

## **Grading & Analysis of Oral Presentation – A Fuzzy Approach**

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*Abstract—Continuous and comprehensive evaluation is essential for judging the progress of a learner and various methods like examinations, tests, assignments, quizzes, research projects etc., are used for assessing their performance. As far as oral tests/presentations are concerned, grades like A, A-, B, B- are awarded which represent ‘Excellent’, ‘Distinction’, ‘First Class’ to ‘Pass Class’. But the scores are just an approximation as there is a great amount of ambiguity. In this paper, the fuzzy method is applied in evaluating the students’ performance in the oral presentation in which the membership value of each gratification level is identified with membership function Chart. The fuzzy marks are generated more consistently by utilizing the fuzzy numbers. Then, the level of gratification of each student’s mark will be calculated. Finally the fuzzy marks with the corresponding linguistic value will be gained. The result that based on the fuzzy sets approach could provide better information which portrays the student performance and at the same time an alternative way of evaluating performance is introduced.*

*Keywords— Fuzzy Set, Membership Chart, Gratification Level, Linguistic Term, Generalization*

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### **I. INTRODUCTION**

In Higher Education Institutions traditional methods are in use since time immemorial to evaluate the performance of students. Very often the system reduces to the level of a mere memory test. It is evident that exact evaluation is impossible using such methods. This paper considers oral presentation in particular where the assessment of a student’s potential needs special attention. The common form of evaluation includes a formal oral presentation after the submission of assignment/ dissertation/ thesis. This evaluation is carried out by a panel of experts who use the nominal score (0 to 10) which in linguistic terms swings between ‘Pass Class’ to ‘Excellent’. At the end of the evaluation process, the students’ results are converted into the form of grading scheme like in the form single letter grade (e.g. A, B, . . . , F), nominal score (e.g. 1, 2, . . . , 10), linguistic terms like “Pass” and “Fail” and so on.

Though this kind of evaluation system prevails commonly in all educational institutions, studies have proved that this evaluation method does not provide the best way to evaluate students, as it involves an elements of fuzziness. This is mainly because the panels comprise of people with different views, attitudes, experience and sensibility and naturally their evaluation of a student will vary and therefore the average score will be taken which may contain a decimal value. Since the grading scales are commonly used in terms of nominal value that represents the value of linguistics, then it will be difficult to define the linguistic values for each of the marks. It is here that the use of fuzzy becomes relevant. Previously there have been a few attempts to experiment the fuzzy method for evaluating the performance of students in laboratory applications (2010) [3] and evaluating student’s performance during post-internship (2009) [3]. The latest application of fuzzy method has been done by Sevindik (2011)[5] and Shen et al (2011)[5] in predicting the student academic performance and in evaluating the quality of project performance respectively.

#### **A. The paper is divided into five parts:**

- Introduction
- Methodology
- Statistical Case
- Analysis
- Conclusion

### **II. METHODOLOGY**

In this paper, Fuzzy Evaluation Method (FEM) is used to evaluate students’ performance in oral presentation. The following methodology has been followed in this evaluating procedure.

#### **Step 1: Generalize the marks**

The marks gained by every student are converted into generalized values. The generalized value is a value that comes in the range of 0 and 1. The mark for each criterion is divided by the total mark to obtain the generalized value. The generalized value will be the input value of this evaluation. Sample of such conversion is given in Table I.

Table I: An example of mark and generalized value

Criteria	Total Marks	Mark Gained	Generalized Value
PHP	100	69	0.69
UNIX	100	81	0.81
INFO. SYSTEM	100	77	0.77
OPERA. SYS.-2	100	82	0.82
ASP.NET	100	79	0.79
PRACTICAL	100	64	0.64

**Step 2: Construct the chart of the Fuzzy Membership Function**

The Chart of membership function is developed in order to execute the fuzzification process. Here the input value is mapped into the Chart of membership function to obtain the fuzzy membership value of that particular input value, using pseudo exponential membership function. Each membership value will represent the level of gratification.

The study proposes 6 gratification levels which are shown in Table II. The amount of gratification shows the range of marks for each gratification level which is also based on some modification of grading system incorporated by the higher institutions. The maximum amount of gratification denoted by  $T(X_i)$  describes a mapping function for corresponding gratification level, where  $T(X_i) \rightarrow [1,0]$ .

