EXPERT SYSTEM AND ITS APPLICATION IN MANAGEMENT

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Abstract:
There are several discussions about knowledge representation but not in its usage in solving the real problems. So we introduce the definition, application and the use of expert system in this article. Expert system resolves those real problems which generally require an expert human to solve. Expert system is a branch of artificial intelligence and is developing quickly. We shouldn't forget although expert system is a beneficial system; it cannot solve all the problems. At the end of this article we mentioned to some of its problems.

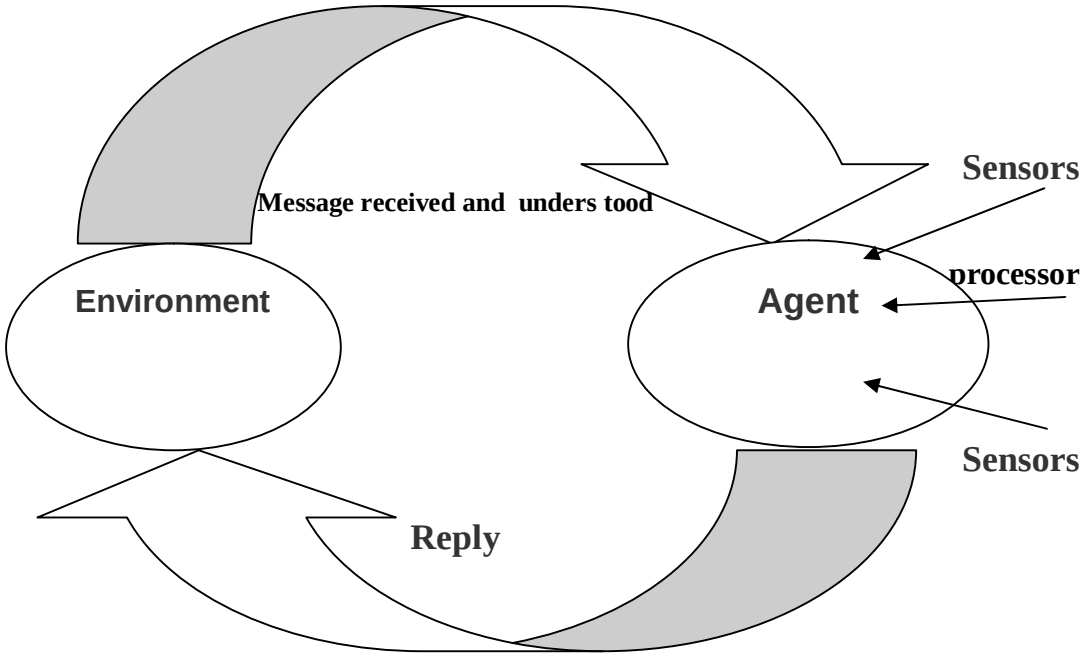
Keywords: expert system, artificial intelligence, management, knowledge based system

Introduction:

There are several discussions about knowledge representation but not in its usage in solving the real problems. So in this article, we introduce the usage of some techniques which are studied in expert system. Expert system resolves those real problems which generally require an expert human to solve, for example a doctor or mining engineer. This knowledge is discoverable-heuristic and is based on estimatedrulesnot definite situation. To summarize the knowledge of an expert in a waythat canbeused bya computerrequiresits ownexpertise. The engineer has its knowledge. The first effort to create such a system can be successful partially, because it is difficult for an expert to express all the knowledge and rules which has applied in solving a problem. Generally, a prototype is prepared based on information obtained from interviews and will change repeatedly. It is not necessary to rewrite all the information for system update. It should be done by deletion and addition of some data. The rule is the most important method to be used for knowledge representation in expert system. Rule based system changes easily in definite or indefinite situation and will prepare suitable ways for system reasoning.

Artificial intelligence and its history:
OstovartRaselmentions to artificial intelligence in his book "New approach".
Artificial intelligence is a new science which has been considered very quickly.
This field was established by AlanTuring's theory called "Turing Test" in 1950.
Artificial intelligence is a method to make smart computers in order to get complex decision.
But there is the question that Howthe brain(the brainof a living creature or designedelectronicbrain) is able to perceiveandmanipulatea worldfarlarger and more complexthanitwould be?

