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# Artificial Intelligence an Expert System

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**Abstract:** Artificial intelligence (AI) is the intelligence of machines, it is the study and design of intelligent agents, where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success". The use of Artificial Intelligence methods is becoming increasingly common in the modeling and forecasting sectors. It is the field of scientific inquiry related with designing mechanical systems that can simulate human mental processes. The field draws upon theoretical constructs from a wide variety of disciplines, including mathematics, psychology, linguistics, neurophysiology, computer science, and electronic engineering. Artificial intelligence has been the subject of optimism, but has also suffered setbacks and, today has become an essential part of the technology industry, providing the heavy lifting for many of the most difficult problems in computer science.

**INTRODUCTION:**

Artificial Intelligence is defined as the science and mechanology of making intelligent machines. Human intelligence is the foundation for this with the description that it can be simulated by a machine. Its the key technology of today's applications, which ranges from banking systems that detect attempted fraud, to the telephone systems that understand speech, to software systems that notice when you're having problems and offer appropriate advice. In the field of information technology it focuses on creating machines that can participate in behaviors that humans consider as intelligent. Researchers create systems that can mimic human thought, understand speech and countless benefits not possible before.

One of the major branches of AI is the Expert Systems. Building an expert system is known as knowledge engineering and its practitioners are called knowledge engineers. The knowledge engineer must make sure that the computer has all the knowledge needed to solve a problem. The knowledge engineers choose one or more forms which represent the required knowledge as symbol patterns in the memory of the computer. He must also ensure that the computer can use the knowledge efficiently by selecting reasoning methods.

In conventional computer programs, problem-solving knowledge is encoded in program logic and program-resident data structures. The Expert systems differ from conventional programs both in the way problem knowledge is stored and used. An expert system is a computer program, with a set of rules which capsulate knowledge about a particular problem domain and these rules prescribe the actions to be taken when certain conditions hold and define the effect of the action on the data. It uses reasoning capabilities to reach conclusions or to perform analytical tasks. Expert systems are especially important to organizations that rely on people who possess specialized knowledge of some problem domain, especially if this knowledge and experience cannot be easily transferred. Artificial intelligence methods and techniques have been applied to a broad range of problems and disciplines, some of which are esoteric and others which are extremely practical.

**Major Branches of AI:**

- **Robotics:** Mechanical and computer devices that perform tedious tasks with high precision.
- **Vision system:** Capture, store and manipulate the visual images and pictures.
- **Natural language processing:** Computer understands and reacts to the command and statements to natural language like English.
- **Learning system:** Computer changes how it reacts or functions to the feedback provided to it.
- **Neural system:** Computer that can act like or simulate the functioning of the brain.
- **Expert system:** Programming computers to make decisions in real life situations. (ex: expert system help doctors in diagnosing the diseases)

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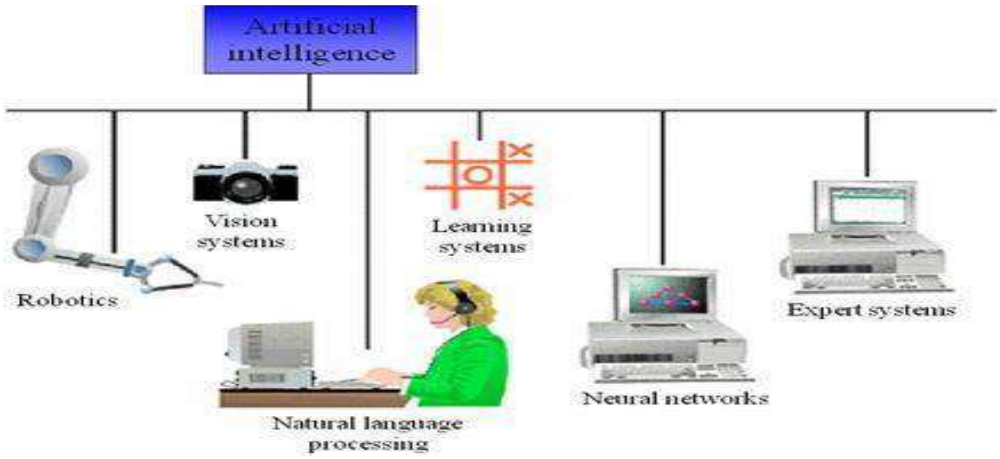


**Expert System Architecture**

Typically an expert system is composed of two major components, they are the Knowledge-base and the Expert System Shell. The Knowledge-base is a collection of rules encoded as metadata in the file system or often in a relational database.

