

Expert systems in artificial intelligence

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Abstract: Artificial Intelligence is the branch of science and engineering of making intelligent machines. Computers are doing things intelligently like human beings. It is accomplished by studying how human brain thinks, learn, decide, and act while trying to solve a particular problem, and then in the same way we use such outcomes of the study as a basis of developing intelligent machines. A developer always wonders that human being is so intelligent who has made it possible for a machine to think. So, the development of Artificial Intelligence started with the intention of creating intelligent machines like human beings. In future, even human being will be handled by artificial intelligence. Expert systems are computer programs that derive from Artificial Intelligence and a latest product of Artificial Intelligence. They started to come into existence as university research projects from 1960s to 1970s. They have now become one of the more important innovations of AI as commercial products as well as interesting research tools. This paper focus on Expert systems including its detailed knowledge as it is one of the esteemed concept of upcoming digital technology.

1. INTRODUCTION:

The expert systems are the computer applications developed to solve complex problems in a specific domain, which matches the level of human intelligence and expertise. An expert system is an application that performs a task that can be performed by a living expert. An Expert System is a piece of software which uses stored information and convert it into useful knowledge and make decisions and give advices to its clients. An Expert System is a program that uses historical information and derives solutions to problems in a specific task domain along with decisions. High Performance, Adequate Response Time, Reliability, Understandability are few features of expert systems.

1.1. High performance. The expert system must be performing at high level than a human expert with the production of precise and accurate decisions. The level of competency should be equal to or greater than that of an expert in the field. That is, the quality of the advice given by the system must be of top level and unique.

1.2. Adequate response time. The expert system must also perform in a very short amount of time. It should take reasonable time to reach on a decision. An expert system that takes very long time i.e. a year to reach a decision would not be very useful.

1.3. Good reliability. The expert system must be reliable and not prone to errors or it will not be used. Security of knowledge should be main concern in expert systems.

1.4. Understandable. The system must explain the steps of its working and reasoning i.e. Logic behind its decision making power. Also, the output given by it should be understandable. The system should have an explanation capability like human beings i.e. they must support their decisions and advices as human beings do [1-7].

2. COMPONENTS OF EXPERT SYSTEMS:

The Knowledge Base	Knowledge Base is the component of Expert System where the information is stored in the form of facts and rules. In knowledge base the knowledge engineer writes the code for the expert system [8].
Agenda	Rules are added to a queue data structure which is known as agenda after being satisfied. The agenda is an unordered list of all the rules whose assertions have been satisfied.
The User Interface	With the help of User Interface, decisions are taken out according to asked questions. . User can interact with expert systems through dialog boxes, command prompts, forms, or other input method.
Inference Engine	The inference engine acts as a heart of any expert system. It is the main processing unit of an expert system. The inference engine use rules from the agenda to take decisions i.e. to inference an advice or output.
Working Memory	Data that is received from the user during the expert system session.

3. CATEGORIES OF EXPERT SYSTEM

Expert Systems have four major categories.

Classification	Advise
Diagnosis	Planning

The development process of expert systems follows various steps which are summarized as follows:

Knowledge Elicitation: First of all, the knowledge engineer interacts with expert in order to gather knowledge about his/her expertise. This step in System Development Life Cycle is known as Requirements Analysis and elicitation [9].

Coding: After gathering and acquiring the knowledge from human expert, the knowledge engineer codes the knowledge in the knowledge base. Coding here, means entering knowledge in knowledge base.

Knowledge Representation: The most common way of representing knowledge in the expert systems is the use of IF... THEN...ELSE type – rules [10].

Evaluation: The expert then evaluates the expert system and gives a critique to the knowledge engineer.

Forward and backward chaining are two strategies used in expert systems.

4. ADVANTAGES AND DISADVANTAGES OF EXPERT SYSTEM:

The concept of expert systems is almost magical: simply capture human expertise and put into a computer program. But there are some limitations associated with expert systems [8-10].

Advantages	Disadvantages
Availability	No age of Scope
Reduced Cost	Complex
Reduced Risk	Less Interactive
Permanence, Preservation	Difficulty in Modification
Multiple expertise	Knowledge Acquisition(Only Tangible)
Reliability, High Quality	
Elaboration	
Fast response, New Products	
Intelligent tutor	
Intelligent database	

5. APPLICATIONS OF EXPERT SYSTEMS [11-19]

Medical Diagnosis/Engineering Diagnosis
Planning and Scheduling
Hardware and software Configurations
Financial Decision Making
Knowledge Publishing
Process Monitoring and Control
Design and Manufacturing
Diagnosis of complex electronic and electromechanical system
Diagnosis of diesel electric locomotion system
Diagnosis of software development project
Planning experiments in biology, chemistry, and molecular genetics forecasting crop damage
Identification of chemical compound structure and chemical compounds locations of faults in computer and communication system
Scheduling of customer order, job shop production operation, computer resource for operating system, and various manufacturing tasks
Evaluation of loan applicants for lending instruction
Assessment of geologic from dip meter logs
Analysis of structural system for design or as a result of earthquake damage

The optical configuration of components to meet given specification for a complex system (like computer or manufacturing facilities)
Estate planning for minimal taxation and other specified goals
Stock and bond portfolio selection and management
The design of very large scale integration (VLSI) system
Numerous military applications ranging from battlefield assessment to ocean surveillance
Numerous applications related to space planning and exploration
Numerous areas of law including civil case evaluation, product liability, assault and battery , and general assistance in locating different law precedents
Planning curricula for students
Teaching student specialized tasks (like trouble shooting equipment faults)

6. CONCLUSION:

Expert and other knowledge-based systems are usually composed of at least a knowledge base, an inference engine, and some form of user interface. The knowledge base which is separate from the inference and control components contains the expert knowledge coded in some forms. Expert system plays a very important role in present time where everyone is expecting advice or solution for their complex problems. The acquisition of expert knowledge for knowledge –based systems remains one of the major issue in developing such systems. Knowledge engineers build systems by eliciting knowledge from experts, coding that knowledge in an appropriate form, validating the knowledge, and ultimately constructing a system using a variety of building tools. Recent progress in research and development of the theoretical basis for expert system has gone hand in hand of researchers with enhancements in the capabilities of real systems.

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