Ritchie first developed an urge to talk to machines, people still regarded the word "digital" as part of the jargon of anatomy. If they no longer do, that is because of the new vernaculars invented to cajole automatons into doing man's bidding. In 1958, Mr. McCarthy came up with the list-processing language, or LISP. It is the second-oldest high-level programming language still in use today–one whose grammar and vocabulary were more perspicuous and versatile than the machine code early programmers had to use. A little over a decade later Mr. Ritchie created C.C. fundamentally changed the way computer programs were written; for the first time it enabled the same programs to work, without too much tweaking, on different machines; before, they had to be tailored to particular models.

Much of modern software is written using one of C's more evolved dialects. These include objective C (which Apple favours), C# (espoused by rival Microsoft) and Java (the choice for a host of internet applications). Mr. Ritchie and his life-long collaborator, Ken Thompson then used C to write UNIX, an operating system whose powerful simplicity endeared it to the operators of the mini-computers which were starting to proliferate in universities and companies in the 1970s. Nowadays, its iterations undergird the entire internet and breathe life into most mobile devices, whether based on Google's Android or Apple's iOS.

UNIX spurred the development of mini and later micro-computers. Mr. McCarthy always argued that the future lay in simple terminals hooked up remotely to a powerful mainframe which would both store and process data–a notion vindicated only recently, as "cloud

computing" has spread.

As for LISP, Mr. McCarthy created it with an altogether different goal in mind–one that was to talk back. Intelligently, LISP was designed to spark this conversation, and with it "artificial intelligence", a term Mr. McCarthy coined hoping it would attract money for the 1st conference on the subject at Dartmouth in 1956.

In 1962, he set himself the goal of building a thinking machine in ten years. He would later admit this was hubristic. Not that technology wasn't up to it, the problem lay elsewhere–in the fact that: "we understand human mental processes only slightly better than a fish understands swimming." An intelligent computer, he quipped, would require '1.8 Einsteins and one-tenth of the resources of the Manhattan Project' to construct.

Neither was forthcoming. Mr. McCarthy continued to tinker away at a truly thinking machine at Stanford. He never quite saw his dream realized. Mr. Ritchie had more luck. "It's not the actual programming that's interesting," he once remarked. "It's what you can accomplish with the end results."

Artificial Legal Intelligence

Legal reasoning involves case analysis in statutory as well as real world perspectives. The impact of real world perspective on case analysis poses serious challenges to knowledge engineers for building legal expert systems. A legal expert system intends to provide intelligent support to legal professionals. The proposed legal predictive system is an attempt to predict the most probable outcome of a case according to statutory as well as real world knowledge of the legal domain.[2] The system accepts the current fact situation of a case and analyses it interactively with legal personnel. This work introduces a frame-like knowledge structure, "lattice", with two-dimensional attributes. This paper contains a detailed discussion on "artificial intelligence-based" case analysis of theft cases in a real world perspective.

One of the basic principles of justice is that 'justice delayed is justice denied'. It is from this that the Supreme Court of India has carved out the fundamental right to speedier trial from Article 21 of the Constitution of India, 1950. The present adjudication process requires transformation in view of the high cost of legal services, baffling complication in existing procedures and frustrating delays in

[2] Brown v. Board of Education of Topeka, 347 U.S. 483 (1953).

securing justice. Formal adjudication should be more of a last resort than it has been in the past. In recent times, efforts have been made to develop alternate adjudication models in the form of *Lok Adalats*, *Nyaya Panchayats* etc. In this context, it is felt that alternate adjudication machinery can be augmented with modern computers for a greater extent of openness and accessibility thus lending credibility to the dependence of both government and people on these modes of alternate adjudication machinery.

Automation in the legal world was first proposed[3] at an International Symposium on Mechanisation of Thought Processes held at the National Physical Laboratory in Teddington, London. Law machines were classified by him into two types–documentary machines and consultation machines. Documentary machines are meant for legal information retrieval operations such as storing/retrieving legal provisions and supporting as well as opposing precedents relevant to the given case. A program FLITE (Finding Legal Information Through Electronics) was developed in 1964 as the earliest full text retrieval system for the U.S. Air Force. LEXIS and WESTLAW[4] are some of the recent commercial systems offering interactive retrieval through terminals at the customer's office. Intelligent support cannot be provided for the user while retrieving the precedents owing to the text matching (keyword search) technique followed in these systems. Hafner[5] proposed an AI-based conceptual retrieval system using individual case frames so that search for relevancy can be made based on a concept of the case rather than text matching of certain keywords. Considerable research work has thus been carried out and significant developments have taken place in the area of documentary machines.

However, no such significant progress can be claimed to have been made in the area of consultation machines which are meant for giving legal advice. The HYPO system developed by Rissland and Ashley[6] during the 1980s aims at helping an attorney to analyse a new case in the light of relevant precedents and accordingly generate outlines of arguments for both plaintiff and defendant. The JUDGE system,

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[3] L. Mehi, *Automation in the Legal World,* Proceedings of Symposium on Mechanization of Thought Processes at National Physics Lab, Teddington, London (1958).

[4] C.D. Hafner, *Conceptual Organization of Case Law Knowledge Bases, in* Proceedings of the 1st International Conference on AI and Law, New York: ACM, 35-42 (1987).

[5] *Id.*

[6] K.D. Ashley & E.L. Rissland, *Dynamic Assessment of Relevancy in a Case Based Resasoner,* Proceedings of the 4th Conference on Artificial Intellgience Applications, California, 208-214; K.D. Ashley, *Reasoning with Cases and Hypotheticals, in* HYPO. INT. J. MAN MACHINE STUDIES 34, 753-796.

developed in the late 80s by Bain[7] proposed modeling the sentencing ability of judges. This system identifies a binding precedent according to a set of salient features and suggests a commensurate sentence for being awarded in the case in hand. These two systems have been the most widely accepted legal consultation systems to date. But these and similar other consultation systems are oriented towards precedents and are based on a case-based reasoning paradigm.

