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Fuzzy system application in education

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Abstract. Fuzzy logic is an AI science through which human reasoning is implemented through computer devices so that the devices can imitate human intelligence. Fuzzy logic enables the computer devices to explain ambiguous concept. Fuzzy logic is described as uncertainty defining logic. It adopts human intelligence and attempts to describe human decision making and saying. In its process, fuzzy logic predicts and draws conclusions based on its expertise by which it becomes tool for users to consult. In education, the application of fuzzy logic is helpful, not only in learning but also in decision making process. Designated applications and experiments have important roles in student performance because group studies and classical student evaluation methods are no longer sufficient for quality education.

1. Introduction

One of the efforts to support the education process is by utilizing ICT media. ICTs are not only used as information and communication media, ICTs can also adopt human thinking. It can be done by entering an expert knowledge into a program, one of which is through Fuzzy logic.

Fuzzy logic as a branch of the artificial intelligence system can be applied in education [1]. Fuzzy logic is also defined as logic that describes uncertainty, fuzzy logic adopts intelligence possessed by humans and tries to describe human words and decision making [2]. In its application, the controlling system is done through linguistic expression. Fuzzy logic is also defined as a set of mathematical principles for the representation of knowledge that uses membership levels [2]. The logic controller of fuzzy logic consists of fuzzification, inference, defuzzification and knowledge base unit[3].

Fuzzy logic has been widely implemented in many fields [3],one of which is in educational evaluation, for example: Educational Evaluation [4], Learning Outcome Evaluation [5], e-learning Evaluation [6], Distance Learning Evaluation [7], Students' Academic Evaluation [8] . Designated applications and experiments have an important role in student performance because group studies and classical student evaluation methods are no longer sufficient for quality education [9].

2. Method

This research was analyzed based on literature study in which it examined the implementation of fuzzy logic in education. The papers were published between 2009 and 2018, while the electronic databases used are the IEEE (Institute of Electrical and Electronics Engineers), what is presented in this paper shows an overview of the use of fuzzy logic and research results related to the use of fuzzy logic in education.

3. Result and Discussion

Fuzzy logic is an AI science through which human reasoning is implemented through computer devices so that the devices can imitate human intelligence. Fuzzy logic enable the computer devices to explain ambiguous concept. Fuzzy logic was originally invented by Prof. Lotfi Zadeh from University of California in 1964, Fuzzy logic enable devices to describe ambiguous concept. Mamdani first developed fuzzy logic used in predicting data result if the data are inaccurate or missing [10]. Fuzzy logic is also defined as logic that describes uncertainty, fuzzy logic adopts intelligence possessed by humans and tries to describe human words and decision making [2]. In education, the application of fuzzy logic is helpful, not only in learning but also in decision making process.

The literature review in this paper showed that fuzzy logic has been widely implemented in various fields for years [3]. The application of fuzzy logic in the field of education varies greatly. The application of fuzzy logic to support learning is: Students' Performance Evaluation Model, Scoring, Desirability and Selection, Learning Outcome Evaluation, Educational Content Model, Learning-style-based Instructional Technique Evaluation, Affective Assessment in Learning Process, Training Education, Model University, Educational Evaluation, Laboratory Experiments, Knowledge Dissemination, MatlablSimulink Design.

Table 1. The Application of Fuzzy logic in education

Application Model	Author name	Country	Year
Educational Content Model	Bunyatova, Fatma Khanim		2009
Learning Outcome Evaluation	Chua, Shing Chyi,Lim, Heng Siong, Oh, Tick Hui		2010
Laboratory Experiments	Pratumsuwan, P,Thongchai, S		2010
Training Education	Wei, S U N		2012
Educational Evaluation	Xu, Jifang		2012
Knowledge Dissemination	Almohammadi, Khalid Hagras, Hani		2013
MatlablSimulink Design	Albayrak, Ahmet, Albayrak, Muammer, Bayir, Raif Ismail, Marina,Syaiful, Lusiana		2015
Affective Assessment	Jesus alfons, remolina caro, Claudia Lucía,		2015
Model University	Guillermo, Alexis		2016
	Sprock, Antonio Silva, Vicari, Rosa María		
Learning-style-based	Nayak, Prasunjit, Madireddy, Sushmitha		2017
Desirability and Selection	Hameed, Ibrahim A.		2017
Student Academic Evaluation	Rao, D. H., Mangalwede, S. R., Deshmukh, V. B.		2017
Scoring			2018

In education, fuzzy logic is commonly used to measure students' performance such as Instructional Technique based on Learning Style [11], It was described that students' learning style can be taken into account considering that learning style might affect learning processes. Understanding students' characteristics and learning styles highly affect instructional technique effectiveness [11]. It can also be used as assessment indicators related to students emotion in learning process [2]. The application of fuzzy logic is helpful in education to facilitate effective learning processes.

4. Conclusion

The application of fuzzy logic in education, from the 14 journals that have been reviewed by the literature, confirmed that the application of fuzzy logic in education is very helpful and proven to give solution in finding conclusions and predicting problems related to the education matters. Developing fuzzy logic is highly recommended, especially in the field of education, to support the process of education.

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