"EVALUATION OF TEACHER'S PERFORMANCE USING FUZZYLOGIC TECHNIQUES"

SIRIGIRI PAVANI[#1], P.V.S.S.GANGADHAR[*2], KAJAL KIRAN GULHARE[#3]

[#1] Research Scholar,Dr. C.V.Raman University,, Bilaspur, India.
**2 Scientist"C", National Informatics Centre, Govt. of India.*
[#3] Research Scholar, Dr.C.V.Raman University, Bilaspur, India.

***Abstract:*-- Most Institutes and Organization use performance appraisal system to evaluate the teachers performance. The teachers performance is very important to the students and as well as school management, in which usually involves crisp and uncertain values to evaluate teacher's performance. In this paper we proposed to evaluate teachers performance on the basis of different factors, applying into fuzzy inference system (FIS) , FIS is the process of formulating the mapping from a given input to an output using fuzzy logic. We can consider some of the most relevant factors, and developed rules will be fuzzified. As input fuzzy variable performance will be fuzzified with suitable fuzzy linguistic variable and ultimately FIS will be developed. This paper explains the comparison of two different membership function and getting more or less similar, So as to achieve the shape of membership function, which is not playing much role to evaluate the performance in positive or negative direction.**

***Keywords:*-- Performance Appraisal, Teacher , Student, Cascaded, Fuzzy Inference System, Sensitivity Analysis, Gaussian MF, Fuzzy Rules.**

I. INTRODUCTION

According to student point of view, we find teacher's performance suppose some teachers beginning is good and his presentation is not good or some teachers voice is slow but his explanation is good .teacher skill affiance to inculcate the subject in student mind plays vital role. hence there is need for evaluation of teachers performances.

Evaluating the performance of a teacher is very necessary due to many reasons. There are

- a) Improvement of the students
- b) Monitoring of the students
- c) Betterment of the students
- The feedback form that is being mad to evaluate the performance of teacher is based an some crisp value (fixed value) which is not at appropriate.

Proposals to use teachers' performance incentives as the basis for school reforms have recently attracted considerable attention and support among researchers and policy makers. The main message is that the most likely way to improve students' achievements is to institute performance incentives, direct monetary rewards for improvements in student outcomes. However, there has been very little experience with applying performance incentives in schools.

To evaluation the teacher performance, I purpose to take the help of student feed back form to apply fuzzy logic. As fuzzy logic is a tool which can be applied in uncertain simulation, must of the factor while evaluate teachers performance are uncertain, Vaguer. Say for example how factor can not be measured with some crisp value, it may be better to have bad, good, better, best etc. which is fuzzy linguistic variable.

"Evaluation of Teachers performance using in fuzzy logic techniques" in this research teachers performance is evaluated. so, first we should survey the teachers requirements and students requirements.

Then researcher must interact the teachers and get some knowledge about teachers. Researcher should meet different teachers. Should meet different natures of teachers' .I will meet primary teachers, secondary teachers and also meet college teachers. all have given some ideas about the finding the teachers performance.

Teachers performance is very important to the should as well as school management. In this research, I just find teachers performance towards the students. student point of view, teacher must have the 1)start 2)voice modulation 3) speed of delivery 4) content arrangement 5)presentation 6)communication 7)genitures 8)overall impression 9)content delivery 10) explanation power 11)overall teaching 12)regularity 13)teaching aids Parameters are required.

Those parameters I choose best of the best 1)knowledge 2)speed of delivery 3)presentation 4)overall impression 5)explanation .all those parameters will be helpful to find out the teachers performance.

II. METHODOLOGY

Fuzzy Logic introduced by Zadeh (1965) gives us a language, with syntax and local semantics, in which we can translate our qualitative knowledge about the problem to be solved.

Fuzzy logic is a 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, fuzzy logic resembles human decision making with its ability to work from approximate data and find precise solutions.

A. Different Membership function::

a) Straight line: The simplest membership function is formed by straight line. We consider the speed of car fig (1.1), and plot the membership function for high. Where the horizontal represent the speed of the car and vertical axis represent the membership value for high.

b) Trapezoidal: If we consider the case 1.2 and plot the membership function for "less", we get a trapezoidal membership function. Fig 1.2 shows a graphical representation, where the horizontal axis represent the force applied to the accelerator and the vertical shows membership value for "less". The function is often represented by "trapmf".

c) Gaussian**:**. Let say a fuzzy set Z which represent "number close to zero". The possible membership function for Z is

μz(x) =e exp(-x^2) (1.3)

