Chapter 3
Expert Systems and Fuzzy Logic

ABSTRACT

An expert system is a system that employs human experience or knowledge captured in a computer to solve problems that ordinarily require human expertise. They may or may not have a learning component. Expert systems are a branch of Artificial intelligence. Truemper describes an expert system as an intelligent system which in an interactive setting asks a person for information and, based upon the response, draws conclusions or gives advice. Problems tend to be solved using heuristics (rules of thumb) or approximate methods or probabilistic methods which, unlike algorithmic solutions, are not guaranteed to result in a correct or optimal solution. The authors go further to clarify that expert systems usually have to provide explanations and justifications of their solutions or recommendations in order to convince the user that their reasoning is correct.

EXPERT SYSTEMS

Expert systems have evolved over the years and have been applied to medical diagnoses systems, robotics, speech recognition and language processing among others. It can be noted from Wang et al (2003) that expert systems have also been applied in maintenance as condition monitoring and diagnostic systems. Expert systems are different from automation or step-by step
programming or conventional computing. In the case of Expert systems, Wang et al (2003) points out that the computer is given knowledge about the subject area plus some inference capability. Expert systems are not just a set of algorithms or some mathematical formulae software based on symbolic representation and manipulation. A symbol, letter, sentence or number is used to represent objects like things, ideas, events or statement of facts. Giarratano et al stated the analogy of the two systems as:

- **Conventional Computer Algorithms**

  \[ \text{Algorithms} + \text{Datastructures} = \text{Programs} \]  

- **Expert Systems**

  \[ \text{Knowledge} + \text{Inference} = \text{ExpertSystems} \]  

**Expert System Architecture**

Figure 1 below shows the system architecture. The data is input by the user or some sensors through the user interface. The user interface has an interviewer component and an explanation facility. The interviewer component controls the dialog with the user and allows measured data to be read into the system. The system for instance asks the user a series of questions, or read a file containing a series of test results (Bullinaria, 2005).

The output of the system is advice, suggestions and explanations. Wang et al (2003) realises that expert systems should give guidelines or instructions on remedy measures on failed equipment, just like the way a human Engineer would do.

The explanation facility provides the ability to trace the inference paths. Bullinaria et al (2005) explains that the explanation facility gives the system’s solution, and provides the user with information about its reasoning process. It might output the conclusion, and also the sequence of rules that was used to come to that conclusion. It might instead explain why it could not reach a conclusion.

www.igi-global.com/e-resources/library-recommendation/?id=78

Related Content

Analysis of the Effect of Human Presence on a Wireless Sensor Network
Ben Graham, Christos Tachtatzis, Fabio Di Franco, Marek Bykowski, David C. Tracey, Nick F. Timmons and Jim Morrison (2013). Pervasive and Ubiquitous Technology Innovations for Ambient Intelligence Environments (pp. 1-11).

www.igi-global.com/chapter/analysis-effect-human-presence-wireless/68919?camid=4v1a

Analysis of Older Users’ Perceived Requests and Opportunities with Technologies: A Scenario-Based Assessment
Mari Feli Gonzalez, David Facal, Ana Belen Navarro, Arjan Geven, Manfred Tscheligi, Elena Urdaneta and Javier Yanguas (2013). Pervasive and Ubiquitous Technology Innovations for Ambient Intelligence Environments (pp. 40-50).

www.igi-global.com/chapter/analysis-older-users-perceived-requests/68923?camid=4v1a
www.igi-global.com/article/automatic-topic-ontology-construction-using-semantic-relations-from-wordnet-and-wikipedia/93153?camid=4v1a

Towards Intelligent Human Behavior Detection for Video Surveillance
www.igi-global.com/chapter/towards-intelligent-human-behavior-detection-for-video-surveillance/201781?camid=4v1a