A precedent can either suggest judgment appropriate to cases with similar current fact situation or it can point to an apt case-law to solve a particular technical ambiguity. These two aspects of the precedent are to be dealt with separately since the first aspect provides only the guidelines whereas the second provides the case-law that is binding on lower courts. The first aspect is emphasized in systems like HYPO whereas the second aspect is considered in system like JURIX[8] and Gardner's legal reasoning system.[9] Gardner's approach suggests that the case be analyzed keeping in view statute as well as relevant case-law. This system aims at giving decisions for "easy" cases, while the "hard" cases, cases which can be argued in either way by a competent lawyer, are left undecided. McCarthy's TAXMAN project[10] models deductive legal reasoning based on statute. The control strategy of legal systems determines the applicability of those systems to various fields of legal domain–HYPO suits trade secret misappropriation. TAXMAN models the taxation of corporate reorganization. Gardner's system deals with formation of contracts by offer and acceptance. However, for certain other legal fields, legal reasoning involves analyzing the case through a real world perspective. Along with the statutory rules, various heuristics imposed by culture, region, conventions and the experience of judges are also to be considered while making the decision. Given the case proceedings/current fact situation, a highly structured legal reasoning system to analyze the case thereby predict the most probable judgment based on the statue and discretion of the judge is proposed in this paper. It is hoped that the proposed legal counseling system will be of use to our society in the following ways:

1. The system, by its ability to predict in advance the most probable outcome in a given case, will enable individual clients to decide about the advisability or otherwise of entering

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7 S.K. Srivastava, *Case-based Systems in Law: A Survey*, Project Report, Department of Electronics, New Delhi.

8 *Id.*

9 A.L. GARDNER, AN ARTIFICIAL INTELLIGENCE APPROACH TO LEGAL REASONING (Brandford Book ed., Cambridge, MA: The MIT Press 1987).

10 T. McCarthy, *The Taxman Project: Towards a Cognitive Theory of Legal Argument in Computer Science and Law: An Advanced Course* (B. Niblett ed., New York: Cambridge University Press 1980).

into a legal dispute in a given situation. This is turn will lead to reduced workload on the considerably over-bounded courts (e.g., Ayodhya case).

2. The system, through its ability to estimate the effect of each individual fact on the judicial decision (by simulating the judgment with altered current fact situation) can aid legal practitioners and criminal investigators in discharging their professional duties more effectively and efficiently.
3. The system, by providing an integrated view of the case through the highly structured representation of the current fact situation of the case, can be helpful to judges in taking faster decision thereby mitigating the hardship caused to the litigant public by delayed justice, the bane of the present judicial system (e.g., Ayodhya case).
4. The system can resolve petty litigations among people who cannot afford the money and the time required in the regular court proceedings, thus providing a computerized alternate adjudication system.
5. Based on the model proposed, a generalized system can be developed by drawing on the expertise of several meritorious judges, which in turn can be used to check the correctness of a specific judgment, so that the case may be reconsidered if necessary.

Proposed Legal System

The proposed system depicted in Figure 1 (APPENDIX 1) is a legal counseling system that accepts the current fact situation of the case from a legal practitioner and interactively proceeds to analyze the case based on statute and real world information. Processing of a case in a real world perspective demands interactive case analyze. This system aims at predicting the most probable judgment. It has to process the following three types of legal information regarding a case:

1. Technical information consists of particulars of sections of the relevant Act invoked in dealing with the case, i.e., the ingredients and evidence level at which each of the ingredients has been established. This information regarding a specific case can be represented as an instance of the section's decision lattice (D-lattice).
2. Non-technical information or the real world information of the case, such as the details of how and why the crime was committed can be represented as instances of the corresponding common sense lattices (C-lattice).
3. Formal general information regarding the sentential details of each section is represented as a sentencing lattice (S-lattice)

and it is of static nature.

When the user interacts with the system, the "shell" uses the C-lattice instances to accommodate the details of the real world information of the present case. "Evidence estimator" and D-lattice filler gets technical information of the present case from the "shell", and prepares the D-lattice instance representing the case in view of the relevant section. "Case strength evaluator" evaluates the corresponding D-lattice instance to measure the strength of a given case in accordance with the statute. The "discretion module" accommodates the experience-based real world knowledge of legal professionals as non-technical heuristics. "Credibility evaluator" applies these heuristics on the C-lattice instances of the cases to determine the credibility of the case. "Decision maker" suggests a decision on whether the accused has to be convicted or not based on the combined effect of strength and credibility of the case.

The judgment of a case includes the decision whether to convict or not as well as the sentence to be undergone by the accused, if necessary. If a decision to convict the accused is taken, the decision-maker enables the sentencing module. Severity evaluator processes the C-lattice instances of the present case to get a severity measure of the crime committed. Based on this measure, punishment will be meted out to the accused in accordance with the sentential norms contained in the relevant S-lattice. According to the norms provided by the S-lattice and the severity of the present case, sentencing will be made by the sentencing module.

Since human reasoning is being simulated in a specific domain, the system becomes an expert system[11] as its decision-prediction performance tends to that of a intelligent professional assistance to legal professionals and offers intelligent support to busy legal professionals while applying the regular domain specific techniques in case analysis so that they can concentrate better on critical aspects of cases. It this paper, the processing of non-technical knowledge to estimate the credibility of a case is dealt with in detail.

Knowledge Structuring

Non-technical knowledge of a case involves information regarding the details of the crime. This knowledge should be organized as a hierarchical system so that the details of higher level objects can be elaborated at lower levels. A highly accepted knowledge structure that

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[11] R. KELLER, EXPERT, SYSTEM TECHNOLOGY: DEVELOPMENT AND APPLICATION (Engelewood Cliffs, NJ: London: Yourdon, Prentice-Hall 1987).

can represent a complex object as a hierarchical system is "frame".[12]

1. Frames

Frames are one of the highly accepted knowledge representational formalisms in the field of artificial intelligence, in particular in computer vision and natural language understanding. A frame represents a complex stereotypical object/occurrence and its slots represent the stereotypical aspects of the object. A slot can contain another frame or an atom as its value at any of its various associated facets the facets act as directives to the inference mechanism. An instance of a frame represents a specific object/occurrence and each of its slots can accommodate the particulars of the associated aspect of the specific object. In case of the absence of an absence of an aspect in a class frame, it can inherit that aspect from its nearest ancestor. This value inheritance[13] property allows frames to avoid redundancy and to be concise. The value inheritance property makes the frames suitable for natural language understanding etc., where implicit knowledge retrieval is essential. The proposed legal system does not need the value inheritance since all individual facts of the case should be established explicitly. At the stage of predicting/making judgment the legal domain is a closed world and no attempts to establish the missing facts are allowed. Hence, the procedural attachment feature of frames in terms of domain etc., is also not necessary. Rather, the hierarchical knowledge structuring aspects of the frame suggest a new knowledge structure called "lattice" to represent the informal knowledge of legal domain.