If we plot this function we get a graph shown in fig 1.3 and are refer as Gaussian membership function.

d)Triangular: This is formed by the combination of straight lines. The function is name as "trimf" .We considers the above case i.e. fuzzy set Z to represent the "number close to zero". So mathematically we can also represent it as

0 if x<-1

μz(x) = x + 1 if -1 ≤ x <0 (1.4)

1 –x if 0 ≤ x <1

0 if 1≤ x

By plotting equation 1.4 we get a triangular graph fig (1.4) called "triangular membership function"

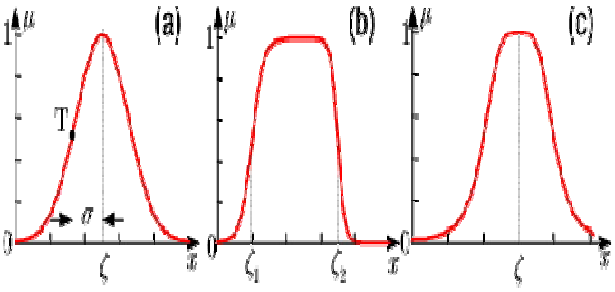
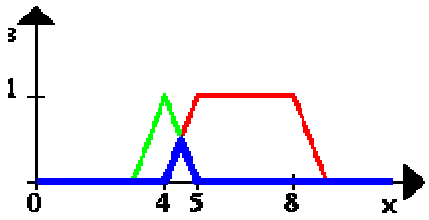


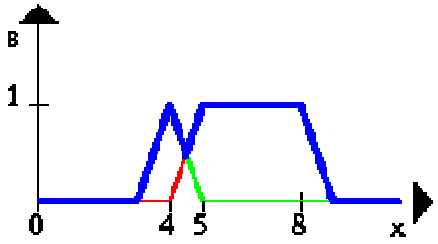
Figure 1: Membership functions with smooth transitions

B. Fuzzy Set of Operations:

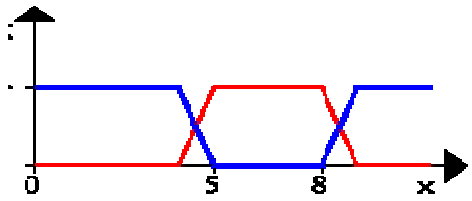
a) Fuzzy intersection
b) Fuzzy union
c) Fuzzy complement



a) Fuzzy intersection



b) Fuzzy union



c) Fuzzy complement

C .Fuzzy Rule Base:

a fuzzy rule-based model of human problem solving is described. The model is presented in its general form and then adapted to fit data from a simulated fault diagnosis task. The model was able to match 50% of human subjects' actions exactly while using the same rules approximately 70% of the time. Problem solving rules were selected by the model according to measures of recall, usefulness, applicability, and simplicity. Rules were further discriminated by their use of symptomatic information for pattern recognition or topographic information for information seeking.

A production rule consists of two parts: condition (antecedent) part and conclusion (action, consequent) part,

i.e: *IF (conditions) THEN (actions)*

Rule 1*: IF (C Score is high) and (C Ratio is good) and (C Credit is good)*

then (Decision is approve)

Rule 2*: IF (C Score is low) and (C Ratio is bad) or (C Credit is bad)*

then (Decision is disapprove)

D. Fuzzy inference system editor:

the FIS editor handles the high level issuing for the system such as the number of input and output

variables an their names, types of the 'AND' and 'OR' operators, and the aggregation and defuzzification methods.

a) **The member ship function editor:**

The membership function editor is used to define the properties of the membership function for the systems variables.

b) **The rule editor:**

The rule editor enables the user to define and edit the of rules that describe

the behavior of the system.

c) **The rule viewer:**

The rule viewer is a read only tool that displays the whole fuzzy inference diagram.

e) **The surface viewer:**

The surface viewer is also a read only tool. it is used to display how an output is dependent on any one or two of the inputs.

E. INPUT PARAMETERS:

1)KNOWLEDGE
2)SPEED OF DELIVARY
3)PRESENTATION
4)OVER ALL IMPRESSION
5)EXPLANATION

F. OUTPUT PARAMETERS:

1)POOR
2)GOOD
3)EXCELLENT

INPUT	INPUTNAME	LINGUSTIC	RANGE
INPUT1	KNOWLEDGE	BAD	1-50
		GOOD	25-75
		VERY GOOD	50-100
INPUT2	SPEED OF DELIVERY	ERATIC	1-50
		MANAGEBLE	25-75
		OPTIMUM	50-100
INPUT3	PRESENTATION	ABSTRACT	1-50
		BETTER	25-75
		RELEVANT	50-100
INPUT4	OVER ALL IMPRESSION	VERY UNIMPRESSION	1-50
		IMPRESSION	25-75
		VERY IMPRESSION	50-100

