Expert System Definition

- An expert system is a computer program that represents and reasons with knowledge of some specialist subject with a view to solving problems or giving advice.
- Possess knowledge
- Specific domain
- Solving problem or giving advice

Basic Expert System Concepts

- Knowledge base
- Inference engine
- Facts
- Expertise
- Problem domain
- Knowledge domain of the expert

Expert System components

- **User interface**
- **Explanation facility**- explains reasoning of the system to a user
- **Knowledge Base –** production memory (rules)
- **Working memory**- global database of facts
- **Inference engine**
- **Agenda**- prioritized list of rules satisfied by facts
- **Knowledge acquisition facility**

Advantages of Expert systems

- Increased availability
- Reduced cost
- Reduced danger
- Permanence
- Multiple expertise
- Increased reliability
- Explanation
- Fast response; steady, unemotional complete response at all times;
- Intelligent tutor, Intelligent database

Expert System Tasks

- The interpretation of data
- Diagnosis of malfunctions
- Structural analysis of complex objects
- Configuration of complex objects
- Planning sequences of actions

Expert Systems Domains

- Medical and health applications
- Agricultural, Livestock, and food issues and needs
- Energy Options
- Natural Resource Exploitation
- Space Technology

Expert System Characteristics

- Simulates human reasoning about a problem domain
- Performs reasoning over representations of human knowledge.
- Solves problems by heuristic or approximate methods.

How ES differ form other AI

- Subject matter of realistic complexity that normally requires a considerable amount of human expertise.
- High performance in terms of speed and reliability is needed.
- Must be capable of explaining and justifying solutions or recommendations.

Explanation Facility

- May be simple or elaborate
- A simple system may just list the facts that made the last rule fire
- More elaborate systems may:
  - List all the reasons for and against a particular hypothesis,
  - List all the hypotheses that may explain the observed evidence,
  - Explain all the consequences of a hypothesis,
  - Give a prognosis of prediction of what will occur if the hypothesis is true, etc. (see page 9-10)

Key Topics in Expert Systems

- Knowledge acquisition
- Knowledge representation
- Controlling reasoning
- Explaining solutions