FUZZY BASED AUTOMATED FEEDBACK COLLECTION AND ANALYSIS SYSTEM

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Abstract

There is a prevalent appreciation to the analysis framework which is a mean for creating stronger and fairer academic institution system. In developing country like India, where higher education is connote to develop new resources for serving its people. A highly effective and fairer fuzzy based reliable system is required for decision making. Fuzzy logic bestows a significant aptitude which moves beyond two values zero and one. In our day to day life, we mostly deal with fuzzy based reasoning called f-valid reasoning. In this paper, we are proposing a fuzzy based educator feedback system. As we know, Faculty performance and feedback analysis is essential to facilitate educators to effectual teaching and learning in order to better engage students in classes. This system aimed at holding teacher's liability for their performance. Proposed fuzzy based system is using linguistic model i.e. multiple input and single output (MISO) Mamdani model to categorize educators. This system will help the institution administrator to write confidential appraisal report.

I. Introduction

As we all know feedback systems have great importance in teaching and learning process. Motivation behind feedback system is to improve teaching and learning process and to find out areas, where educators are lacking. This system helps the educators to better engage the students in the classes by discovering the undersupplied areas in teaching. This system will also help the institution administrator to write confidential appraisal reports. In recent years, soft computing techniques are becoming very popular and can be used in a variety of disciplines. According to Zadeh, soft computing technique like fuzzy logic is more forbearing in handling imprecision and uncertainty than traditional hard computing techniques [1]. Traditional evaluation systems are highly structured and take up scientific or quantitative data measures. But, it is extremely hard to compute performance dimensions as qualitative data [2]. Further, if we try to evaluate educator performance manually, then it will be very time consuming and tedious task. Therefore, a fuzzy based feedback collection and evaluation system is proposed. In proposed system first system is web based system through which student feedback is collected from a group of students based on sixteen parameters. For developing this system PHP, JavaScript, HTML, XAMPP server and MYSQL etc. are being used. In this system, average of each parameter is calculated using some arithmetic and statistical formulas and saved in database. Second system is fuzzy based system for analysis. In fuzzy based system a linguistic model i.e. multiple input and single output (MISO) Mamdani model is used. This paper consists of five sections. Section II, contains review of educator performance based on fuzzy method. Section III, contains our proposed system. Section IV consists of result. In last section we have concluded the paper.

II. Review of Fuzzy Methods in Educator Feedback Evaluation

Nowadays fuzzy logic is being used in range of applications from aerospace, automotive, business, defense to healthcare etc. In this section we have done a survey of methods already modeled to evaluate and analyze feedback of educator using fuzzy based system.

(A) A Soft Computing Model for Evaluating Teacher's Overall Performance using Fuzzy Logic:

In 2017, Javed Alam et al., proposed a fuzzy system, to evaluate teacher overall performance using MATLAB fuzzy toolbox [5]. In this model, reasoning approach has been used for crafting fuzzy inference system (FIS). In this model author has created two modules. First module which calculates teaching performance and known as teacher overall performance (module-1) and second module calculates administrative performance named as teachers overall performance module. On the bases of these modules overall performance of teacher is calculated. In 2012, O. K. Chaudhari et al., proposed a fuzzy expert system for evaluating faculty performance based on technique of fuzzy logic containing "vague facts" in the decision making procedure [6]. It introduces the main beliefs behind fuzzy logic and illustrates application of these beliefs by educators to assess teachers' performance. This model was basically built for creating the confidential yearly reports of the teacher.

(B) An Evaluation of Students Performance in oral Presentation Using Fuzzy Approach :

In 2011, Wan Suhan Wan Daud et al., proposed a technique for student's academic assessment using fuzzy logic approach [3]. According to author, the assessment of students is a judgment making process based on numerous fundamentals such as examinations, assignment, test, quiz, research work and so on. The method of evaluation used till date was not the best because, for student evaluation, we have many panels having different attitude, experience and sensibility. This involves fuzziness, but previously we have no method to handle this fuzziness. In this paper, author had used following methodology to handle fuzziness. Firstly, student's marks are normalized, and then graph of the fuzzy membership function is developed followed by calculation of degree of satisfaction and finally, final marks are computed.