2. Lattice

A class of objects/occurrences with a predefined set of attributes can be represented as a lattice. The specific information regarding a particular object/occurrence can be represented as an instance of the class lattice. The values of an attribute of the instance lattice can be filled, if and only if the corresponding class lattice supports that attribute (e.g., if it is a relevant attribute). Instead of unidimensional attributes, the lattice has two-dimensional attributes for the following benefits:

i. Two-dimensional attributes make the lattice more expressive and nearer to the natural way of representing legal information.

ii. Due to the modularly derived by the two-dimensional attribute lattice, it is preferred by domain/legal experts. Hence,

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12 E. RICH & K. KNIGHT, ARTIFICIAL INTELLIGENCE (2d ed., New Delhi: Tata McGraw-Hill 1991).

13 W.F. Tichy, 20(11) IEEE COMPUTER 43-54 (1987).

knowledge acquisition is convenient.

iii. Firstly, conversion of the domain expert's knowledge into internal knowledge structures is simpler for the knowledge engineer; secondly, checks for completeness and making modifications to the existing knowledge are more convenient due to the modularity.

The value of an attribute of an instance lattice can either be an atomic value or an instance of another lattice as dictated by the nature of the attribute.

3. Knowledge Representation

Non-technical information of a case involves details of the case in layman's view. This knowledge can be represented using various C-lattices. The set of C-lattices to represent theft cases are as follows:

i. **Case-Ref**: This lattice is at the topmost level in the lattice system. This has to be accessed by the reference number of the case.
ii. **Accused-name**: This lattice gives the details of the accused in this case. All relevant known information of the accused should be filled into various attributes of this lattice.
iii. **Execution-Ref**: This lattice accommodates the details of the commitment of the crime. These details are in turn structured into the three lattices-event-no, abettor's name, item-name.
iv. **Event-no.**: This lattice represents the details of a particular event such as when and where the event happened.
v. **Abettor-name**: This represents the relevant capabilities of the abettors of the case.
vi. **Item-name**: It represents the characteristics of a particular item of interest.

The C-lattices are shown in Figure 2 (APPENDICES 2a-2f).

4. C-lattice Operators

C-lattices provide the structure for organizing the real world/non-technical knowledge of a particular case. Each of these provides a general structure for a chunk of relevant non-technical knowledge. Several functions were developed in Common-LISP to operate with these lattices. The operations needed to store and retrieve the details of a case are as follows:

i. **(Intro-instance <ref-no> case-ref)**: This function generates an instance of case-ref lattice and identifies it with <ref-no>.
ii. **(Ct-put <lattice-id> <attribute-path) <value))**: This function is called while storing the details of a case. The value of the detail is stored in the identified lattice at the location according to the <attribute-path>. While storing, the function checks the

relevancy of the attribute-path. Automatic introduction of the value as an instance of its compatible lattice is done through this function.

iii. **(Ct-update <lattice-id> <attribute-path> <value>)**: This function can be used if a particular value of an attribute is found to be wrong and has to be deleted. The value will be deleted from the list of values of the attribute of the identified lattice.

iv. **(Ct-update <lattice-id> <attribute-path> <value>)**: This function can be used to overwrite the previous value of an attribute with a new value of <attribute-path> of the <lattice-id).

v. **(Ct-get <lattice-id) <attribute-path))**: This function will be used to fetch/retrieve the list of values of <attribute-path) of lattice identified.

vi. **(Ct-removelatt <lattice-id>)**: This function can be used to delete lattices that were introduced as sub-structures to the lattice-id in a cascaded way. This function will be of use in cases of withdrawal of a case or cases that are finalized.

5. Discretion Module

C-lattice instances associated with a case can be processed with the discretion module to evaluate the credibility of the case. The discretion module consists of heuristic knowledge of judges. This heuristic knowledge is represented procedurally over the C-lattice operators. Various chunks of heuristic knowledge are represented as individual "rules" and a rule either supports or opposes the guilt of the accused. Some of the heuristics useful for dealing with theft cases have been implemented in our legal system. They are as follows:

RULE 1

If	the belongings of the accused are found at the scene of occurrence of the crime
Unless	all of them are explained reasonably
Conclude	to increase the credibility of the charge/commission of the offence of theft.

RULE 2

If	the accused takes away less valuable items apparently leaving high valued items
Unless	there is a threat of being captured on the spot or the portability of the stolen item is more than that of

items untouched
or
the untouched items are easily traceable

Conclude to reduce the credibility of the case.

RULE 3

If the accused who is old/child/female forced stronger victims

Unless the accused is supported by a strong weapon or a chemical or an abettor

Conclude to reduce the credibility of the case.

RULE 4

If the presence of the accused is recorded at a place other than the scene of occurrence at reasonably the same time that the crime was committed (alibi)

Unless journey by any viable fast transport makes it possible to reach the destination within the stipulated time
and
the accused is healthy and capable of doing such a journey

Conclude to make the credibility of the case zero.

RULE 5

If the accused is not sound physically/mentally at the time of commission of the crime

Unless the experts certify his capability to perform all the required skills to commit the crime
or
abettor can help him with those skills

Conclude to reduce credibility of the case to a greater extent.

RULE 6

If time elapsed between entry and exit of the accused into the crime scene is less than the minimum expected duration of crime

Unless with the support of a familiar abettor or the accused himself is familier with the scene of crime

Conclude to make the credibility of the case zero.

RULE 7

If	the accused acquired/prepared a rare tool or vehicle that was used/suspected to be used while executing the crime
Unless	he lost it well before the occurrence of crime
Conclude	to increase the credibility of the case to a greater extent.

RULE 8

If	the accused did not acquire the required special skills
Unless	the skilled abettors helped him or an effective preparation to take care of the situation is recorded
Conclude	to reduce the credibility of the case.

RULE 9

While comparing the recovered items with the stolen items

1. If	some recovered items were found identical in all aspects to the stolen items
Unless	the accused proves his right of possession/ownership on all those items
Conclude	to increase the credibility of the case.
2. If	all recovered items differed from the stolen items in one way or the other
Conclude	to reduce the credibility of the case.

Credibility Evaluator

Credibility is a positive real number associated with each case to represent the "believability" of the case. For the sake of unbiased evaluation, the credibility of the case should be initialized to unity which neither supports nor opposes the guilt of the accused prior to evaluation. Then "credibility evaluator" selects the applicable discretion rules and executes them in an order dictated by the offence involved. In this process, the credibility of a case may increase/decrease in accordance with the execution of rules that support/oppose the guilt of the accused. The resultant credibility will be returned as a real number. If the resultant credibility is more than unity, the accused is more likely to be convicted and if it is less than unity, he may be acquitted. Credibility suggests the judgment in view

of non-technical information of the case. A sample session with credibility evaluator is given in APPENDIX 3.

