

EXPERT SYSTEMS

An expert system stimulates a person's knowledge and expertise. The medical expert system is designed to enable doctors and other medical staff to make correct and quick decisions regarding their patients by obtaining expert medical information.

The main features of a expert system are:

- It is limited to a specific domain (area of expertise)
- It is typically a rule based
- It can reason with uncertain data (the user can respond “don’t know” to a question)
- It delivers advice
- It explains its reasoning to the user

An expert system has the following constituents:

- “the knowledge base” that contains the facts and rules provided by a human expert
- Some means of using the knowledge (an ‘inference mechanism’ or ‘inference engine’)
- A means of communicating with the user (the ‘man-machine interface’ or ‘human-computer interface’).

The knowledge base

The knowledge base will store knowledge in different forms namely FACTS and RULES. For example –

- | | |
|---------------------------------------------------------|------|
| • The basic fee for a 10 week course is £25 | FACT |
| • The course code for C programming is BEC5012 | FACT |
| • If student is unemployed then the basic fee is waived | RULE |

Computers keep databases of detailed information on how doctors have successfully treated patients' problems in the past, and doctors in this age can quickly search through the information. The system is remarkably effective and presents information regarding rare or unfamiliar problems e.g. diseases. Systems are available through the internet for patients themselves to research their symptoms or common plagues, namely NHS Direct Online.

Input

The data is collected by a number of doctors over a period of years and then typed into the database.

Processing

The database has been created around a set of rules enabling the search to lead to definite findings (inference engine). A doctor, when using the system, will answer a series of questions asking for the patient's medical details. The rules of the database will search through all the data and offer an answer.

Output

The expert system offers a medical opinion, recommends treatment or suggests what drugs to be prescribed.

Security Obligations

The information in the database must be absolutely correct to protect patients from any mistakes.

Advantages

Provides a second opinion on a rare or complex medical condition

Compares data with millions of previous cases, giving a clear picture of the situation, and offers the best action based on historical cases

Helps doctors to evaluate the probability of surgical success

Helps doctors make decisions which could save money or time

Reduces the possibility of human errors

Collects expert data worldwide, which would otherwise be unavailable

Disadvantages

The majority of patients prefer to talk to a doctor rather than search through a computer system

The database must be updated regularly

GIGO (Garbage In Garbage Out), the quality of the output depends on the quality of the input

Stimulates the person's knowledge and expertise
 Helps doctors to make decisions
 Presents information regarding rare problems or identifies unfamiliar diseases
 Offers a diagnosis, recommends possible treatments and drugs

Expert Systems in Medicine.

An expert system...

- ...has a large database of knowledge.
- ...allows the database to be interrogated.
- ...has a set of rules (inference engine) for making deductions.

An expert system is a computer system which simulates the knowledge and expertise of a human expert.

For example, in Medicine, expert systems are being used for disease diagnosis.

The patient's details and symptoms are input, and the system outputs probable diagnoses, recommended treatments or drugs which may be prescribed.

Some patients would feel happier typing medical information into a computer than discussing it with a human doctor...but others would prefer the 'human' touch.

The **advantages** of an expert system over a doctor are...

- ...a large database of knowledge can be added to and kept up-to-date - it can store more knowledge than a person.
- ...the system cannot 'forget' or get facts wrong.
- ...it survives forever. There is no loss of knowledge as there is when a doctor retires.
- ...the computer can access specialist knowledge that a doctor may not have.

An expert system would be programmed using an AI (Artificial Intelligence) language such as PROLOG.



Expert systems are not really replacing doctors but are being used to help them. There are ethical and legal reasons for this - if a computerised diagnosis is wrong, who do you sue?

	Expert systems are widely used in medicine to help treat patients.	
(a)	Explain what you understand by the term expert system.	[2]
(b)	Give two advantages to a doctor in using an expert system.	[2]
(c)	Give one advantage to a patient of the use of an expert system.	[1]
(d)	Give one disadvantage of using such a system.	[1]