



Expert Systems



Expert systems

Also known as ‘Knowledge-based systems’:

- ◆ Computer programs that attempt to replicate the performance of a human expert at some specialised reasoning task.
- ◆ Able to store and manipulate knowledge so that they can help a user to solve a problem or make a decision.
 - Limited to a specific domain (area of expertise);
 - Typically rule-based;
 - Can reason with uncertain data (the user can respond “don’t know” to a question);
 - Delivers advice;
 - Explains its reasoning to the user.



Constituents of an Expert System

- ◆ **The ‘knowledge base’**
 - containing the facts and rules;
- ◆ **The ‘inference engine’**
 - the computer program;
- ◆ **The ‘human-computer interface’**
 - to communicate with the user.

www.cee.hw.ac.uk/~alison/ai3notes/chapter2_5.html

www.pcwebopedia.com/expert_system.htm



Uses of expert systems

- ◆ **Medical diagnosis**
- ◆ **Fault diagnosis of all kinds**
 - gas boilers, computers, power stations, engines
- ◆ **Geological surveys**
 - to find oil and mineral deposits
- ◆ **Financial services**
 - to predict stock market movement
- ◆ **Social services**
 - to calculate the benefits due to claimants
- ◆ **Industrial uses**
 - such as ELSIE in the construction industry



Benefits of expert systems

Some of the *organisational* benefits are:

- ◆ **Can do some tasks much faster than a human**
 - e.g. cost calculations for a construction project
- ◆ **Reduces downtime of expensive equipment when an expert system can diagnose the fault**
- ◆ **Error rate in successful systems often very low - may be lower than that of a human**
- ◆ **Recommendations consistent and impartial - given the same facts**
- ◆ **Can capture scarce expertise**
 - e.g. of professional who leaves/retires, and can be used at places where human expert is not available
- ◆ **Repository for organisational knowledge**
 - the combined knowledge of all the qualified experts in an organisation
- ◆ **Useful for training employees**



Limitations of expert systems

- ◆ **Can make mistakes, just as humans do**
 - even a low error rate e.g. in the diagnosis of a disease, may cause people to mistrust it
- ◆ **Expert systems do not ‘learn from their mistakes’**
 - new knowledge has to be entered into the knowledge base as it becomes available
- ◆ **Difficult to acquire all the required knowledge from the human experts in order to build the expert system**
- ◆ **Use can result in decline in skill level of some of the people using the systems**
- ◆ **Over-reliance may stifle creative thinking and lead to advice delivered being slavishly followed**