Althoughphilosophers andpsychologistshavetypicallyexaminedthe way ofthinkingandbehavior, artificial intelligence in addition to identify the components of a behavior, tries to reconstruct them as a computer program.
So as it is clear in the first picture, Understandingintelligentagentsinartificial intelligenceisvery important.



So thesciences which are abase forartificial intelligence will be noted in the following:

Philosophy (450 BC): Herbert deryfus said that artificial intelligence has been established in 450 BC.
As it was mentioned before, Artificial intelligence is a method to make smart computers.
It will be possible when we can identify the humanmindwhen making decisionsorsolving problems. As Socrates,Plato andAristotle did it. Aristotle tried to formulate the rules which are available on the logical part of mind by syllogism theory. So in the next step the mind should be copied as a physical system.
Although Rene Decart (1596- 1650) agreed with the reasoning but was a follower of dualism theory and believed that a part of mind is out of nature and is exemptfromthelaws of physics.Animals lack this quality. The theories which are similar to Decart's have seriously challenged a complete copy of mind.
The nextimportant elementinphilosophy is the relationship betweenknowledge andaction.

Mathematics:
The philosophers have introduced the most important ideas of intelligent system. But for their relationshipwith thetheoretical knowledge, it isrequired todevelopamathematical formulain threemain areas: calculation,logic andprobability. Algorithm is refers to ninth century and

Khwarizmi. The logic is related to Aristotle period. But Georg Boal (1818- 1864) innovated the logic. The probability is the third big branch of mathematics in artificial intelligence.

Psychology:
Thisviewthatthe brainprocessestheinformation, constitutethe main featureof cognitive psychology. Psychology explains the stimulus mechanism, processingfiltersandthebehavior. It is exactly what artificial intelligence follows in mind modeling.

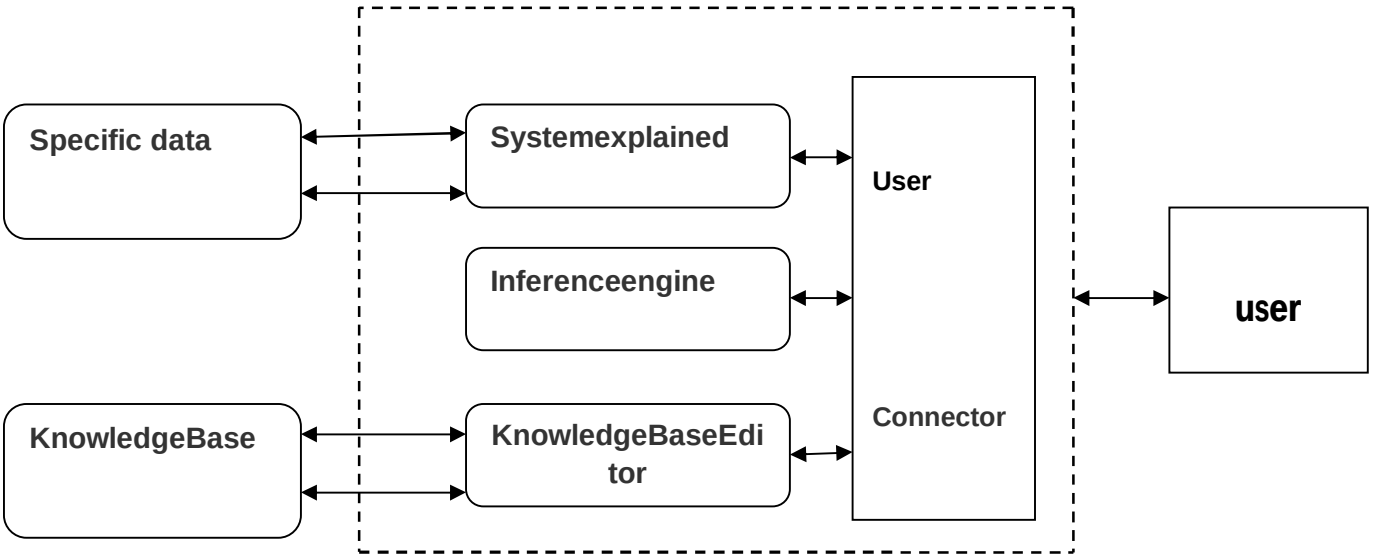
Computer engineering:
Two factors are vital for developing the artificial intelligence: The intelligence of an artificial product. Computer is an artificial product which has the best chance to show the intelligence. The software part of computer plays a very important role in AI.