Conclusion

Computer-based legal systems have to progress a long way to aid legal reasoning rather than legal information retrieval. The existing legal consultation systems are aimed at certain specific civil cases and a few of these systems attempt criminal cases. The distinctive feature of criminal cases as against civil cases is the increased effectiveness of non-technical matters in reaching the judgment. In this paper, a model of a judgment prediction system has been proposed. This model aims at analyzing a specific criminal case through technical as well as non-technical perspectives and accordingly, suggests the judgment. Co-accused cases are not considered in the present model. The components of the model to analyze the case through non-technical perspectives are implements in Common-LISP on the APPOLLO, NEXUS 3500. Though the sub-system developed is limited to handling theft cases, it can be extended to most other criminal cases.

APPENDIX 1

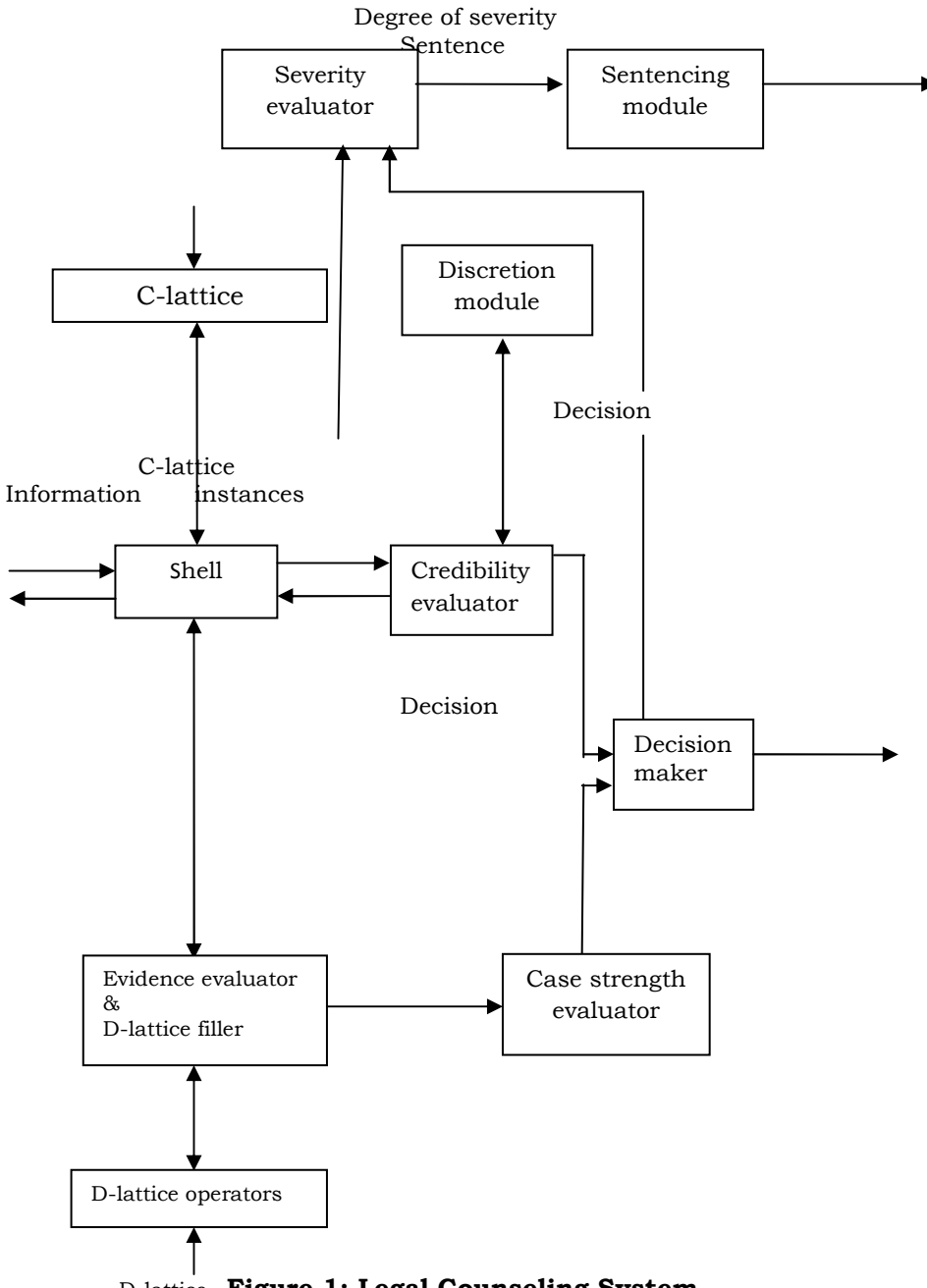

Figure 1: Legal Counseling System

APPENDICES 2a-2f

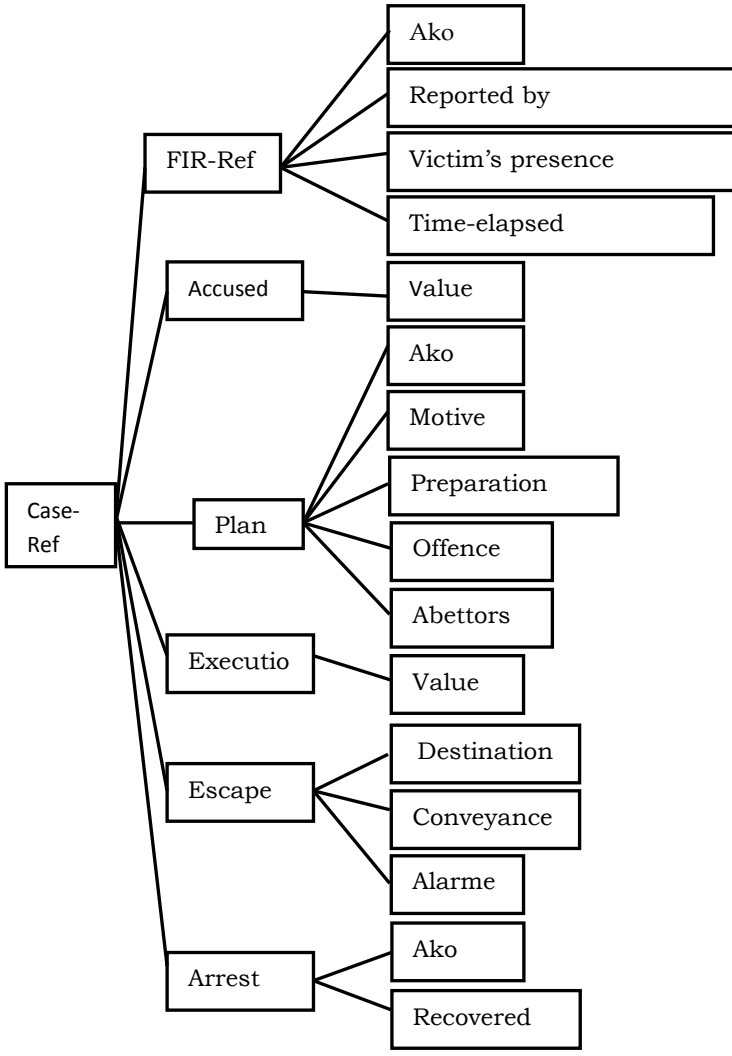

Figure 2a: Case Reference Lattice

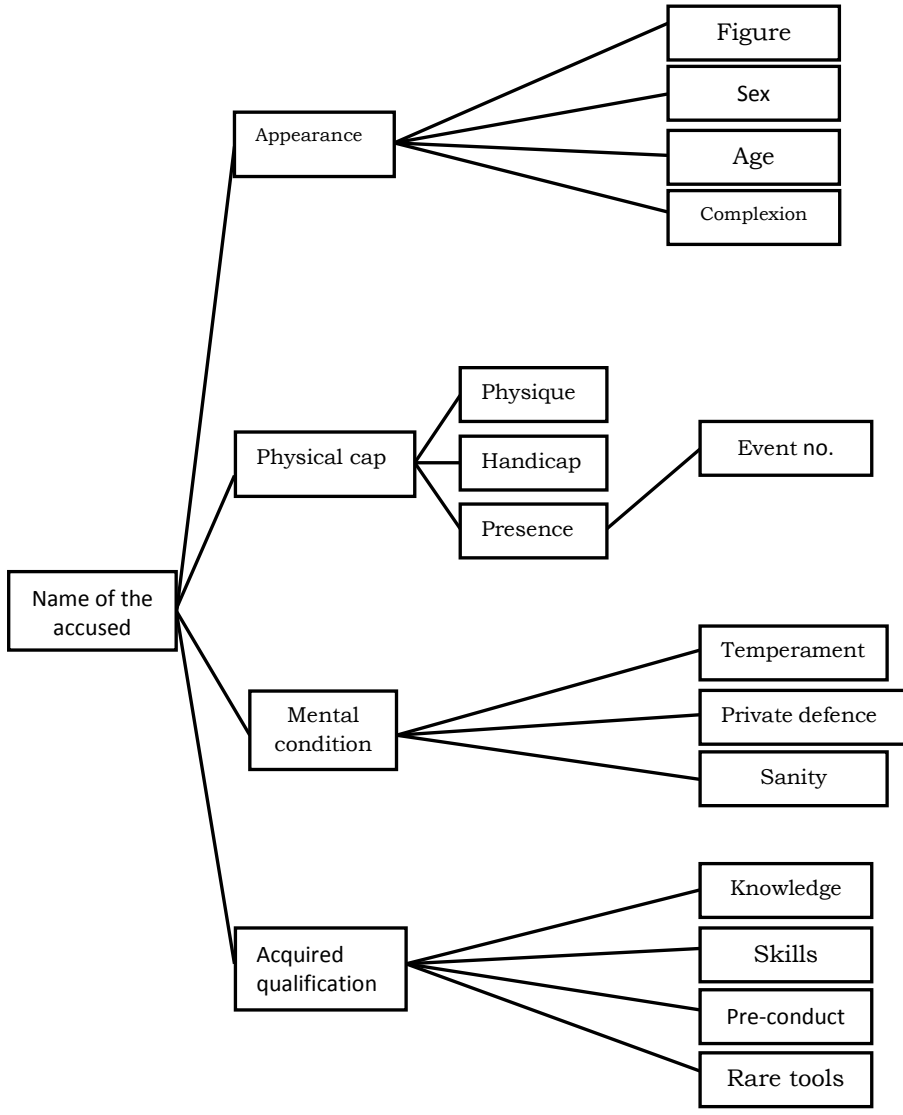

Figure 2b: Accused Name Lattice

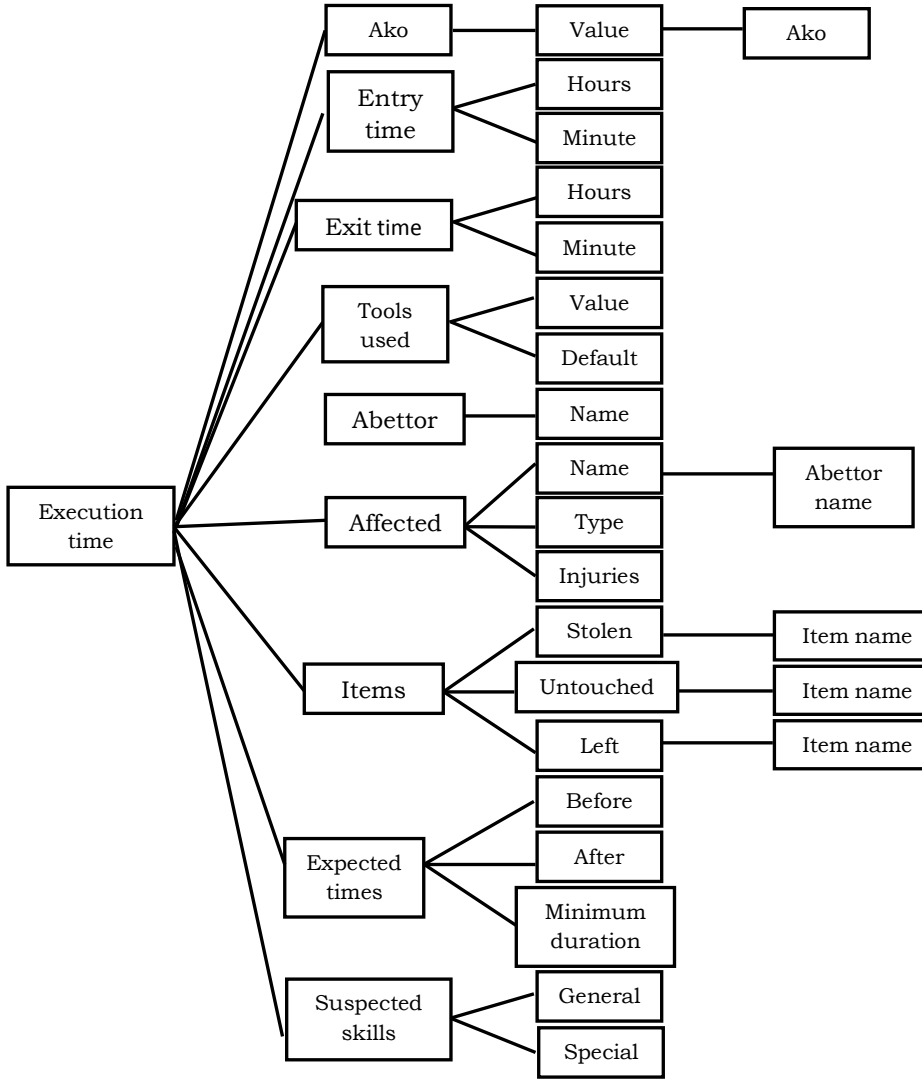

Figure 2c: Execution Time Lattice

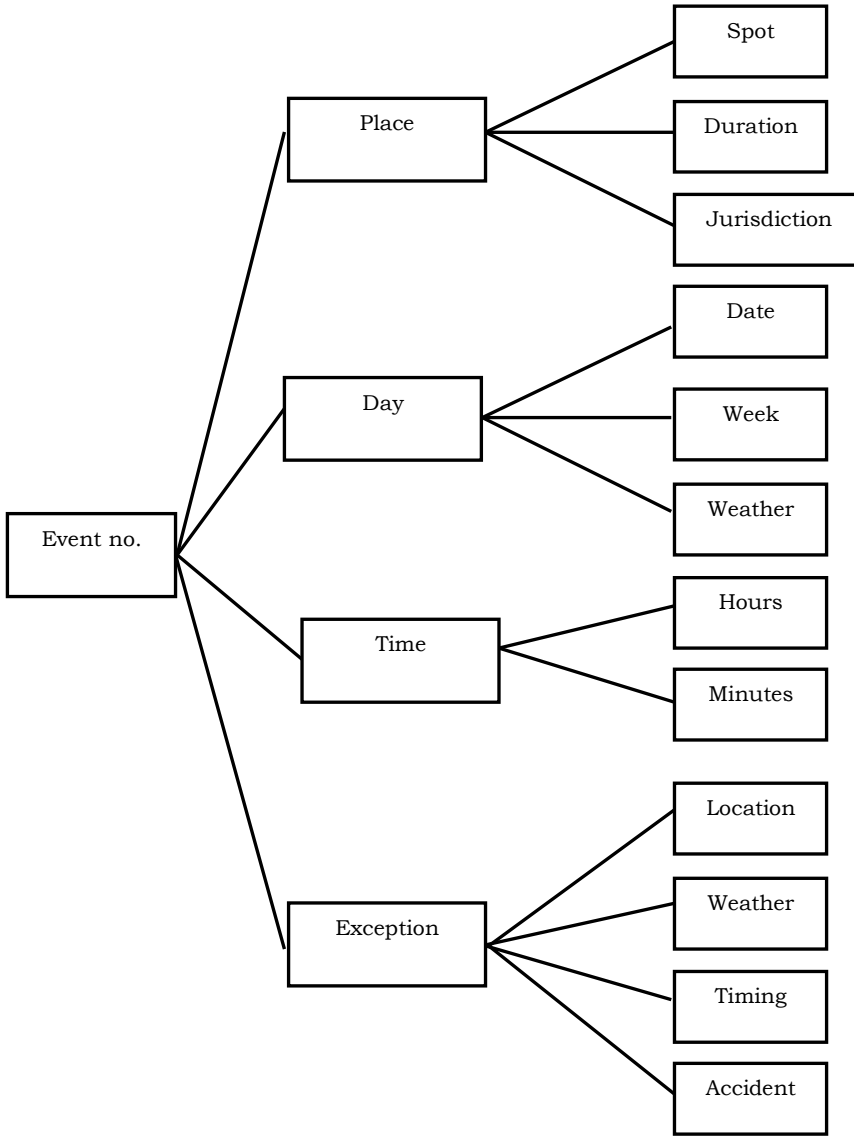

Figure 2d: Event Number Lattice

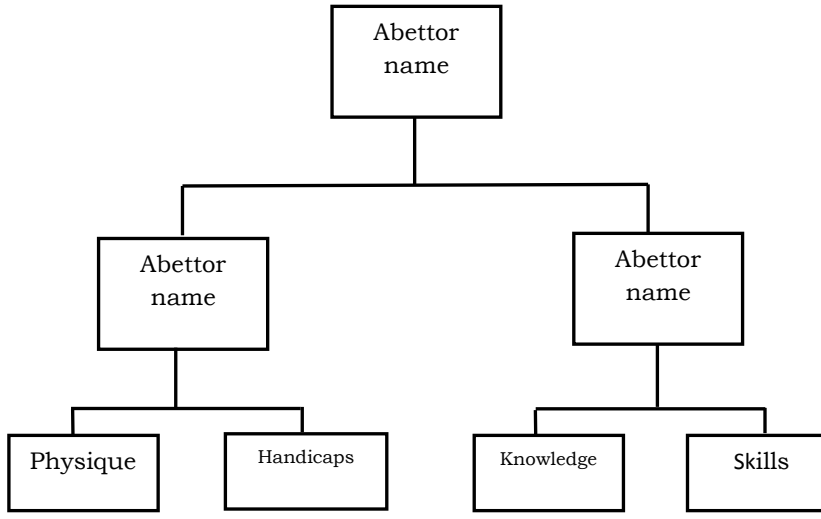

Figure 2e: Abettor Name Lattice

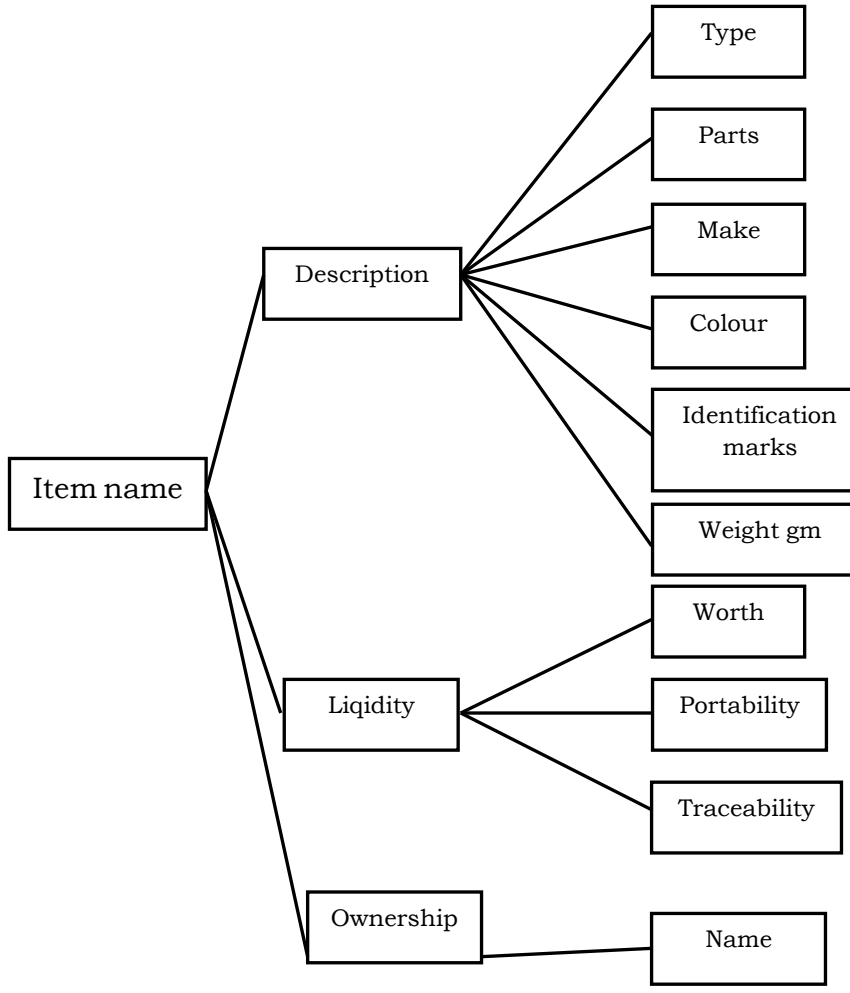

Figure 2f: Item Name Lattice

APPENDIX 3

Sample Cases

