

A Review of Research and Development Aspects of Expert System

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Abstract

Expert System is nothing but knowledge based system. It is Software package that encodes the knowledge and decision rules of human expertise. This helps us to make our own decisions in problem of particular domain. In simple terms; it is a computer program that uses a direct encoding of human expertise knowledge i.e. processed knowledge to solve any complicated problem .A number of methods can be used to simulate the performance of expert is actually called as knowledge based system. In expert system domain, particular knowledge is combined with inference engine, it processes knowledge encoded in the knowledge base to respond to users request for advice or decision making. To do so, it simulates the human reasoning process by applying specific knowledge and interfaces. Expert systems also use human knowledge to solve problems that normally would require human intelligence. So It is a program that emulates the interaction a user might have with a human expert to solve a problem. This research paper introduces introduction, structure, applications or review of expert system. This paper also discusses the advantages, new tools and various research aspects in expert systems. This paper intends to outline current research trends which are found in expert system in judiciary with special reference to crimes against women in Indian penal code.

Keywords: *Expert System, IE, WM.*

Introduction

Expert knowledge is valuable and scarce. Expert systems are computer programs that capture some of that knowledge and allow its dissemination to others. It is intelligent system developed to solve problems in a particular domain. It is a part of computer sciences i.e. artificial intelligence system. An expert system or knowledge based system is a problem solving and decision making system based on specific knowledge, its task and rules. 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.

Structure of Expert System

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 consists of 3 levels or parts.

A. Knowledge base (Rule base)

- [1] Consists of problem solving knowledge
- [2] 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.

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. 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

or applicable rules.

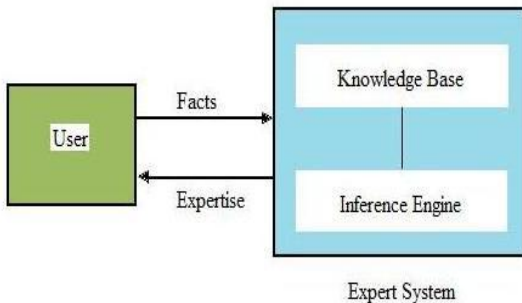


Fig-2.1 Expert System

2.1 Advantages and Applications 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 [9] Single person.
- [10] **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.
- [11] **Permanence**:-Expert system does not forget the way human expert does.
- [12] It is cost effective.
- [13] It provides high potential.
- [14] It provides expertise needed at a number of locations at the same time.

3.1) Expert system application– A review an expert system is

- [1] **MYCIN** – First expert system used in 1979 for diagnosing blood diseases.
- [2] **Dendral** – Used to identify structure of chemical compounds.
- [3] **Prospector** – Used by geologists to identify sites for drilling or mining.
- [4] **PUFF** – Diagnosing respiratory conditions.
- [5] **Design Advisor** – Give advice to designers of processors.

3.1.1) Legal Expert System Application (review)

In 1987, according to Boston, Boulogne 1989, Vancouver 1989, expert systems in law are generally built for only lawyers and are produced by researchers from theoretical perspectives (bench – capon T.J.M. and A 1987, 1989 Gardner van der Lieth A 1987, Martino A.A, 1987, Mac Carty L.T. 1977, 1989, smith J.C. and Deedman G.S. 1987, sprowl J.A. 1984, Susskind R. 1987). Research into artificial intelligence applied to law is now opened for practical applications in administration and implementation of criminal justice. In 1988, the phoenix police department acquired twenty million dollars of bond funds to upgrade its information processing capabilities for next five years. It includes computer aided dispatch, computerized record management and fingerprint identification. After this national and international level use of computer or expert system in criminal justice is increasing day by day. A large number of systems used with redundant and conflicting information of varying quality some examples are;

- [1] **CAPRI**– (Computer Aided Police Records Index) manages criminal history at a local and regional level.
- [2] **PACE** (Police Automated Computer Entry) evolved from the recognition of growing burden of paperwork of Phoenix Police Department. PACE will automate the access and update the offense reports, arrest records juvenile referrals and interrogation cards.
- [3] **AFIS** - (Automated Fingerprint Identification System) provides automated searches of 10 print

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cards and fingerprints and generate ranked candidate list.

