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Difficulty of test by Fuzzy logic

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Abstract **-** In this paper we present an idea how we can measure the difficulty of a test by Fuzzy Logic. Designing an achievement test requires recognition not only of the program but also of the latest technology. Learning and teaching are complex processes.

Fuzzy Logic has the advantage of modeling the qualitative aspects of human knowledge, and decision making as done by human beings by applying the rule base. Modern information management systems enable the recording and the management of data using sophisticated data models and a rich set of management tools. This model consists of four components fuzzy inference engine, fuzzy rules, fuzzier, and a defuzzifier.

Application of fuzzy logic in processing student evaluation, are expected to represent the mechanisms of human thought processes capable of resolving the problem of evaluation of students. Fuzzy mathematical modeling technique provides a solution in area of performance measurement techniques and its evaluation. Evaluated student test make it easier for teachers to assess students according to the level of difficulty of the test. With a system of evaluation of student test results by using fuzzy logic will be able to support the needs of teachers as well as those related to monitor student progress so that it can support the success of students.

Keywords – Fuzzy Logic, Membership Function, Difficulty Of Test, Rules Inference, Rule Viewer

Introduction

It is very important that on the basis of the curriculum, assessment tests of students must include all levels of difficulty.

Over the past decade, the rapid development of computer and Internet technologies has affect a variety of fields of the human's everyday life. Such a field is the education. The ways of teaching and learning have been changed and the e-learning systems and processes have been developed significantly.

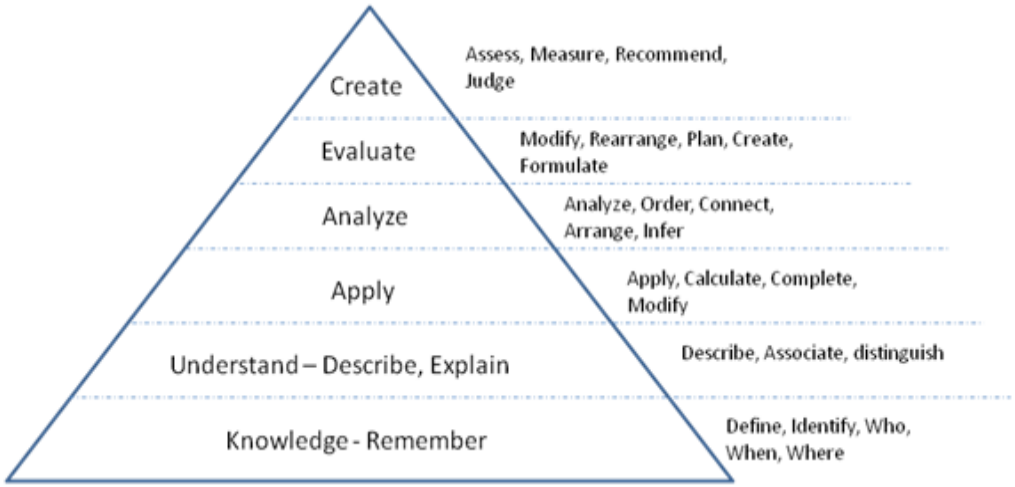
The Fuzzy Logic applications in the field of education are quite promising. The integration of this technology with other artificial intelligence techniques is making the traditional learning increasingly adaptable to the needs of students. It is this reality that will increasingly allow quality education without borders and student-centered.

Learning and student's evaluation are complex. They are defined by many factors and are depended on tasks and facts that are uncertain and, usually, unmeasured. One possible approach to deal with this is fuzzy logic, which was introduced by Zadeh

(1965) as a methodology for computing with words in order to handle uncertainty

Fuzzy Logic has the advantage of modeling the qualitative aspects of human knowledge, and decision making as done by human beings by applying the rule base. Modern information management systems enable the recording and the management of data using sophisticated data models and a rich set of management tools. Application of fuzzy logic in the processing of student test evaluation, expected to represent the mechanism of human thinking processes to solve problems of student exams. With a system of evaluation of student exam results by using fuzzy logic will be able to support the needs of teachers as well as those related to monitor student progress so as to support student's success.