Table II: Standard gratification level and the corresponding Amount of gratification.

Gratification Levels( $X_i$ )	Grade	Gratification Level	Maximum Level of Gratification $T(X_i)$
Excellent(EXC)	A	80% - 100% (0.8-1.0)	1.0
Distinction(DI)	A-	70% - 79% (0.7-0.79)	0.79
First Class(FC)	B+	60% - 69% (0.6-0.69)	0.69
Second Class(SC)	B	50% - 59% (0.5-0.59)	0.59
Pass Class(PC)	B-	40% - 49% (0.4-0.49)	0.49
Fail(F)	C	0% - 39% (0-0.39)	0.39

**Step 3: Calculate the Amount of Gratification.**

The Amount of Gratification of  $j^{th}$  criteria which is denoted by  $D(C_j)$  is evaluated by:

$$D(C_j) = \frac{y_1 * T(X_1) + y_2 * T(X_2) + \dots + y_6 * T(X_6)}{y_1 + y_2 + \dots + y_6} \quad [1]$$

where  $y_i$  = amount of membership value for each gratification level,  $y_i \in [0, 1]$  for  $i=1,2,\dots,6$ .

**Step 4: The Final mark Calculation**

The final mark for  $k^{th}$  student denoted by  $F(S_k)$  is calculated using the formula given below:

$$F(S_k) = \frac{w_1 * D(C_1) + w_2 * D(C_2) + \dots + w_6 * D(C_6)}{w_1 + w_2 + \dots + w_6} \quad [2]$$

where  $w_i$  = the total marks of  $i^{th}$  criteria for  $i = 1,2,\dots,6$ .

Table III: The result gained is put into the fuzzy grade sheet in the suitable fields.

S n.	Criteria	Fuzzy Membership Value						G. Level	Final Marks
		F	P	S	F	D	E		
1	PHP	0	0	0	0	0	0	0	
	UNIX	0	0	0	0	0	0		
	INFO. SYSTEM	0	0	0	0	0	0		
	OPERA. SYS.-2	0	0	0	0	0	0		
	ASP.NET	0	0	0	0	0	0		
	PRAC.	0	0	0	0	0	0		

### III. STATISTICAL CASE

Marks of a student are taken (as in Table I). The student is analysed based on procedure explained above. The chart of fuzzy membership function is generated to implement the fuzzification process as shown in Figure I.

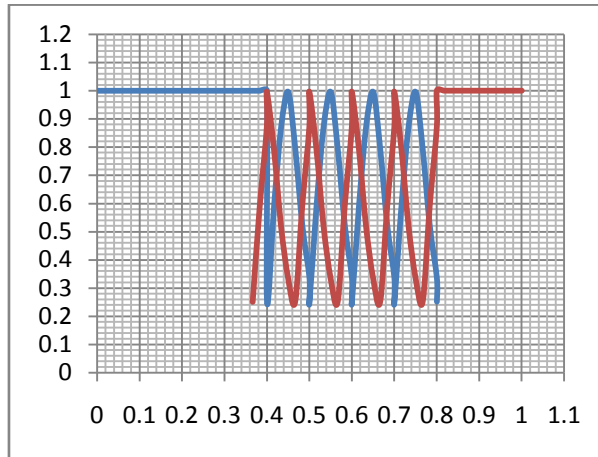


Figure I: Oral presentation satisfaction level's Membership functions

Based on Figure I, we can see the gratification level of Distinction and Excellent represents the Amount of membership 0.4 and 0.6 respectively. The amount of gratification regarding criterion 1 is calculated as follows:

$$D(C_1) = \frac{0.23 * 0.6 + 0.77 * 0.69}{0.23 + 0.77} = 0.67$$

The same procedure is applied for calculating the  $D(C_1)$ ,  $D(C_2)$ , ... and  $D(C_6)$ .