[4] **WIN** – (Western Identification Network) WIN is a regional network designed to access AFIS in eleven western states.

[5] **NCIC** (National Crime Information Center) A National Information system which uses a telecommunications network to store and retrieve wanted person and stolen item data (Vehicles, guns etc).

In 1988, another system EXILE (Expert System in Legal Evidence) was well known. It was used to explore the issues involved in building a legal decision making adviser. EXILE was expanded with its knowledge base, it becomes advisor. A new module known as WASP i.e. Wise Advisor on Suitable Procedure. Again after some time WASP itself was expanded with increasing ability to advice on related issues of the jurisdiction under Federal and Queens land State rules. The EXILE shell has been revised and upgraded which is MASTER. At this level, legal expert system for non-lawyers does not exist. D- Expert, LOGE-Expert is legal expert system for non - expert users. In 1991, ESPRIT project was developed KADS-II expert system for a library. Thus expert systems are used for lawyers and non-lawyers.

3.2) Expert system used in India –

National Institute of Agricultural Extension Management in Gujarat has developed an expert system. This system is used for diagnosis of diseases and pests for rice crop. TDP Technologies Pvt. Ltd., In Chennai is using MYCIN technique for diagnosing blood disorders. Center for Informatics Research and Advancement, Kerala has prepared an Expert System called AGREX to help the agricultural field personnel to give timely and correct advice to the farmers. Tata Memorial Hospital in Mumbai is using PUFF for diagnosis of respiratory disease.

3.2.1) Legal Expert System in India-

In India, crime branch used software in 1997. The main objective of this branch is to implement and monitor the progress of the software applications for use of state police. CIPA (Common Integrated Police Application aims at automation of all functions carried out at the Police Stations. CIPA has been

designed and developed by NIC in English language with multilingual interface developed for Indian languages. To bring awareness among senior police officers at Guwahati in 2007, pune in 2008, Shimla in 2008, Patna in 2008, Motor Vehicle Coordination System (MVCS) has been implemented in all states. It provides information to public and other agencies regarding the recovered /lost motor vehicle. In India Talash software are used in overall states. Kerala, A.P., Punjab etc. Use criminal software maximum for monthly crime preceding. The personnel information system CCISMLE, crime in India, IPS etc. most of systems are used in police station but maximum police stations get do not use such systems.

3.3) New Tool used in ES –

ES/KERENZ is latest Japanese tool currently used. It gives the application developer's choice in the use of reasoning method - rule based, object oriented etc.

3.3.1) Characteristic of ES/KERNELZ-

It provides graphics for developing applications. It helps knowledge engineers in modifying the knowledge base.

\ Research Aspects of Expert system

4.1 Distributed Robotics

In China, recently people use Distributed Robotics to transfer weather condition from one region to other. As this is distributed robotics system, so they use multiple robots. These robots are trained by experts. One robot learned from environment. Second robot learned from the first robot using various ES techniques. The time for the objective to be completed is measured at each observation. Three trails of such robots have been made successfully.

4.1.1 Working of Distributed Robotics

Input from environment

- Cameras
- Sensors Communication
- To other robots processing
- Weather forecasting

4.2 Learning Agents

Building an agent for a specific application consists in customizing the shell for that application and in developing the knowledge base. The learning engine facilitates the building of the knowledge base by subject matter experts and knowledge engineers. Develop a capability that will allow subject matter experts and typical computer users to build and maintain knowledge bases and agents, as easily as they use personal computers for text processing.