Fuzzy set theory was proposed in 1965 by Zadeh to help computers reason with uncertain and ambiguous information. Zadeh proposed fuzzy technology as a means to model the uncertainty of natural language. He reasoned that many difficult problems can be expressed much more easily in terms of linguistic variables. Linguistic variables are words and attributes which are used to describe certain aspects of the real world. One important feature of linguistic variables is the notion of their utility as an expression of data compression. Zadeh describes this as compression granulation. He argues that this is important because it is more general than use of discrete values. This point means that an agent using linguistic variables may be able to deal with more continuous and robust descriptions of reality and problem spaces. Our approach is to design a fuzzy rule base system to control difficulty exams process in the steps below (Fig 1):



Fuzzy logic is powerful problem solving methodology with a myriad of applications in embedded control and information processing. Fuzzy provides a remarkably simple way to draw definite conclusions from vague, ambiguous or imprecise information. In a sense, FL resembles human decision making with its ability to work from approximate data and find precise solutions.

Application of fuzzy logic in processing student evaluation, are expected to represent the mechanisms of human thought processes capable of resolving the problem of evaluation of students. With a system of evaluation of student test results by using fuzzy logic will be able to support the needs of teachers as well as those related to monitor student progress so that it can support the success of students.

Fuzzy Logic theory

Definition (Zadeh, 1965) Let X be a nonempty set. A fuzzy set A in X is characterized by its membership function: $\mu_A : X \to [0,1]$

μ(x) is interpreted as the degree of membership of elements in fuzzy set A for each x ϵ X.

Let μ be a fuzzy subset of X; the support of A, denoted supp(A), is the crisp subset of X whose elements all have nonzero membership grades in A. Membership functions are (show in Fig 2 respectively)