The Expert System Shell is a problem-independent component facility for creating, editing, and executing rules which includes the software modules purposed to process requests for service from system users and application layer modules, to support the creation and modification of business rules by expertise, translation of business rules based on the suggestion of the experts into a form readable by the machines. They execute business rules and provide low-level support to expert system components in order to retrieve metadata and save it to the knowledge base and build abstract Syntax Trees during modification of business rules based on suggestions by experts.

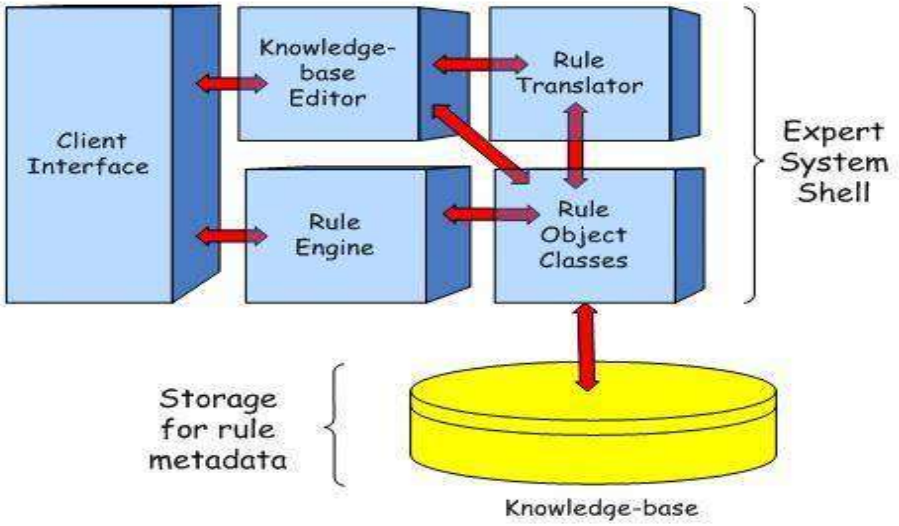


Figure 2 - Expert System Architecture

**Constructing an Expert System**

Using lexical analyzers and parser generators large portions of the Rule Translator can be automatically generated, and Text editors can be brought without any expense and integrated into the Expert System Shell.

The design and the construction of the expert system involve the four major steps as depicted in the below figure:

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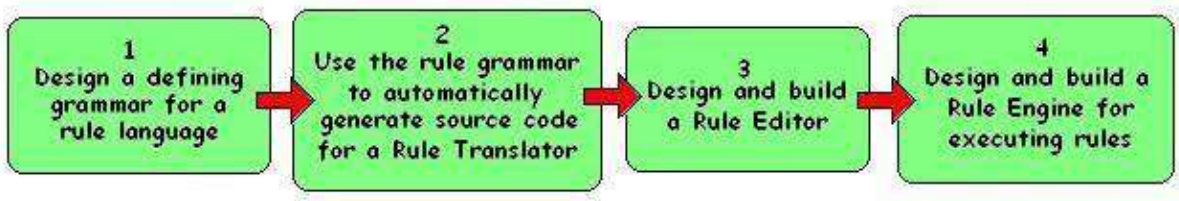


Figure - - Construction steps

**Rule Translator**

Rules, as composed by subject expertise are not directly executable. They must first be converted from their human-readable form into a form that can be interpreted by the Rule Engine. Converting rules from one form to another is a function performed by the Rule Translator. The translation of rules in their original form to a machine-readable form requires parsing the textual representation to obtain a data structure referred to as an Abstract Syntax Tree (AST). The AST is an abstract data type designed to make its interpretation by the Rule Engine simple and efficient.

The AST representation of rules is the memory-resident data structure that guides the execution of the inference engine when it comes to application. This abstract data type is very expressive and permits the construction of very complex and powerful rules.
There is a third form in which rules may be expressed that is conversion into an equivalent form suitable for storage in the Knowledge-base and the way in which this information appears in the Knowledge-base depends on storage technology.