OUTPUT	OUTPUTNAME	LINGUSTIC	RANGE
OUTPUR1	PERFORMANCE	POOR	1-40
		GOOD	40-80
		EXCELLENT	90-100

III. FUZZIRIFICATION:

Fuzzification comprises the process of transforming crisp value into grade of membership for linguistic terms of fuzzy sets. The membership function is used to associate a grade to each linguistic term

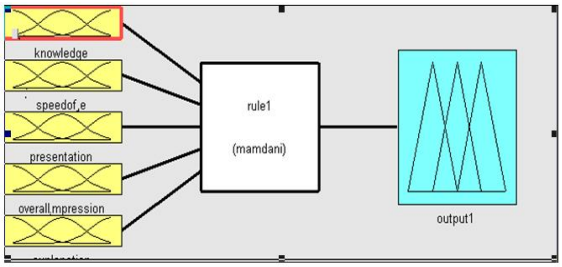


Figure: 1 developed with five inputs and one output of FIS

Figure describes the we select the five parameters and one output of the teachers activities and apply to the FIS and arrange the rules then we evaluate the teachers performance.

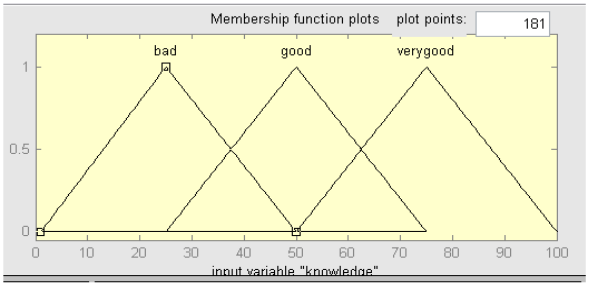


Fig :2 fuzzification of knowledge

Figure 2 shows fuzzification of input parameters knowledge with there membership function and its corresponding range as explain in table1, the membership function are overlapping with each other for achieving better results

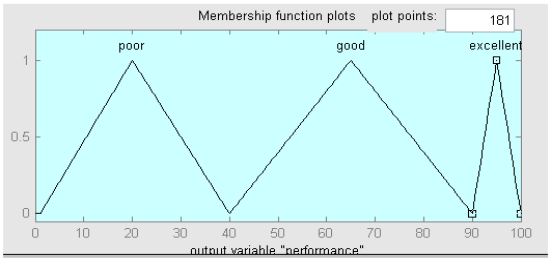


Fig 7 fizzification of performance

Figure 7 shows fuzzification of output parameter performance with there membership function and its corresponding range as explain in table 2, the membership

function are touching with each other for achieving better results.

III. RULE BASED:

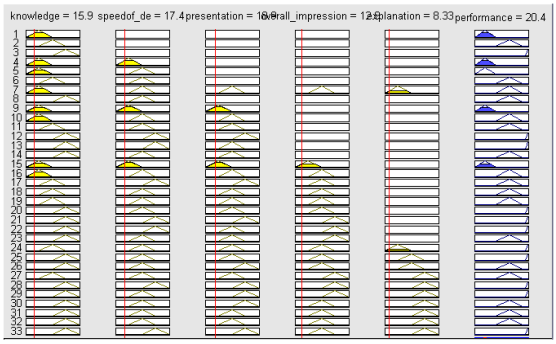
As per the input and output parameters fuzzified as shows in fig 1 to fig 7 rule base is generated by applying my own reasoning as an expert person to observe or taking decision to Evaluate the performance of a teacher. There are 34 numbers of rules generated using 'AND' and 'OR' operator. The overall rules are written below

1, If (knowledge is bad) then (performance is poor

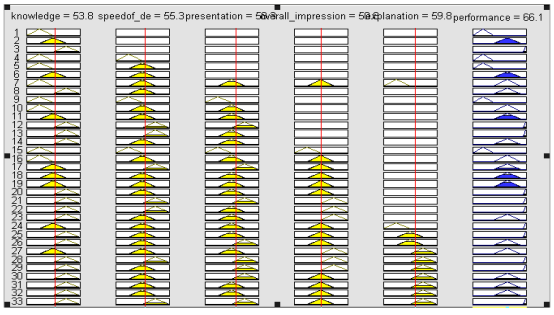
11, If (knowledge is good) and (speed of delivery is manageable) and (presentation is relevant) then (performance is good)