Non-technical information processing to estimate the credibility of theft cases is illustrated through the following sample cases with system.

CASE 1

Description of Case-1

On June 29, 1992, Monday, at around 2.30am, a theft happened in the house of Sri Ramesh, situated at Kankarbagh, Patna. While the inmates were sleeping, the accused entered the house through a ventilator with a rope, an abettor waited outside the house. The accused threatened the inmates with a sharp knife and stole a gold chain worth Rs. 10,000/- weighing 30gm a gold ring worth Rs. 3,000/- weighing 10gm bearing the identification mark 'Th' on it, and cash equal to Rs. 5,000/- when the watchman (*gorkha*) approached the house, the abettor heard him, signaled to the accused through a window and both of them escaped. Four silver plates worth Rs. 16,000/- weighing 2000gm were they were trying to sell a gold chain (weighing 29gm) and a ring (weighing 10gm) which were similar to the stolen articles. The victims of the offence recognized Pal, the offender. It was found that the rope left at the scene of the crime was bought by Pal two days prior to the day of the crime. The accused Pal (30) is a strong man. Though he is dumb and deaf, he is skilled in climbing heights with a rope. The abettor Raheem is skilled in liquidating gold articles.

C-Latticles Referenting the Case-1

```
(CIS-380      IS-A (VALUE (CASE-REF)))
              (ACCUSED (VALUE (PAL)))
              (EXECUTION.(VALUE (EX-I)))
              (ARREST (RECOVERED (RlNG2) (CHAIN2))
                      (AKO(Ev-2))
              (ESCAPE ALARMED(GORKHA))))
(PAL (IS-A (VALUE (ACCUSED-NAME)))