(C) A Teaching Evaluation System Based on Fuzzy Rule with scientific Teaching Material:

In 2011, Zhang F. et al. had done a survey in which it is considered that evaluation process is qualitative rather than quantitative [4]. From ancient time, the evaluation of teaching process mostly depends on student's performance in examination .But, it does not believe in student's attitude, teaching growth and other factors like teaching order management,

construction management quality of courses, teaching reform and research ability, management level of teaching quality.

III. Proposed Model for Feedback Collection

Architecture of Proposed system

Conventional faculty evaluation methods are lacking in information and evolution methods. Real world information is not static but dynamic, which involve fuzziness. Tradition systems were lacking in handling fuzziness. To overcome shortcomings of traditional system we have proposed, a fuzzy approach to perform the proposed method of educator feedback collection and analysis. It is noteworthy, that intend of the anticipated method is not to substitute the conventional method of assessment, instead it will make it stronger by adding decision making. Figure 1. Shows proposed method for educator performance collection and evaluation. This system for storage of data has been intended to use the MYSQL Database and all the user interfaces has been designed using the PHP and Java Script technologies.
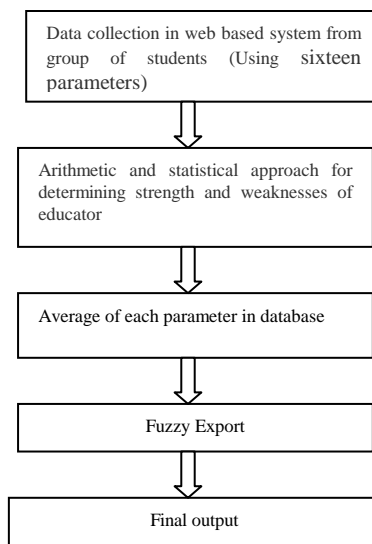

Figure 1. Proposed system for data collection and manipulation.

Educator Feedback collection:

Observing educator record and getting insights into feedback of educator is very crucial to aid them to get their own reflection, mainly over time as

memory predictably dims. These records help an educator to find their strength and weakness, while going through the progression of expounding their teaching goals. Based on feedback educator can devise courses of stroke for development, reflecting on these changes as they are put into practical. For feedback collection proposed system has a web based system.

Parameters used

List of sixteen parameters used for taking feedback from group of students is mentioned in table 1. Students can submit their responses in front of these parameters in the form of numbers from 1 to 10. After, getting the responses from students, average of each parameter is calculated. Parameter having an average of 70% becomes the strength of educator and parameters having an average less than 50% become educator weakness. On the basis of feedback collected and average calculated, parameters can categorize educator as POOR, AVERAGE, GOOD or EXCELLENT. The output obtained from online system is tabulated in table 2.

Feedback Analysis

For feedback analysis we have adopted a hierarchal system. To create this hierarchal system parameters of proposed system are divided in three categories and output of one category feed to other category. This hierarchal system is implemented in MATLAB using its fuzzy tool. Three categories of parameter are as follows: Primary parameters, in this category we have chosen three parameters i.e. Power of Expression, Command over language and Subject knowledge. Secondary parameters are Regularity, Punctuality, Syllabus completion, Interactive. Third category is of Ornamental parameters like Use of Audio/Video Aids, Checking of Assignments, Creativity, Clarifications of doubt, Discussion of Examples of related subject, Motivation/Introduction to topics, Evaluation Fairness, Speed of course coverage will act as an ornamental parameters.

Feedback Parameters	
Primary parameters	**Ornamental parameters**
Power of Expression	Clarifications of doubt
Command over language	Discussion of Examples of related subject
Domain knowledge	Motivation/Introduction to topics

Secondary parameters	Evaluation Fairness
Regularity	Speed of course coverage
Punctuality	Use of Audio/Video Aids
Interactive	Problem Solving Techniques used
Syllabus completion	Checking of Assignments
	Creativity

Fuzzy based system

Performance analysis of educator with Fuzzy based System will be done through four steps:

1. Identifying of crisp value.

2. Fuzzification of input value.

3. Determine application rules and inference method.

4. Defuzzification of final output.

Crisp set: Educator feedback form duly filled by students saved in database. Then, we have taken average of each parameter as crisp set. The output of online feedback collection is tabulated in table 2, that will act as a crisp set.