20, If (knowledge is very good) and (speed of delivery is manageable) and (presentation is relevant) and (overall impression is impressible) then (performance is good)

34, If (knowledge is very good) and (speed of delivery is optimum) and (presentation is relevant) and (overall impression is high impressible) and (explanation is very satisfactory) then (performance is excellent



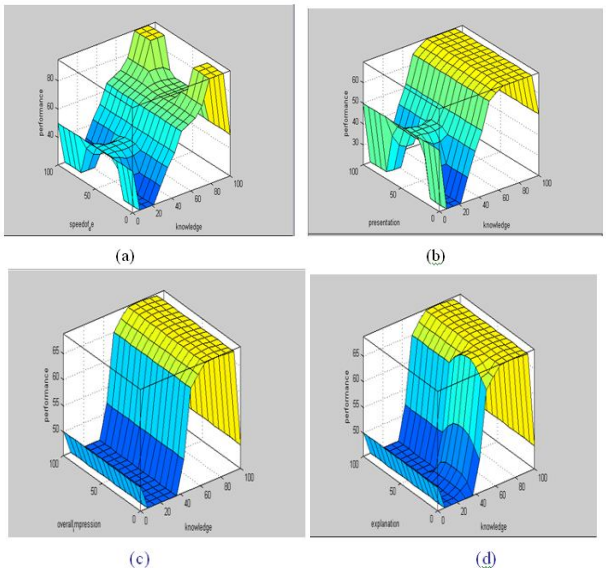
The above Figure : Inference process when knowledge =15.9, speed of delivery =17.4, presentation =18.9, overall impression =12.9, explanation=8.33 then performance =20.4



The above Figure: Inference process when knowledge =55.3, speed of deliver=55.3, presentation =55.3,overall impression =55.3, explanation=55.3 then performance =66.5

INPUT						OUTPUT
SNO	Knowledge	Speed of delivery	Presentation	Over all impression	Explanation	Triangular
1	6	12.9	18	15.9	20.5	20.4
2	7	12.2	24.5	9.85	22	33.7
3	32.6	35.6	28	37	31.1	40.4
4	44.7	38.6	40.2	31.1	38.6	56.2
5	40.2	47.7	52.2	41.1	55	67.2
6	53.8	41.7	53.5	55.2	61.4	68.3
7	64.4	58.3	62.8	64.4	64.4	70.4
8	68.8	76.5	70.5	75	72	76.1
9	78.5	81.1	70.5	70	84.1	83.8
10	97.7	87.6	97.7	96.2	96.2	95

The above Table : Inference process when knowledge =97.7, speed of delivery =97.7, presentation =97.7,overall impression =97.7, explanation=97.7 then performance =95.



Three dimensional of surface viewer of rule base explains the knowledge is on X-axis and speed of delivery is Y-axis with respective to performance on Z-axis.

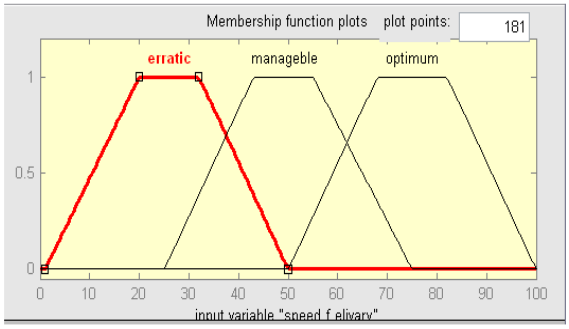
V. DEVELOPMENT OF FUZZYSYSTEM USING TRAPEZOIDAL:

Trapezoidal Fuzzifiers:

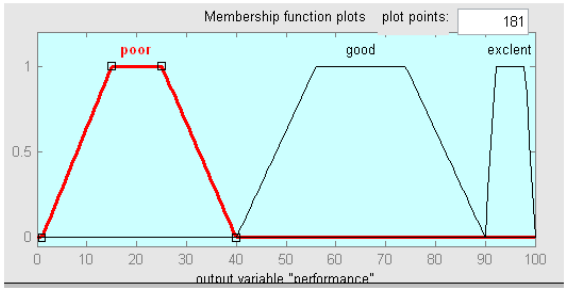
For the simplicity of discussion only the trapezoidal fuzzifiers are presented here Fuzzification of a real-valued

variable is done with intuition, experience and analysis of the set of rules and conditions associated with the input data variables. There is no fixed set of procedures for the fuzzification.