-Triangular
- Trapezoidal
- Sigmoid
- Gaussian

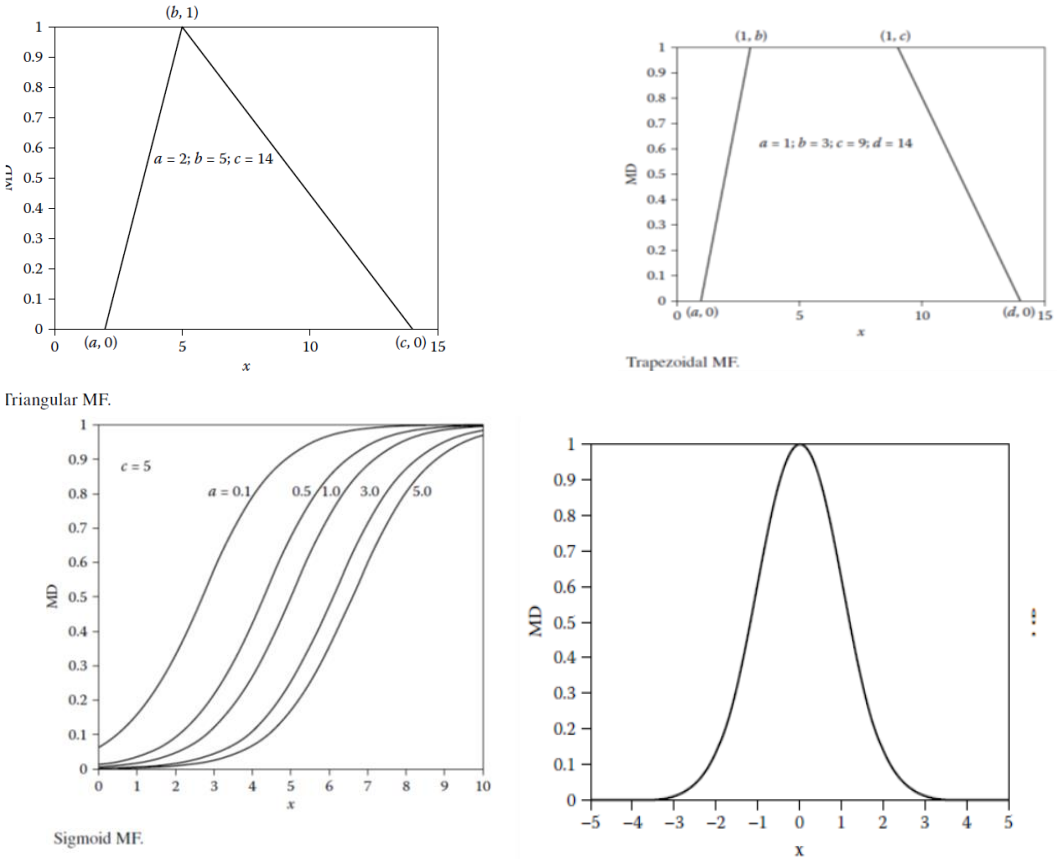


Fig 2

- **MATLAB fuzzy logic toolbox**

MATLAB fuzzy logic toolbox facilitates the development of fuzzy-logic systems using graphical user interface (GUI) tools command. The tool can be used for building Fuzzy Expert Systems, Adaptive Neuro-Fuzzy Inference Systems (ANFIS).

- Graphical User Interface (GUI) Tools

There are five primary GUI tools for building, editing, and observing fuzzy inference systems in the Fuzzy Logic Toolbox:

- Fuzzy Inference System (FIS) Editor
- Membership Function Editor
- Rule Editor
- Rule Viewer
- Surface Viewer

In MATLAB: Fuzzy Logic Toolbox

Two type of inference system

- Mamdani inference method
- Sugeno inference method

Mamdani's fuzzy inference method, the most common methodology

- **Application**

About the level of difficulty is an opportunity to answer correctly a question at a certain skill level, usually expressed in the form of an index. Difficulty level of the index is generally expressed as a proportion of the size range from 0.00 to 1.00. The greater the difficulty level of the index obtained from the calculation, then the easier about it.

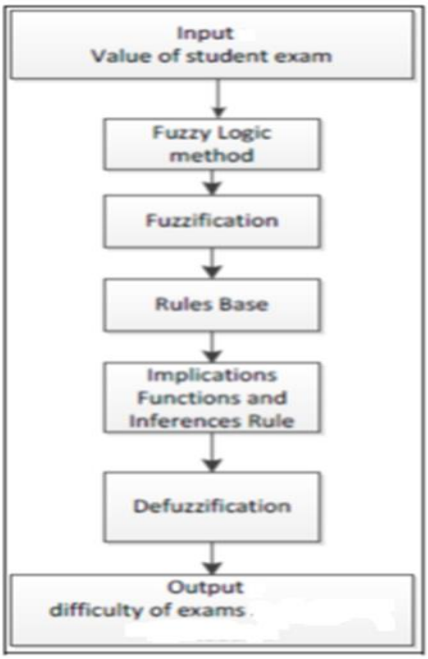
Difficulty levels result using the above formula describes the level of difficulty about it. The difficulty level classification problem can be illustrated as follows:

Value	Criteria
0% - 45%	Difficult
46% - 75%	Medium
76% - 100%	Easy

While usability for process of testing and teaching, among others: introduction of the concepts needed to re taught, the signs the strengths and weaknesses of the school curriculum, and weave the test have data on accuracy.

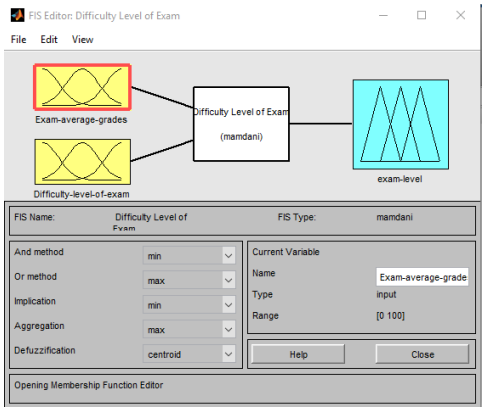
- **Fuzzy Logic Method**

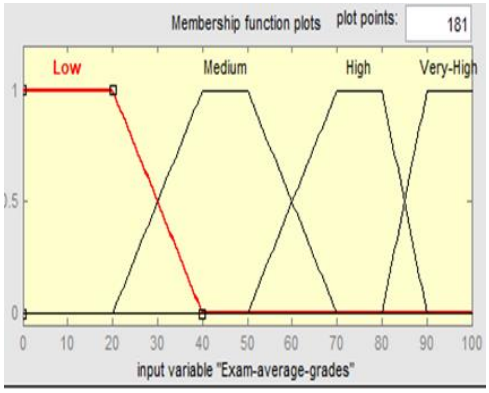
This model comprises of four components fuzzy inference engine, fuzzy rules, fuzzifier, and a defuzzifier. The steps processes are:

