Chapter 60
Expert Systems in Distance Education

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ABSTRACT

Computers have been used in educational environments to carry out applications that need expertise, such as compiling, storing, presentation, and evaluation of information. In some teaching environments that need expert knowledge, capturing and imitating the knowledge of the expert in an artificial environment and utilizing computer systems that have the ability to communicate with people using natural language might reduce the need for the expert and provide fast results. Expert systems are a study area of artificial intelligence and can be defined as computer systems that can approach a problem for which an answer is being sought like an expert and present solution recommendations. In this chapter, the definition of expert systems and their characteristics, information about the expert systems in teaching environments, and especially their utilization in distance education are given.

INTRODUCTION

One of the most discussed problems of distance education is whether the learning outputs taken without being in the same place with many students are better than the traditional methods (Miller, 2001). While it is seen in some studies that the results are equivalent, it is true that sometimes limitations occur due to lack of time, place, experts and abundance of students (LaBay & Comm, 2003; Mehlenbacher, et al., 2000; Chatpakkarattana & Khlaisang, 2012). The teachers, who are to get to know students and determine the appropriate type of instruction for them, have a very important role as experts in the success of distance education (Lin, et al., 2005; Wiesner, 2000). As a solution for the lack of experts, systems which can simulate what an expert is doing, which are run to use human knowledge in the solution of problems that can usually be solved with high level capabilities, can be used to lead students in distance education and can be used as assisting systems in compiling data (Russell & Norvig, 2010).

The expert systems as an application of artificial intelligence are interactive decision tools that are created on the basis of knowledge gathered from the expert and which utilize information of events and experience to solve complex problems (Baykal & Beyan, 2004). In addition, they are defined as software that models reasoning and decision processes of the one who is an expert on a subject (Nabiyev, 2005). Expert systems, designed to make the logic of a human expert available to others, preserve and transmit individual and collective experiences in specialized domains. They receive, keep and incorporate the experience which certain skilled ones in an organization have accumulated over the span of their professional lifetimes (Wachter & Gupta, 1997).

The first expert system known is the writings on Luxor papyrus dated around 3000 BC, found in Egypt, about the application of symptom-treatment-process situations according to "if-then" rules. The expert systems in the real sense of the meaning have been developed by the communities of artificial intelligence in the middle of 1960s with the idea that the combination of some reasoning rules and powerful computers, performance of expert, even superhuman, could be revealed. The first application examples of this period could be expressed as the development of DENDRAL by E.Feigenbaum and afterwards the appearance of MYCIN (Russel & Norvig, 2010; Turban et al., 2007).

The goal of the expert system is not to replace any expert; it is to facilitate common use of the expert knowledge by leading it into as many channels as possible. The expert improves himself in problem solving in areas which need special knowledge and becomes an expert on that subject. The expert systems gather all the knowledge about a subject which needs expertise from experts, printed and online sources such as journals, books, articles and store them in the database of the system. When needed, the expert system can deliver this knowledge to any person who wants to use it. Thus, the knowledge of the expert is put into more common use (Erkoç, 2008).

In traditional programming methods, the data in the database is effectively processed in the system according to the algorithm created by the programmer and a predetermined result is reached. But during knowledge processing, knowledge bases created by defined rules and facts are effectively processed in the system based on experience/heuristic or similar methods independent of any algorithm. Expert systems are especially used in cases where quantitative data and mathematical modeling of traditional programming techniques are inadequate and judgmental knowledge based on expertise is needed. Result refining mechanisms are used in expert systems instead of algorithms (Russell & Norvig, 2010; Biondo, 1990; Sasikumar et. al., 2007; Turban et. al., 2007).

Expert systems are systems that also learn from new inputs. For example, when your car breaks down, you enter possible error symptoms and the computer stores them in the workplace. As a result, a hypothesis is developed in the workplace, the computer suggests you some checks, the results are saved in the workplace and thus it also learns this problem and its solution (Russell & Norvig, 2010; Turban et al., 2007).

Harmon and King (1985) contend that, as a greater volume of information is collected, merged and shaped into meaningful patterns more rapidly than ever, expert systems will play a major role in the reforming of conventional concepts of what composes an organization and how it is managed. Furthermore, traditional educational organizations are transformed into web-based learning environments including expert systems.

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