

Expert System using Knowledge Based System

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Abstract— Expert System and Knowledge Based System is very important field of an Artificial Intelligence. Expert System is an application of an Artificial Intelligence. Expert System is also known as Knowledge Based System. Expert Systems are used to solve very critical problems in a particular domain. It is using the extra human intelligence concept and expertise things. A knowledge based expert system used to human knowledge to solve any problems according to require human intelligence. Expert system and knowledge based system is communicate with each other. This paper explains the how to development an expert system, how to use expert system with knowledge based system.

Keywords - Expert System, Knowledge Based Expert System, Knowledge Based System, Rule Engine, Shell

I. INTRODUCTION

A) Expert System: -

Expert system is a computer system which is evaluates the decision making ability of a human expert, which main goal to solve critical problems by the help of knowledge based system and reasoning. Expert system is subset of an Artificial Intelligence. Expert system is also known as knowledge based system. It is a computer program which is contains the knowledge skills and analytical skills. The main goal of the design of any expert system is to capture the knowledge of a human expert relatively to some specific domain [1].

It is computer programs that express the judgement and behaviour of a human that has expert knowledge and better experience in a particular field. An expert system is a computer program, with a set of rules encapsulating knowledge about a particular problem domain. (Such as medical diagnosis, blood infection, neural network etc.). Expert system that record the knowledge needed to solve a problem as a collection of rules stored in a knowledge base are called rule based system. Expert system is built of particular software which is known as tool or another name is shell [1] [2].

B) Knowledge Based System: -

Knowledge based system contains the knowledge necessary for understand the problem, formulating the problem and for solving the problems. It is captured from the human expert via the knowledge acquisition module. Knowledge based system is basically represent a way that expertise can be captured, coded and reused. Expert system contains a

knowledge base having good experience and different set of rules for apply the knowledge base to each particular situation which is described by the particular program. Knowledge based system using a concept of shell which is used for building and maintaining knowledge based applications. A shell is a fully environment which is provide step by step method and user friendly interface like as GUI (Graphical User Interface). [2]

II. FEATURES OF AN EXPERT SYSTEM

Many features are available of Expert System are as follows:-

- i. High Quality Performance
- ii. Decision Making Capability
- iii. Reliability
- iv. Consistency
- v. High Explanation Capability

III. CAPABILITIES OF AN EXPERT SYSTEM

The expert systems are capable of –

- i) *Advising*: - Expert system advice to human how can solve the problem. It is essential.
- ii) *Instructing human in decision making*: - Expert system provides the instruction to human how can take a decision.
- iii) *Deriving a solution*: - Expert system provides solution of given problem by the help of knowledge based system.
- iv) *Understanding*: - Expert system is understood of the given problem. For e.g. diagnosis of blood cancer in humans.
- v) *Explaining*: - Expert system explains the problem according to situation.

- vi) *Interpreting input*: - Input is accepted by inference engine.
- vii) *Predicting result*: - Result is gain by the help of I/O interface.
- viii) *Justifying the conclusion*: - Finally explain summary of the result (desired outcome).
- ix) *Alternative options to a problem*: - Alternative option must be require solving any type of problem. (More than two solutions of given problem) [3].

IV. DEVELOPMENT OF AN EXPERT SYSTEM

General steps of develop an expert system are as follows:-

A. Identify the Problem : -

- a) The problem must be suitable or capable for an expert system to solve it.
- b) Find the experts in task domain for the ES project.
- c) Establish cost-effectiveness of the system.

B. Design the System: -

- a) Identify the Expert System Technology or Method
- b) Know and establish the degree of integration with the other systems and databases.
- c) Realize how the concepts can represent the domain knowledge best.

C. Develop the Prototype

From Knowledge Base: The knowledge engineer works to –

- a) Acquire domain knowledge from the expertise.
- b) Represent it in the form of If-THEN-ELSE rules or Condition Action Rules.

D. Test and Refine the Prototype

- a) The knowledge engineer uses sample cases to test the prototype for any deficiencies in performance.
- b) End users test the prototypes of the Expert System.

E. Develop and Complete the Expert System

- a) Test and ensure the interaction of the Expert System with all elements of its environment, including end users, databases, and other information systems.
- b) Document the Expert System project well.
- c) Train the user to use Expert System.

F. Maintain the System

- a) Keep the knowledge base up-to-date by regular reviews and updates.

V. EXPERT SYSTEM TECHNOLOGY

There are several levels of ES technologies available. Expert systems technologies include –

- I. **Expert System Development Environment** – The ES development environment includes hardware and tools. They are –
 - i. Workstations, minicomputers, mainframes.
 - ii. High level Symbolic Programming Languages like as List Programming (**LISP**) and Programming in Logic (**PROLOG**).
- II. **Tools** – They are reducing the effort and cost involved in developing an expert system to large extent.
 - i. Powerful editors and debugging tools with multi-windows.
 - ii. They provide rapid prototyping.
 - iii. Have Inbuilt definitions of model, knowledge representation, and inference design.
- III. **Shells** – A shell is nothing but an expert system without knowledge base. A shell provides the developers with knowledge acquisition, inference engine, user interface, and explanation facility. For example, few shells are given below –
 - i. Java Expert System Shell (JESS) that provides fully developed Java API for creating an expert system.
 - ii. A shell developed at the National Centre for Software Technology, Mumbai in 1993. It enables knowledge encoding in the form of IF-THEN rules or Condition-Action Rules.