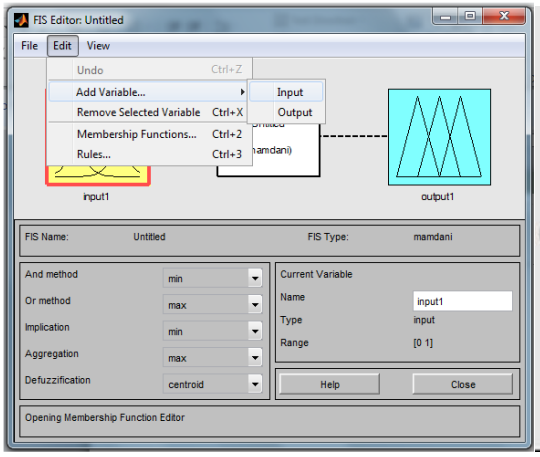


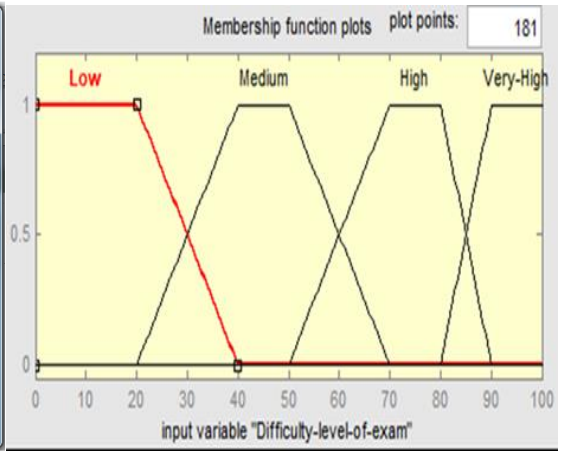
- **In Matlab create FIS**

- Input Membership Function

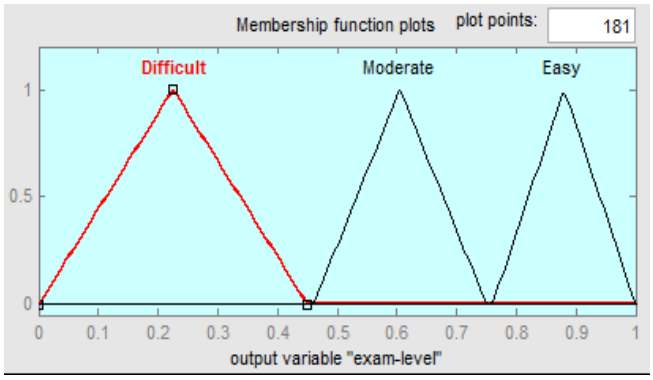




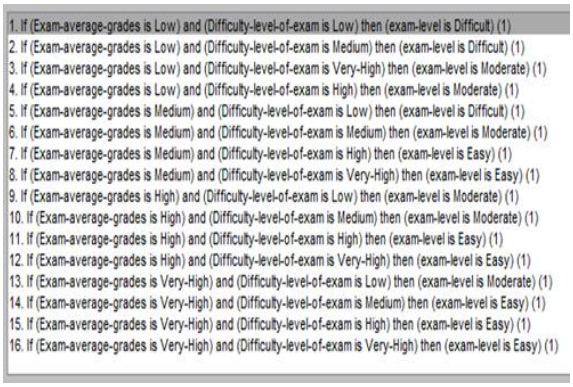




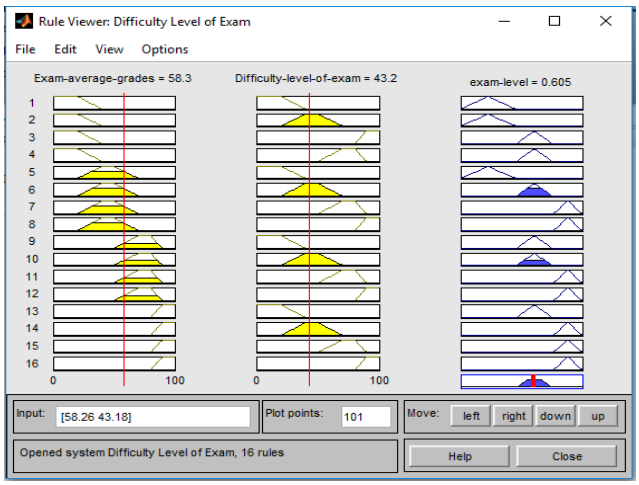
- **Output Membership Function**



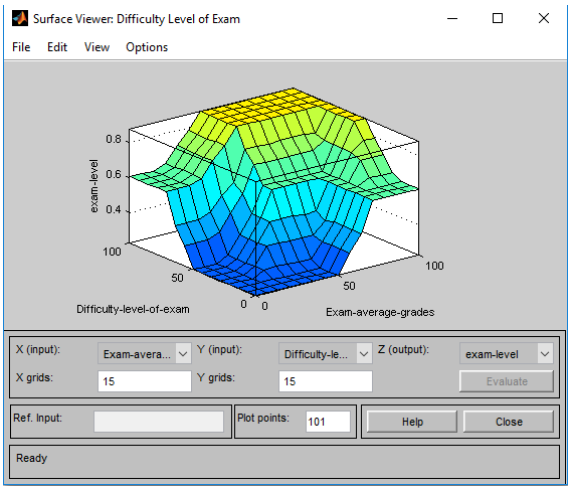
- **Rules inference**



- **Rule viewer**



- **Surface viewer**



Fuzzy logic is very good when used in evaluating student test making it easier for teachers to assess students according to the level of difficulty of the test. It is also regarded as a good reference for teachers to evaluate the level of the exam is the benefit of this evaluation

- Conclusions

Fuzzy mathematical modeling technique provides a solution in area of performance measurement techniques and its evaluation. Modeling with fuzzy logic can also be applied in comparing the achievements of students in high school and University. This would give an idea and an accurate orientation of faculty choices.

References

[1] Institute for Advanced Management Systems Research Department of Information Technologies A bo Akademi UniversityA Short Survey of Fuzzy Reasoning Methods Tutorial Robert Fuller