Table 2. Average of each Parameter in Database.

t_id	t_name	course	class	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	c11	c12	c13	c14	c15	c16
ECE158	Vishal Jain	Digital Signal Processing	6ECENA	5.0	5.0	5.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0
ECE186	Monika Gambir	Digital Design using Verilog	6ECENA	8.0	8.0	8.0	8.0	8.0	8.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
ECE164	Pankaj Batra	Digital Communication	6ECENA	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0
ECE178	Arun Rana	Computer Communication Network	6ECENA	6.0	6.0	6.0	7.0	7.0	7.0	4.0	4.0	4.0	4.0	4.0	9.0	9.0	9.0	9.0	9.0
MBA372	Annu Dahiya	Fundamental of Management	6ECENA	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	5.0	5.0
CSE3040	NIDHI SHARMA	Neural Networks & Fuzzy Logic	8CSEA	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
CSE31	RAHUL KAUSHAL	Mobile Apps Development	8CSEA	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
CSE38	KUNAL UPPAL	Software Testing	8CSEA	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Fuzzification of Input Value: The input variables are divided into linguistic variables such as 4-Excellent, 3-Good, 2-Average, 1-poor, membership functions are then formed assigning the proper range to respective linguistic variables. In this paper, trapezoidal and triangular membership functions are used. For input variable poor and Excellent, trapezoidal membership function and for input variable average and good,

triangular membership functions are used. For convenience we have divided the whole system in four subsystems. In subsystem 1, we have considered only Primary parameters. Similarly for secondary and ornamental variables subsystem 2 and subsystem 3 are created. Finally output of subsystem 1, subsystem 2 and subsystem 3 combined to create final analysis as shown in Figure 2.
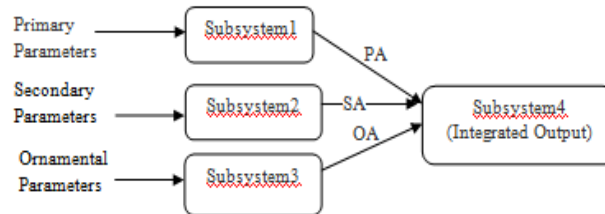

Figure-2 Proposed Fuzzy Expert system

Membership function of the input variable Subject knowledge (C3) is shown in Figure 3. The remaining membership functions of the input variables like power of expression (C1), and Command over Language (C2) are designed in similar way. Here, results are produced using Fuzzy tool in MATLAB.
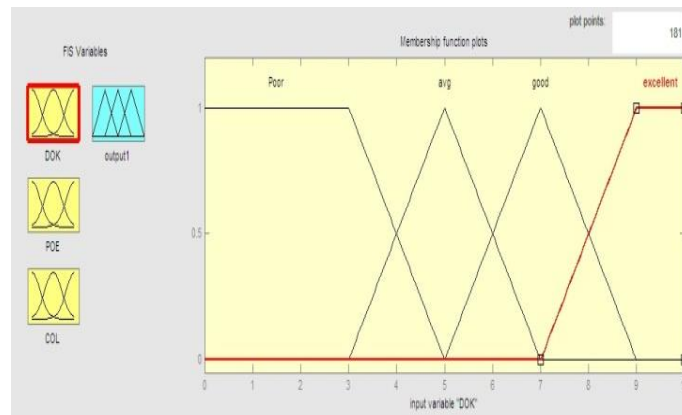
Figure 3. Membership function of input variable DOK(C3).

Inference Fuzzy Rules: The rules conclude both input and output membership functions that will determine the inference process. Inference rules are linguistics, also known as "IF-THEN" rules. With some discussion with academic experts we have formulated certain rules. As number of inputs is more so there are so many rules but we are showing some of the rules.