VI. EXPERT SYSTEM USING KNOWLEDGE BASED SYSTEM

Mainly three steps to be follows: -

- I. Knowledge Base
- II. Rule Engine/Inference Engine
- III. User Interface

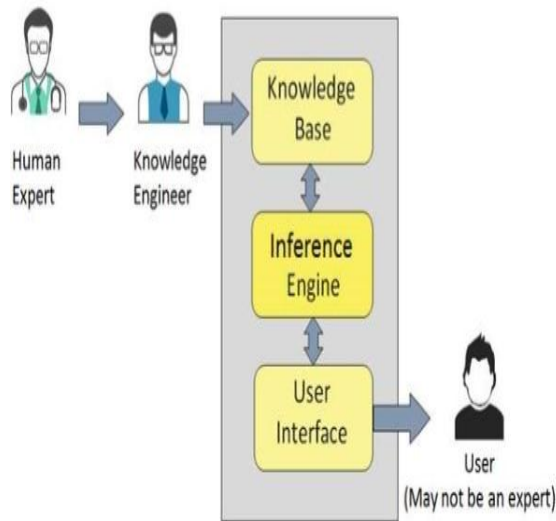


Figure:-1. Expert System using Knowledge Based System

I) Knowledge Base: -

The Knowledge Base Contains facts and rules about some specialized knowledge domain. It also contains domain specific and high quality knowledge. The success of any expert system is mainly depends upon the collection of highly accurate and very precise knowledge. For real life example is family relationships. In this concept using 2 natural language processing are used (LISP and PROLOG) [4].

Components of Knowledge Base: -

There are two components of Knowledge Based are as follows:-

- i. **Factual Knowledge** – It is the information widely accepted by the Knowledge Engineers and scholars in the task domain.
- ii. **Heuristic Knowledge** – It is about practice, accurate judgement, one’s ability of evaluation, and guessing.

Knowledge based system is not only store and manipulate the data but also maintain the knowledge representation and knowledge acquisition.

• Knowledge representation: -

It is the method used to organize and formalize the knowledge in the knowledge base. It is in the form of IF-THEN-ELSE rules.

• Knowledge Acquisition: -

The success of any expert system majorly depends on the quality, completeness, and accuracy of the information stored in the knowledge base.

The knowledge base is formed by readings from various experts, scholars, and the **Knowledge Engineers**. The

knowledge engineer is a person with the qualities of quick learning, and case analyzing skills.

He acquires information from subject expert by recording, interviewing, and observing him at work, etc. He then categorizes and organizes the information in a meaningful way, in the form of IF-THEN-ELSE rules, to be used by inference machine. The knowledge engineer also monitors the development of the ES.

II) Inference Engine: -

It is use of efficient procedures and rules by the Inference Engine are essential in deducting a correct solution. The main work of inference engine is accepts user input queries and responses to question by the help of I/O interface. The Inference Process using three stages: - 1. Match 2. Select 3. Execute [4].

In knowledge-based ES, the Inference Engine acquires and manipulates the knowledge from the knowledge base to arrive at a particular solution.

To recommend a solution, the Inference Engine uses the following strategies –

- a) **Forward Chaining**
- b) **Backward Chaining**
- a) **Forward Chaining**

It is a strategy of an expert system to answer the question, “**What can happen next?**”

The Inference Engine follows the chain of conditions and derivations and finally deduces the outcome. It considers all the facts and rules, and sorts them before concluding to a solution. For example, prediction of share market status as an effect of changes in interest rates.

This strategy is followed for working on conclusion, result, or effect.

a) **Backward Chaining**

With this strategy, an expert system finds out the answer to the question, “**Why this happened?**”

On the basis of what has already happened, the Inference Engine tries to find out which conditions could have happened in the past for this result. This strategy is followed for finding out cause or reason. For example diagnosis of blood cancer in humans.

III) User Interface: -

User interface provides interaction between user of the ES and the ES itself. It is generally Natural Language Processing so as to be used by the user who is well-versed in the task domain. The user of the ES need not be necessarily an expert in Artificial Intelligence.

The user interface makes it easy to trace the credibility of the deductions.

- a) **Requirements of Efficient ES User Interface:** -
- It should help users to accomplish their goals in shortest way.
 - It should be designed to work for user's existing.
 - Its technology should be adaptable to user's requirements.
 - It should make efficient use of user input.

VII. CONCLUSION

In this review paper, I am explaining development of an expert system and expert system using knowledge based system. In my review paper main aim is how to use expert system directly connect with knowledge base. In previous thing expert system and knowledge base is different environment. Firstly program design by expert system after that transfer the information in knowledge base. The entire process is very long. This process is reducing by the expert system using knowledge based system. It is very short process. It is beneficial to solve any type of problem. In this process information directly transfer by the human expert through knowledge engineer in knowledge base. After that Knowledge based is communicate with inference engine and user interface.

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