(APPEARANCE (AGE (30))
                      (SEX MALE)))
                      (PHYSICAL-CAP )
                      (PHYSIQUE (STRONG))
                      (HANDICAPS (DUMB-AND-DEAF)))
                  (ACQUIRED-QUAL (SKILLS (CLIMBING-WITH-ROPE))))
            (EX-l (IS-A (VALUE (EXECUTION-REF)))
```

```
            (AKO (VALUE (EV-l)))
            (ABETTORS (NAME (RAHEEM)))
            (TOOLS-USED (VALUE
            (ROPEl)(KNIFE)))
 (SUSPECTED-SKILLS (GENERAL (RUNNING))
                          (SPECIAL (CLIMBING-WITH-ROPE)
                          (LIQUIDATING-GOLD)))
(AFFECTED (TYPE (MALE) (FEMALE)))
 (ITEMS (STOLEN (CHAINl)
                              (RING 1)
                              (CASHl))
               (UNTOUCHED (SILVER-PLATES))
              (LEFT (ROPE1))))
 (EV-l(IS-A (VALUE (EVENT-
 NO)))
            (PLACE (SPOT (DWELLI NG- HOUSE))
                       (LOCATION (KANKARBAGH))
                       (JURISDICTION (PATNA)))
                       (DAY (DATE (29-6-92))
                      (WEEK (MONDAY)))
            (TIME (HOURS (2))
            (MINUTES (30))))
 (CHAIN 1 (IS-A (VALUE (ITEM-NAME)))
                (DESCRIPTION (TYPE (ORNAMENT))
                      (MAKE (GOLD-90))
                      (WEIGHT -GMS «30 0.95))))
                      (LIQUIDITY (WORTH (10000))
                     (PORTABILITY (VERY HIGH))))
 (RING 1 (IS-A (VALUE (ITEM -NAME)))
 (DESCRIPTION (TYPE (ORNAMENT))
                                  (MAKE (GOLD-90))
                                (WEIGHT -GMS «(10)))