[2] Introduction to Fuzzy Logic Control,Deepak_Fuzzy Logic

[3] Zadeh, L.A., "Fuzzy sets," *Information and Control*, Vol. 8, pp. 338-353, 1965.

[4]Zekai Sen, Fuzzy Logic *and* Hydrological Modeling.Book

[5] Adel Abdennour, Electrical Engineering Department, King Saud University, Tutorial on Fuzzy Logic using MATLAB

[6] Zhifka Muka' Elda Maraj, Shkelqim Kuka, "Modeling the Amount of Rainfall Using Fuzzy Logic"

[7]"Fuzzy Logic Method for Evaluation of Difficulty Level of Exam and Student Graduation" Rusmiari, Darma-Putra, Arya-Sasmita

[8] Rajeev G. Sapre and Shraddha Surve, International Journal of Fuzzy Mathematics and Systems. Vol 2, Fuzzy Mathematical Approach for Performance Evaluation of a Student

[9] Rusmiari1, Darma-Putra 2 and Arya-Sasmita, "Fuzzy Logic Method for Evaluation of Difficulty Level of Exam and Student Graduation", IJCSI International Journal of Computer Science

[10] Ibrahim A. Hameed and Claus G. Sorensen Aarhus University, Research Centre Foulum Blichers Allé 20, DK-8830, Tjele, Denmark "Fuzzy Systems in Education: A More Reliable System for Student Evaluation"