Linguistics:
It has begun by Skinner's book which is named behavioral language. (1957)
Most studies on knowledge representation are involved with language.
Knowledge representation is an important part in rule based expert system.Linguisticresearchhas led toa philosophicalanalysisof language. The modern Linguistics and AL have been probably born in a similar time. They were introduced as a natural language processing.
Turing Test:
This field was established by AlanTuring in 1950 and is the origin of AL.
"Turing Test" mention to Allan Turing theory which asks: is it possible for a machine to think or not?
Turing believes that this is a pointless question. In his idea if we ask this question about digital computers, it can be the beginning of a very important discussion.
This examination refers to existence of intelligence in smart creature. He suggested that the computer should be examined by a person who typeand it can be successful in the test if the researcher cannot recognize that it is a human being or a computer. So a computer should be able to natural language process, knowledge represent, automatedreasoning and mechanical learning.
Because the expert system is a branch of AL, it was necessary to talk generally about AL in this article.
In the following we introduce the expert system, some of its software and finally its application in management.

What is expert system?
Richard Bas believes that the expert system is a branch of AL. in other word this system is smartcomputer software in which the expert role is collected as scientific information.
Brows and Buchman believe that knowledge based systems are expert system. The data which is used in this system is expert knowledge.
One of the result s of researches about artificial intelligence is the technique which models the information broadly.
Some tools like CLIPS and Shell have a very major contribution in decreasing the cost of expert system development.
Rule based programming is One of themost widely usedtechniques forexpert systemdevelopment. The rule is combined of two parts: If and Then.

The “if” part is called patterns conformation. Expertsystem use a mechanism which is named inference engine.
The “then” part is a series of action that will be done when thelawisapplied. This action starts when the inference engine gives the order of operation.

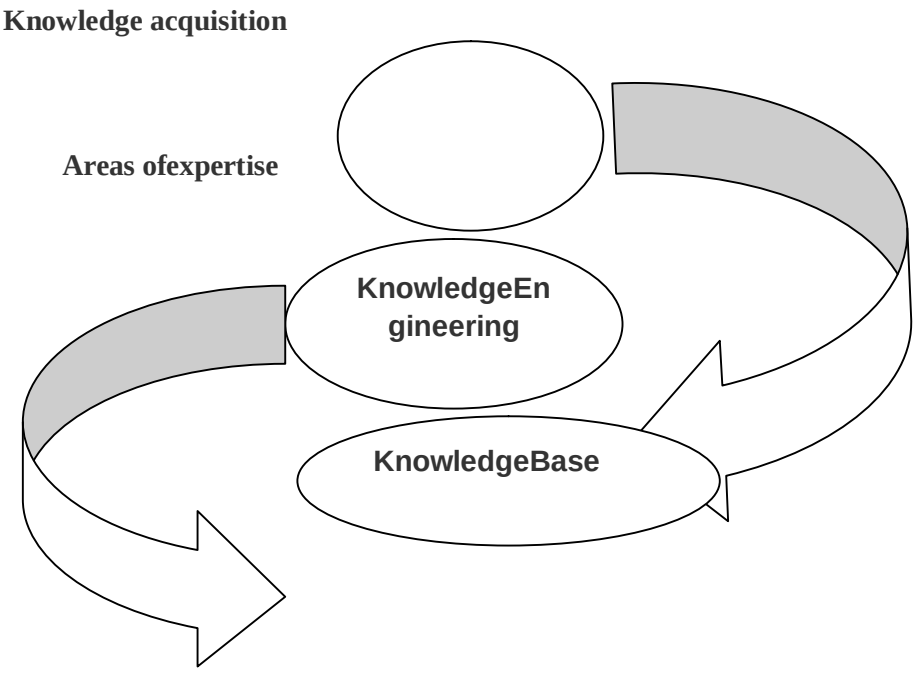
Picture 2 shows a rule based expert system, the user is in collaboration with the system by an interface user.