                                  (ITEN- MARKS (TH)))
            (LIQUIDITY (WORTH (3000))
                       (PORTABILITY (VERY HIGH))))
 (CASH 1 (IS-A (VALUE (ITEM-NAME)))
            (LIQUIDITY (WORTH 5000))
                          (PORTABILITY (HIGH)))
 (DESCRIPTION (TYPE (MONEY))))
 (SILVER-PLATES (IS-A (VALUE (ITEM NAME)))
                               (LIQUIDITY (PORTABILITY (MEDIUM))
                               (WORTH (16000)))
```

(DESRIPTION (WEIGHT-GMS (2000))))
(ROPE (IS-A (VALUE (ITEM-NAME)))
(OWNERSHIP (NAME (PAL))))
(RAHEEM (IS-A (VALUE (ABETTER-NAME)))
(ACQUIRED-QUAL (SKILLS (LIQUIDATING-GOLD))))
(EV-2 (IS-A (VALUE (EVENT-NO)))
(DAY (DATE (OJ -7-92)))
(PLACE (JURISDICTION (DARBHANGA))))
(CHAIN 2 (IS-A (VALUE (ITEM-NAME)))
(DESCRIPTION (TYPE (ORNAMENT))
(MAKE (GOLD-90))
(WEIGHT-GMS (29))))
(RING2 (IS-a (VALUE (ITEM-NAME)))
(DESCRIPTION (TYPE (ORNAMENT))
(MAKE (GOLD-90))
(WEIGHT-GMS (10))
(IDEN-MARKS (TH))))

CASE 1. Evaluation follows in context 1.
> (evaluate' C1S-280)
ROPE 1 belonging to accused was found at the scene of occurrence.
Is this reasonably explained?
Indicate y/n. n

Does the deformity (DUMB-AND-DEAF) allow the accused to perform EACH and
EVERY ONE of the following tasks (even with the help of RAHEEM)?
(RUNNING, CLIMBING-WITH-ROPE)
Consult the experts and accordingly indicate y/n. n
It is assumed that the weight of RING 1 is exact.
Did the accused prove his ownership/right of possession regarding each of the following items?
(CHAIN2, RING 2)
Please indicate y/n. n

1.5625 is the value of credibility for the present case CIS-380.
THANK YOU!