**Rule Engine**

The Rule Engine is often referred to as an inference engine in AI literature. It is responsible for executing Knowledge-base rules. It retrieves rules from the Knowledge-base, converts them to ASTs, and then provides them to its rule interpreter for execution. The Rule Engine interpreter goes through the AST thus executing actions specified in the rule along the way.

**Client Interface**

The Client Interface processes requests for service from system-users and from application layer components. Client Interface logic routes these requests to an appropriate shell program unit. When a subject matter expert wishes to create or edit a rule, he uses use the Client Interface to dispatch the Knowledge-base Editor. Thus scheduling a rule or a group of rules for execution by the Rule Engine.

**Knowledge Base Editor**

The Knowledge-base Editor is a simple text editor or a graphic editor, or a hybrid of the above two types. It provides facilities that enable expertiset to compose and add rules to the Knowledge-base.

**Advantages :**

- Smarter artificial intelligence frees people for other tasks by automating manufacturing and transportation tasks.
- Self-modifying, self-writing and learning software can relieve programmers of the burdensome tasks of specifying the functions of different programs.
- Artificial intelligence will be used as cheap labor, thus increasing profits for the corporation.
- Compared to traditional programming techniques, expert-system approaches provide the added flexibility and easier modifiability with the ability to model rules as data rather than as a code.
- It provide a means that can allow organizations to adapt more to readily changing needs.
- Practically modern expert-system technology is employed as an alternative to traditional programming techniques where this approach allows the combination of the strengths of both modern and traditional approaches.

**Disadvantages :**

- Rapid advances in AI could lead to massive structural unemployment.
- Unpredictable impacts of new features.
- An expert system or rule-based approach is not the final answer for all the problems.
- Considerable knowledge is required in order to overcome its misapplications.
- Ease of rule creation and rule modification can be misused.
- A system can be sabotaged by a non-knowledgeable user who can easily add worthless rules or rules that conflict with existing ones.
- Reasons for the failure of many systems include the absence of facilities for system audit, detection of possible conflict and rule lifecycle management.

**Applications:**

- Applicable in Machine Learning.
- Fuzzy Logic Improves Decision Support Software.
- Shell Programming in Expert Systems.
- Smart Home Appliances for Better Quality of Life – (Combining artificial intelligence with home automation in smart home appliances results in an improved quality of life for many which includes elders and disabled.)
- Voice Recognition Software for Disabled Students –(Disabled students are often at a disadvantage in the classroom. Voice recognition software improves communication, enables note-taking, and increases participation.)
- Teaching special case Children with Autism.

**Scope of expert systems:**

An expert system does the work of a professional. It virtually has no operating cost, never forgets what it learns, never tires, or goes on vacation. Beyond these, intelligent computers can hold a large amount of data, these systems can be considered as a substitute for human control over nuclear weapons, stating that, they respond more quickly to the threat. Weather forecasting relies on many variables, and a computer expert can more accurately pool all of its knowledge, in some fields such as forecasting the weather or finding bugs in computer software, expert systems are sometimes more accurate than humans. Expert systems have the power and range to aid to benefit, if used with discretion and discerning, it will benefit humankind to a greater extent.

**FUTURE**

As thought by the majority of us, the hardware and the software both will be available to achieve human-level artificial intelligence with the broad supply of human intelligence including our emotional intelligence in the coming years. These super machines will also have morals and respect their creators. Humans themselves will be smarter, healthier, and more capable in the near future by merging with this technology. These tiny robots when implanted in our brains will work directly with our neurons and make us smarter answer some of the most fundamental questions about human existence by understanding the nature of intelligence, not only human intelligence it has grown into a scientific and technological field affecting many aspects of commerce and society. Work is progressing on developing systems that converse in natural language, that perceive and respond to their surroundings and encode and provide useful access to all of human knowledge and expertise.

**Conclusion**

It's now the time to sit and think upon for the future of artificial intelligence in expert systems whether as to go with traditional technologies or to adopt the science of artificial intelligence. The overall motivation behind this paper is to modernize our ancestral methods so as to bring in a rapid change in the growth of highly developed expert systems so as to meet to the needs of the growing population. The development process may be incremental but the overall concept requires a perspective shift in the way we think about the modernization of production that is based more on needs and ways of meeting them rather than modifying existing techniques.

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