Picture 2: different parts of an expert system.

The body of expert system (shell):
The shell has four parts: inference engine, interface user, explanation subsystem and knowledge based editor.

The expert system designing is combined of two main parts: in the first part the overall frame work will be designed and the second part is the knowledge base of system.
Using sometypesthatare availablein the markettodayis very usefulfor designing the first step of expert system and will cause aconsiderable saving in the cost and timeofexpert systemdevelopment.
There are several shells of commercial expert system today which have their own usage like HYSM in marketing management and GENESYS in production management.
1.



KnowledgeRepresentation

Selecting a question:
Writinganexpert systemusuallyrequiresalot oftime and money. Toavoid thecost andpossiblefailures, there aresomeguidelines:
1: a real evaluation of thecosts andbenefitsshouldbeapplied.
2: The experts in all required field should not be available.
3: For a problem solution,symbolicreasoningtechniquescan be used.
4: the problem should be defined.
5: The problem shouldn't be easily solved by thetraditionalcalculation methods.
6:Asignificant number of coordinator experts should be available.
7: The problem has a proper limit.
Knowledge engineering:
After selecting a suitable problem, it is the time to copy from theknowledge ofexperts in order to prepare the information bank. This is the duty of Knowledge engineering.
As Pitter Jackson (1986), Buchman (1988), Richard Bas (1991) and JaanDarkin (1994) mention that this duty doesn't require high computer knowledge, it is a technical- art process.
Knowledge engineering is very closed to artificial intelligence and is the presenter of the expert's knowledge.
The experts do not need to express some of the matters which are so obvious for them. They may even do it unconsciously. But all of these things should be expressed in details in order to have a high quality system.
The disability of language andspeechtechnology to express all the waystoperform a scientific activity is the most difficult part to obtain the information. A similar perception of a specific sentence betweenanexpert andtheknowledge engineer is very important.
CLIPS and its history:

As we mentioned in the second season, CLIPS is a beneficial tool to develop and design the express system and can decrease the cost and time.
Gray Rely (2005) has introduced the general principles about this software.
CLIPS was produced in Jansonsnace center of NASA in 1984.
There are 3 problem in using LIPS as a basic language.
1: the LIPS are not available in traditional computers.
2: the high cost of hardware.
3: the disability of LIPS in combination with other languages.
Artificial intelligence says that a traditional language like C can solve all of these problems.
The first version of CLIPS started to work in 1985.
The first goal of CLIPS was to acquire some usefulknowledge andinsightson the structure of the expert system tools and to create atool toreplacetheexistingcommercialtools.
CLIPS fundamentalproperties:
1: knowledge representation.
2: Moving ability
3: the combination
4: the communication improvement
5: being reliable
6: Documentary
7: low cost
The usage of expert system in management:
Inthissectionwe introducesomeapplicationsof expert system and itsusageis considered.
It has its own advantages and disadvantages. In reviewing the benefits of expert system, its usage in management is mentioned.
Strategic Planning:
Expert system helps the managersto select andimplement astrategic plannow.
For example the expert system IBMPC/AT or Turbo prolog tm can be noticed. Thesesystems after introducing a tool, suggest different levels and stages of planning in order to success the strategic planning tools.
The next step is more detailed process of the operation.
Production and operation management:
In the recent years, with the increased complexity and the need for more efficient production, the short life cycle of product, higherflexibility, higherproductquality, customer satisfaction and lower cost have changed the face of operations. Themain challengeatthistimeishow toadapt tothechangingbusiness environment.
Metaxiotis believed that planning for production and operation is necessary for the organization success.
GENESYS is expert system software which is designed for small organization.
MarketingManagement:
Potentialadvantagesandthe widespread useof expertsystems can help the managersinmarketing andmarket management.About theusageofexpert systemsinthis field, Mc Donald's (1989) work can be noticed. Okhsamer and others (1992) studied about theprocessofapplyingexpertsystemsininternational marketing. Joan and Barrel (1995, 1997, and 2002) studied a lot about the use ofexpert systemsinthemarketing. They introduced HYSM as a marketing strategic planning.
Total Quality Management in the organization:

Total Quality Management is one of the majorissuesarediscussedin the management today.
TQM overcome all other organizational tasksin the successful organizationwith emphasis onthe customerneeds.
Various studiesindicatethat only one-third of the qualitycirclesis stable in the organization and the restwere defeated. In studying about thefailureofqualitycircles,several reasons have been identified.
Lack of fitness, efficiency, adequacy and integrity of producers, managers and the companies which use from quality circles.

Decision Support Systems by knowledge management:
Metaxiosis and others (2003) believed that knowledge managementhasbeen mentioneda lot incomputerinformation systems recently.
Governments, industriesand companiesshowgreat interests about it.

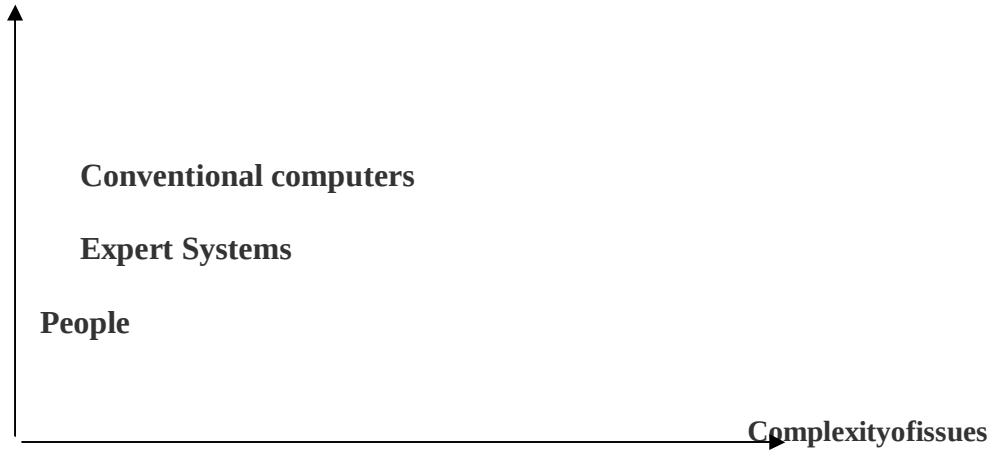
However,in addition tothe above,expert systems help the managers and engineers very much; some of them are mentioned below:

- Industry.
- Agriculture
- FinancialCommunity
- MedicalServices
- Miningoperations
- SafetyServices
- Robotics.

The main problems of expert system:

1. One of the main problems of expert system is when the question is very complicated and need some methods for decision.
2. The high cost of this system is a very important problem.
3. An expert system improvement takes a lot of time.
4. Being accepted by managers and employees is very important.
5. Obtaining the experts knowledge is a very hard duty.

Picture 5



Problems of applying the expert system:

- The loss of knowledge about the advantages of expert system
- Lack of funds
- Lack ofprivate sector
- Lack ofsystems tohave foreigninvestment
- ExclusiveEconomic
- The hugegapbetween management andownership
- Not paying attention to copy- right rules.

Conclusion:

Expert systemwas discussed asone of the mostpowerfulbranch ofartificial intelligence.
In addition to high performance, these systems can behave and decide like a human in processing the extensive information. Because it shows the management in its decision, their position in management and organization is noticed.
But it should not be forgotten that in addition to its main benefits, this system has some problems.
For example the high cost and time is one of the problems. There are lots of limitations in Iran which make the possibilityofapplyingthis system near tozero.

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