CASE 1. Evaluation follows in context 2.

> (evaluate' CIS -380)
Rope I belonging to accused was found at the scene of occurrence.

Is this reasonably explained?
Indicate *y/n.* y
Does the deformity (DUM-AND-DEAF) allow the accused to perform EACH and
EVERY ONE of the following tasks (even with the help of RAHEEM)?
(RUNNING, CLIMBING-WITH-ROPE)
Consult the experts and accordingly indicate *y/n.* y

It is assumed that the weight of RING 1 is exact.
Did the accused prove his ownershiplright of possession regarding each of the following items?
(CHAIN 2, RING2)
Please indicate *y/n.* y

I is the value of credibility for the present case CIS 380.

THANK YOU!

CASE 2

Description of Case-2

On 2nd August, 1992, Sunday, at 8.15 p.m., a theft occurred in the house of Reddy, situated at Banjara Hills, Hyderabad. Reddy returned from his office with a briefcase containing one lakh rupees in his blue Maruti-92 car. After he relaxed for 5 minutes, he found that a man of 25 years of age was driving away in his car and immediately noticed that the briefcase containing the cash was missing. Through investigation, it was found that Geetha, the maid servant in the house, had dropped the briefcase and the car keys to help the accused. Three days later,one Rao was arrested with a similar red Maruti car in Warangal. The accused produced an alibi showing evidence that he was consulting a doctor in Tata Hospital, Bombay, on the day of the theft at 5.30 p.m.

C-Lattices Representing Case-2

(C2S-380 (IS-A (VALUE (CASE –REF)))
(ACCUSED (VALUE (RAO)))
(EXECUTION (VALUE (EX-2)))
(ARREST (AKO (EV-22))

```
                (RECOVERED (CAR2l))))
              (EX-2(IS-A (VALUE (EXECUTION-REF)))
              (ENTRY-TIME (HOURS (8))
                                (MINUTES (13)))
            (EXIT-TIME (MINUTES (15))
                                (HOURS (8))
            (AKO (VALUE (EV-20)))
            (ITEMS (STOLEN (CASH20) (CAR20)))
            (AFFECTED (NAME (REDDY))
                                (TYPE (MALE)))
            (ABETTERS (NAME (GEETHA)))
            (SUSPECTED -SKILLS (GENERAL (VISION))
                                                (SPECIAL (CAR-DRIVING)))
            (EXPECTED- TIME (MIN-DURATION(5))))
(EV-20 (IS-A (VALUE (EVENT-NO)))
              (PLACE (SPOT (HOUSE))
                            (LOCATION (BANJARA-HILLS))
                            (JURISDICTION (HYDERABAD)))
                            (DAY (DATE (2-8-92))
                                    (WEEK (SUNDAY)))
                             (TIME (HOURS (8)))
                                  (MINUTES (15))))
(CASH20 (IS-A (VALUE (ITEM-NAME)))
(LIQUIDITY (WORTH (100000))
                                (TRACEBILITY (LOW))))
(CAR20 (IS-A (VALUE (ITEM-NAME)))
              (DESCRIPTION (TYPE (VEHICLE)).
                                        (MAKE (MARUTI -92)
                                        (IDEN-MARKS (701284))
                                        (COLOUR (BLUE)))
              (LIQUIDITY (WORTH (120000))
                                    (TRACEBILITY (HIGH)))
               (OWNERSHIP (NAME (REDDY))))
(GEETHA (IS-A (VALUE (ABETTER-NAME)))
(ACQUIRED-QUAL (KNOWLEDGE (INMATE))))
(RAO (IS-A (VALUE (ACCUSED-NAME)))
            (APPEARANCE (AGE (125))
                                    (SEX (MALE)))
            (PHYSICAL-CAP (PRESENCE (EV-21)))

(ACQUIRED-QUAL (SKILLS (CAR-DRIVING))
(EV-21 (IS-A (VALUE (EVENT-NO)))
(PLACE (SPOT (TATA-MEMORIAL-HOSPITAL))
                                        (LOCA TION (DADAR))
                                        (JURISDICTION (BOMBAY)))
                                        (DAY (DATE (2-8-92)))
                                    (TIME (HOURS (5))
                                (MINUTES (30))))
  (CAR21 (IS-A (VALUE (ITEM-NAME)))
                        (DESCRIPTION (TYPE (VEHICLE)) .
                                    (MAKE (MARUTI-92))
```

(IDEN-MARKS (701284))
(COLOUR (RED))))
(EV-22(IS-A (VALUE (EVENT-NO)))
(PLACE (JURISDICTION (WARANGAL)))
(DAY (DATE (5-8-92))))
CASE 2. Evaluation follows in
context 3.
(> evaluate 'C2S-380)

what is the distance in kilometers between HYDERABAD AND BOMBAY? 750
Can the accused fly between HYDERABAD AND BOMBAY?
Indicate y/n. n

Check whether a flight took off at BOMBAY on 2-8-92 after 6'0 clock and reached HYDERABAD BEFORE 8.
Please indicate y/n. n
C2S-381 INVALID
The court believes the alibi is reasonable.
0 is the value of credibility for the present case C2S-380.
THANK YOU!
.
CASE 2. Evaluation follows in context 4.
> (evaluate 'C2S-280)

What is the distance in kilometres between HYDERABAD AND BOMBAY?750
Can the accused fly between HYDERABAD AND BOMBAY?
Indicate y/n. y

Check whether a flight took off at Bombay on 2-8-92 after 6'0 clock and reached HYDERABAD before 8.
Please indicate y/n

Is there is possibility to change the colour of CAR 21?
Indicate y/n. y

Did the accused prove his ownership/right of possession regarding each of the following items?
(CAR 21)

Please indicate y/n n
1-25 is the value of creditability for the presence case c28-380

THANK YOU!