Finally, the final mark earned by the student for all criteria is compute using equation [2]:

$$F(S_j) = \frac{(100 * 0.67 + 100 * 0.99 + 100 * 0.75 + 100 * 0.98 + 100 * 0.77 + 100 * 0.60)}{600}$$

$$= 0.7933$$

$$\approx 0.79$$

Based on the final marks gained, the student is awarded by the fuzzy linguistic terms of Distinction at 0.16 ( $\mu_{EX} = 0.16$ ) and Excellent at 0.84 ( $\mu_{DI} = 0.84$ ). These values are gained from the Chart of membership function (as in Figure 1). Besides that, the final mark also can be valued as 79.33 (by multiplying with 100%) which are represent the linguistic term of Excellent. The details of the fuzzy marks gained from this evaluation procedure are shown in Table IV.

Table IV: Fuzzy grade sheet with contain the overall fuzzy marks of student 1

S n.	Criteria	Fuzzy Membership Value						Level of G.	Final Marks
		F	P C	S C	FC	DI	EX C.		
1	PHP	0	0	0	0.23	0.77	0	0.67	0.79
	UNIX	0	0	0	0	0.07	0.93	0.9	
	INFO. SYS.	0	0	0	0	0.49	0.51	0.74	
	OPERA. SYS.-2	0	0	0	0	0.08	0.92	0.98	
	ASP. NET	0	0	0	0	0.23	0.77	0.78	
	PRAC.	0	0	0	0.96	0.04	0	0.59	

#### IV. ANALYSIS

In this section we have attempted to make a comparative performance analysis of the result gained from fuzzy evaluation method and the non-fuzzy method. Table V shows the results gained from both methods for 10 students.

**Table V:** Results for 10 students gained from fuzzy and non-fuzzy method.

Sn.	Non-Fuzzy Process			Fuzzy Evaluation Process		
	Final Mark	Grade	Linguistic term	Final Mark	Grade	Linguistic Term
1	0.75	A	Excellent	0.79	A	Distinction at 0.16,Excellent at 0.84
2	0.44	B-	Pass Class	0.46	B-	Pass Class at 0.38,Second Class at 0.01
3	0.55	B	Second Class	0.57	B	Second Class at 0.48, First Class at 0.02
4	0.66	B+	First Class	0.66	B+	First Class at 0.43, Distinction at 0.19
5	0.60	B+	First Class	0.60	B+	First Class at 1.0
6	0.49	B-	Pass Class	0.49	B-	Pass Class at 0.62, First Class at 0.38
7	0.56	B	Second Class	0.58	B	Second Class at 0.85,First Class at 0.15
8	0.62	B+	First Class	0.62	B+	First Class at 0.65, Distinction at 0.35
9	0.59	B	Second Class	0.59	B	Second Class at 0.55, First Class at 0.45
10	0.60	B+	First Class	0.60	B+	First Class at 1.0

Fuzzy membership values in the range of  $[0, 1]$  are used in the fuzzy evaluation method for computation and therefore the results gained from this method are in the range of  $[0, 1]$  only but the marks have to be converted into percentage for adaptation. Thus the first student's final mark of 0.79 becomes 79% after the conversion.

It is evident from the table that the fuzzy marks gained are higher than the non-fuzzy marks. Moreover, the linguistic terms denoted by the fuzzy method are also more in detail since it provides the Amount s of gratification for each corresponding linguistic term. Now it is easy to describe the student's performance. For example, student 1 has the performance of *Distinction* at 0.16 and also *Excellent* at 0.84. It is more meaningful than the letter grade used by the non fuzzy method. In short, this method is very useful in comparing the students' performances which have the same final linguistic terms by looking into the Amount s of gratification.

#### V. CONCLUSION

On one hand, performance evaluation is very important but on the other it is true that the traditional scores in linguistic terms involve uncertainty. This study has attempted to bring in a new method – the Fuzzy Evaluation Method – by Pseudo Exponential Function for a more comprehensive and satisfactory evaluation of oral presentation. It is very systematic with the help of the membership function Chart and the fuzzy grade sheet which was introduced by Chen and Lee (1999) [1]. In addition, this method can provide additional information of the student's performance in any criteria. At the same time the use of linguistic terms is also useful as the students can understand their position and work hard for better performance. Thus, this method is simpler, easily manageable and more comprehensive.

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