

A Novel Web-based Human Advisor Fuzzy Expert System

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ABSTRACT

The applications of the Internet-based technologies and the concepts of fuzzy expert systems (FES) have created new methods for sharing and distributing knowledge. However, there has been a general lack of investigation in the area of web-based fuzzy expert systems. In this paper, the issues associated with the design, development, and use of web-based applications from a standpoint of the benefits and challenges of development and utilization are investigated. The original theory and concepts in conventional FES are reviewed and a knowledge engineering framework for developing such systems is revised. For a human advisor to have a satisfying performance, expertise is a must. In addition, some of advisory rules are subject to change because of domain knowledge update. The human requests may have linguistic or crisp forms and a conventional expert system (ES) is not able to overcome the fuzziness in the problem nature. In this research, a Web-based fuzzy expert system for Common Human Advisor (FES-CHA) is developed and implemented to be used as a student advisor at the department's web portal. The system is implemented by using Microsoft Visual Studio .NET 2010, MVC and Microsoft SQL Server 2012.

Keywords: fuzzy expert systems, web-application, common human advisor, total average.

1. Introduction

Knowledge-based and decision making systems are the branches of artificial intelligence which are based on imitating the human demeanor in finding the pattern of solutions to problems. In the real world, if definite and straightforward solution cannot be found, human expertise is needed. Experts often follow a trial-and-error approach for problem solving. Since there is no specific solution for this kind of problems, defining a certain computer method for achieving the solution is difficult. Therefore, expert systems are used to reach this goal. In these systems, the program consists of a set of rules. The knowledge in an expert human brain is also a set of if-then rules. M. H. Goodarzi [1,2,3] proposed the fuzzy application in student evaluating system, portfolio advisor system and educational advisor system. Fuzzy concepts can convert multiple crisp inputs to specific linguistic variables and use fuzzy rules to infer. In [4] the fuzzy-based advisor for elections and the creation of political communities was proposed. In [5], a web-based fuzzy expert system is used to help inexperienced Indian farmers in the use of pesticide for their farms. The

initial version of this software was introduced in 1995 in a single-user form. In forums, usually a user starts a discussion and expresses his/her opinions and approaches to a particular problem. [6] Proposes a model for creating a fuzzy-based expert forum that intelligently responds to questions asked by users. Finding the right broker at the right time is another issue that requires expertise. This may be the reason for which inexperienced investors loose in stock markets. In [7] a stock expert system model is proposed. The goal of this system is to make a good suggestion based on information about goods and market in order to reduce the loss and increase the benefit. Educational consulting system tries to mimic the behavior of the staff addressing the educational consulting issues. In [8] a fuzzy expert system for intelligent tutoring systems with a cognitive mapping is proposed. Human cognition has become one of the most attractive areas of research and application in artificial intelligence in which human susceptibility is emulated. In [9] a new fuzzy method for hotel selection is introduced as a hotel advisory system.. In [10] the student

achievements and education system performance in a developing country is proposed. The current paper, includes five major sections: in the next section some of related works are reviewed. The third section describes the fuzzy rule-based and decision making systems and introduces the proposed model. In section 4 the proposed system is discussed in details. Section 5 includes a sample of the advisor system implemented in a university. Finally, a conclusion is provided.

2. Literature review

In a real voting the total of both, positive and negative votes for the candidates are collected. A major problem for the voters is when they have to select their deputies from a large list of candidate. The problem is more serious in cases where the candidates are unknown to the voters. However, the creation of political societies interested in addressing political issues is a hurdle to overcome. In [4] an advisor system for elections and creation of political communities based on fuzzy logic is proposed. In this approach the recommendation engine works with a modified fuzzy C-means algorithm and the Sammon mapping technique used for visualization of recommendations.

Each year in India, many farms are destroyed due to pests attack and insufficient experience of the farmers. In 2001, the loss was about 6.3 billion dollars. Soybean pest expert system (SOYPEST) [5] is a fuzzy expert system that asks fuzzy questions in order to generate a web-based response for the user. SOYPEST is created by using JESS and gradually became more accurate by receiving feedback from the users and the experts. Mutual information interchange and the creation of forums on the web are important issues which captivate many researchers. One of the best known content management systems (CMS) tools for this purpose is Vbulletin. There are reasons that support the possibility of receiving irrelevant answers, no answers at all, different confusing answers from several other users and unclear answers. These drawbacks may be considered as the Achilles heel of such systems. In [6], linguistic expressions are categorized and then n-gram algorithm is used to edit and convert the sentences to a proper format. This system supports 15 languages and by default the

questions are multiple choice questions. The strong point of this system is its gradual improving knowledge base, the extended number and the expanded fields of topics; however, no considerable effort is done to find the best answer and the problem is solved through partial simulation of the human brain.

3. Fuzzy decision making system

Most humans face difficulties related to life rules and regulations during their problem solving process. These rules and regulations are changing every now and then therefore, an expert is needed to memorize these rules in order to be able to help humans in their issues. The state of each person regarding the rules and regulations may differ from that of other people. Human state (HS) is a member of a fuzzy set with a degree of membership equal to μ_{HS} .

The First Step: determining and fuzzifying the inputs to the system by using fuzzy rules. Following are some examples of the fuzzy sets of the system on hand:

Fuzzy set for Law in judgment system.

Fuzzy set for passed courses in university.

Fuzzy set for marks of selected courses in university.

Fuzzy set for the rank and grade of student in the entrance exam

And so on...

3.1 One sample for fuzzification of the crisp variable of TA in university system

Total grade point average (GPA) of students can be categorized into these groups: A, B, C, D and E. This categorization can be expressed through linguistic terms as *Excellent*, *Good*, *Middle*, *Weak*, *Very Weak*.

The Second Step: determining the degree of membership of linguistic terms including 3 following phases:

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