Here, we are showing some rules of integrated system.

Figure 4. Inference rules for integrated system.

Defuzzification and Final Output: The output variable determines overall performance of an educator, which has four linguistic Variables. When one rule is active, an AND operation is applied between inputs. After completing defuzzification final output is obtained.
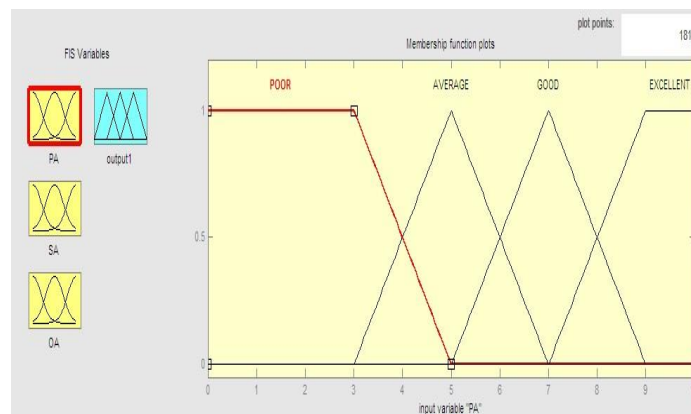

Figure 5. Membership function for educator overall performance.

The final performance is obtained by converting fuzzy number into crisp value. This practice is known as Defuzzification. For this conversion proposed system uses centroid technique. Rule viewer for the proposed fuzzy based system for the analysis of an educator's performance is shown in Figure 6.
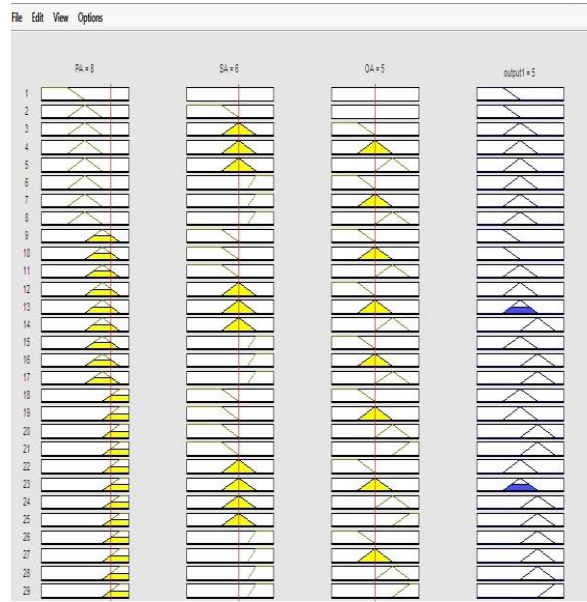
Figure 6. Rule Viewer.

IV. Result

Surface viewer of projected fuzzy based system for feedback evaluation of educator is shown in Figure 7.
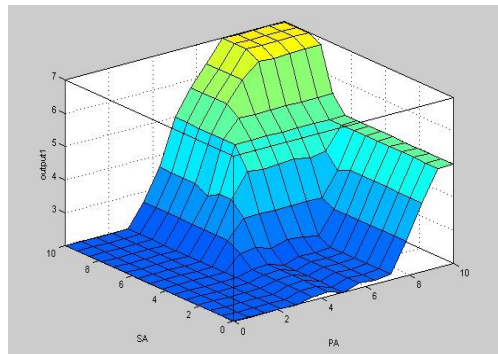

Figure 7. Surface view of Fuzzy based system.

V. Conclusion

Educators' regular evaluation is recommended to retain excellence in higher education. There are various applications of fuzzy based system. Fuzzy

based system tools using fuzzy logic is extremely fascinating for quantitative and qualitative facts evaluation. In this paper a fuzzy based system is designed to analyze educator's feedback on the basis of diverse correlated activities. The qualitative elements are mapped to statistical results by implementing the fuzzy based system through diverse input examples and established a foundation to use the system for advance decision making. In this way, teacher is encouraged to reflect on quality, sufficiency, fulfillment, competence and novelty in teaching in the technical institutions.

IV. Acknowledgement

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