4.3 Business Structure with ES

Japan and Australia plan to use expert system because without expert system they have to face many problems, such as:

- Slow Decision
- High cost of equipments
- High cost in hiring of locals and other Japanese
- Cultural integration with local employees to work in a flawless way
- In Building the next set of large, deep relationships-means improve customer relationship.

Expert systems are a major application of AI. They act like a human “expert” in analyzing unstructured situations. Expert systems are also called “knowledge-based” systems since they are built on a framework of known facts and responses to situations. It is believed that we are moving rapidly from industrial-based society to an information based one. The application of computer technology to management information and decision support systems has certainly had an effect on how managers perform their tasks And on how organizations behave Information systems are seen as a strategic resource within the organization: that is, they have an

important impact on key operations which determine the livelihood of the organization.

4.4 High Performance Computing Research Center

This center is currently developing Expert systems that are able to access intramuscular fat in cows and pigs. Amount of fat depends on breed, food, placement of the animals, weather, and many other factors. Animal scientists know what they want, but they cannot find the correlation between these factors. So, developing the neural network, or fuzzy logic or expert system to guide decision during the raising of the animals will help to achieve the quality and cut down cost. This institute also currently start to develop a Knowledge Base that Support Detection and Diagnosis and do Research in Mammography. This will be done by using Expert system, neural network that will firstly do identification and modeling and then will consider other various factors together with mammogram results to give accurate result and helps us in making decision.

Conclusion

This paper shows that expert systems have now become need of the age. Experts systems are used in almost all spheres whether they are medical field, research field, education field, teaching field and business field. Expert systems or knowledge based systems are used to represent and process in a format that is suitable for computers but still understandable by humans. A large number of expert systems are in real use and quite a few even being sold for individual use. In the future one is likely to see more expert systems packaged with domain knowledge being used.

References

- [1] Dutta.S, 1997, Strategies For Implementing Knowledge Based Systems, 20132, IEEE Trans. Engineering Management, pp. 79-90.
- [2] Santhiseela.R and Janarthanan.S, 2003, An Expert System For Automatic Fault Diagnosis Of A Quadruplex Digital Computer, International Conf on Advances in Aerospace Science, pp. 294-301.

- [3] Spitzer.R.Cary, 1993, Digital Avionics Systems: Principles And Practices, Ed 2, MGH Inc.
- [4] James.P.Ignizio, 1991, Introduction To Expert Systems – The Development And Implementation Of Rule Based Expert System, NY, MGH Inc.
- [5] J.L. Connell and L.B. Shafer, Structured Rapid Prototyping. Englewood Cliffs, NJ: Prentice-Hall, 1989.
- [6] D.E. Brown and J.J. Pomykalski, 1995. Reliability Estimation during Prototyping of Knowledge- Based Systems, IEEE Trans. on Knowl. Data Eng., **7** (3): 378-390, 1995.
- [7] J.J. Pomykalski and D.E. Brown, 1996. Knowledge-Based System Design Enhancement Through Reliability Measurement, Expert Systems with Applications: An International Journal, **11** (3): 277-286, 1996.
- [8] Merriam-Webster Collegiate Dictionary, 10th Edition. Springfield, MA: Merriam-Webster, 1993.
- [9] S.J. Russell and P. Norvig, Artificial Intelligence: A Modern Approach. Englewood Cliffs, NJ: Prentice-Hall, 1995.
- [10] Z. Chen, "Impact of Expert Systems: The Technique Dimension," IEEE Technology and Science Magazine, Oct. 1991.
- [11] Y. Cheng, Q. Hu & J. Yang, "An Expert System for Education: IPTS," IEEE Computer, 1988.
- [12] M. Stefik, et al. "The organization of expert systems, A tutorial," Art. Infelligence, vol. 18, no. 2, pp. 135-173.
- [13] Russell, Stuart., Norvig, Peter. Artificial Intelligence A Modern Approach. Upper Saddle River, New Jersey: Prentice Hall, 1995.