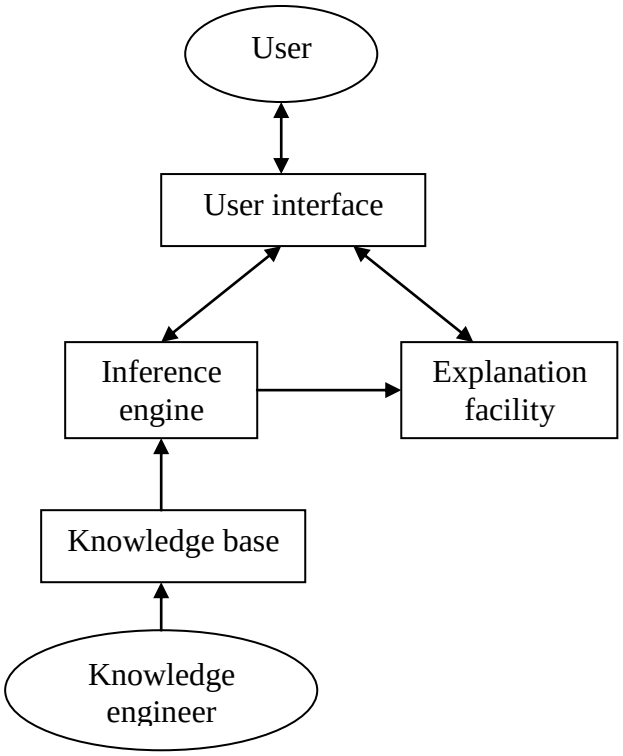
Expert System

- what are Expert Systems(ES):

1. Expert system are computer programs that are derived from a branch of computer science research called Artificial Intelligence(AI). AI programs that achieve expert-level competence in solving problems in task areas by bringing to bear a body of knowledge about specific tasks are called Expert System.
2. A model and associated procedure that exhibits, within a specific domain, a degree of expertise in problem solving that is comparable to that of a human expert.
3. An expert system is a computer system which emulates the decision-making ability of a human expert.
4. An expert system is a program, which attempts to mimic human expertise by applying inference methods to a specific body of knowledge called the domain.

- Architecture of Expert System



Core elements of expert system are:

1. User interface
2. Inference Engine
3. Explanation facility
4. Knowledge Base
5. Knowledge Engineer

- Knowledge Engineer:

The job of the Knowledge Engineer is to extract the knowledge from the expert and represent it using your expert system shell.

The knowledge engineer my initially have no knowledge of the application domain. To extract knowledge from the expert the knowledge engineer must first become at least somewhat familiar with the problem domain, may be reading books or talking to the expert. After this, more systematic interviewing of the expert begins. He/ she must be perfect analyst for this. Typically expert set a series of example problems, and will explain their reasoning in solving the problem. The knowledge engineer will extract general rules from these explanations, and check them with the expert. It is up to the knowledge engineer to capture the knowledge of the domain expert into a knowledge base, which is then used for an expert system. knowledge engineer need to be able to analyse and apply problem-solving techniques so that they can document troubleshooting. knowledge engineer need to be able to pick out the most important pieces of information. And the properties of knowledge engineer are:

1. capable of designing , building and testing an expert system.
2. responsible for selecting an appropriate for the expert system.

3. the knowledge engineer establishes what reasoning methods the expert uses to handle facts and rules and decides how to represent them in the expert system.
4. the knowledge engineer then chooses for some development software or looks at programming languages for encoding the knowledge (and sometimes encodes it himself).

- knowledge base

Reasoning is important part of the knowledge base. The main purpose of the knowledge base is to provide the connections between ideas, concepts, and statistical probabilities that allow the reasoning part of the system to perform an accurate evaluation of a potential problem. knowledge bases are large systems of "if then" statements or may contain only associative relationships among different concepts, or simply large databases of facts that can be compared to one another based on simple conventions intrinsic to exert system. Contains all the rules(rule-base) and most of the facts.

- knowledge representation

knowledge representation is the process of describing and mapping expert knowledge using a set of symbols and attaching meaning to the syntax. There are a number of various techniques to represent expert knowledge :

- Semantic networks
- Rules
- Frames
- AND/OR diagrams

- inference engine

Inferencing is to computers what reasoning is to humans. A computer expert system would need to decide which, and in what order, the rules should be selected for evaluation. To do this, an expert system uses an inference engine. The inference engine controls overall execution of the rules. It searches through the knowledge base, the consequent can be executed.

IF...THEN Rules

Ex:

Rule: Red_Light

IF the light is red

THEN stop

Rule: Yellow_Light

IF the light is yellow

THEN look.

Rule: Green_light

IF the light is green

THEN go

Two alternative strategies are available using in inference engine

1. forward chaining
2. backward chaining

- Explanation facility

جزء التوضيح لايشترط وجوده في النظام الخبير حيث يوضح كيف ولماذا تم الوصول الى القرار (why/how).

-User Interface:

وسيلة التخاطب او واجهة التخاطب مابين user والنظام الخبير من خلالها يمكن المستخدم ارسال اسئلة واستفسارات خاصة للنظام الخبير ومن ثم الحصول على التوضيح والاجابات(الحلول الذكية).

- User:

هو مستخدم النظام الخبير ويجب ان تكون له خبرة ومهارة في استخدام النظام الخبير.

- To Build Expert System There are 4 steps to follow

1. Analysis
2. Specification
3. Development
4. Deployment

- Expert System classes

1. Rule_Based النظم الخبيرة العلائقية
2. Frames_Based النظم الخبيرة المؤطرة
3. Logic_Programming نظم المنطق الخبيرة
4. Procedural Programming النظم الخبيرة الاجرائية
5. Fuzzy Expert System نظم المنطق المضبب الخبيرة
6. Blackboard Expert System النظم الخبيرة متعددة المصادر