INPUT:



OUTPUT:



INPUT						OUTPUT
SNO	Knowledge	Speed of delivery	Presentation	Over all impression	Explanation	Trapezoidal
1	15.9	15.9	15.9	15.9	15.9	20.3
2	25	25	25	25	25	20.4
3	33	35	35	35	35	48
4	44.7	44.7	44.6	44.7	44.7	55.6
5	55.3	55	55.3	55.3	55	67.2
6	65.9	65.5	65	65.7	65.8	71
7	68.8	76.5	70.5	75	72	76.1
8	87.1	83.3	84.4	78	70.5	80.8
9	73.5	81.1	70.5	82.8	84.1	87.8
10	97.7	97.6	97.7	97.7	97.7	95

The following table shows that how inference engine works for different input values .if we observe this table minimally then one can say that for different values of a input parameters the output (performance) that is produced by FIS more or less current.

COMPARISION TABLE:

INPUT						OUTPUT	
SNO	Knowledge	Speed of delivery	Presentation	Over all impression	Explanation	Triangular	Trapezoidal
1	9.85	12.9	18	15.9	20.4	20.4	20.3
2	29.5	12.2	23.5	9.85	22	33.7	20.4
3	32.6	35.6	28	37	38.1	40.4	48
4	44.7	38.6	40.2	38.1	38.6	56.2	55.6
5	40.2	47.7	53.3	48.1	55	67.2	67.2
6	53.8	41.7	53.3	55.2	61.4	68.3	71
7	64.4	58.3	62.8	64.4	64.4	70.4	76.1
8	68.8	76.5	76.5	75	72	76.1	80.8
9	73.5	81.1	70.5	70	84.1	87.8	87.8
10	97.7	97.6	97.7	96.2	96.2	95	95

In the above table an example is demonstrated by and my point of view is taking arranging input values for getting the output as teachers performance in shape triangular and trapezoidal member ship functions.

Suppose Sno.1: knowledge range is 15.9, speed of delivery range is also15.9, presentation range is also 15.9, over all impression range also 15.9, explanation range is 15.9 then performance in triangular shape we get 20.4 and also trapezoidal shape we get 20.3.

Sno.10: Suppose knowledge range is 97.7, speed of delivery range is also97.7, presentation range is also 97.7, over all impression range also 97.7, explanation range is 97.7 then performance in triangular shape we get 95 and also trapezoidal shape we get 95.

VI. CONCULSION

So far we have developed FIS with different input parameters to evaluate the performance of teacher using two different membership functions triangular and trapezoidal and compared the performance. Result shows that in both the cases the performance in percentage we are getting is more or less similar,

So we can conclude that the shape of membership function is not playing much rule to evaluate the performance in positive or negative direction.

VII. REFERENCES

[1] L.A. Zadeh, Fuzzy Sets, Information and Control, 1965
[2] L.A. Zadeh, Outline of A New Approach to the Analysis of of Complex Systems and Decision Processes, 1973

[3] L.A. Zadeh, ”Fuzzy algorithms,” Info. & Ctl., Vol. 12, 1968, pp. 94-102.
[4] L.A. Zadeh, ”Making computers think like people,” IEEE. Spectrum, 8/1984, pp. 26-32.
[5] S. Korner, ”Laws of thought,” Encyclopedia of Philosophy, Vol. 4, MacMillan, NY: 1967, pp. 414-417.
[6] C. Lejewski, ”Jan Lukasiewicz,” Encyclopedia of Philosophy, Vol. 5, MacMillan, NY: 1967, pp. 104-107.
[7] A. Reigber, ”My life with Kostas”, unpublished report, Neverending Story Press , 1999
[8] J.F. Baldwin, ”Fuzzy logic and fuzzy reasoning,” in Fuzzy Reasoning and Its Applications, E.H. Mamdani and B.R. Gaines (eds.), London: Academic Press, 1981.
[9] W. Bandler and L.J. Kohout, ”Semantics of implication operators and fuzzy relational products,” in Fuzzy Reasoning and Its Applications, E.H. Mamdani and B.R. Gaines (eds.), London: Academic Press, 1981.
[10] M. Eschbach and J. Cunnyngham, ”The logic of fuzzy Bayesian influence,” paper presented at the International Fuzzy Systems Association Symposium of Fuzzy information Processing in Artificial Intelligence and Operational Research, Cambridge, England: 1984.
[11] F. Esragh and E.H. Mamdani, ”A general approach to linguistic approximation,” in Fuzzy Reasoning and Its Applications, E.H. Mamdani and B.R. Gaines (eds.), London: Academic Press, 1981.
[12] J. Fox, ”Towards a reconciliation of fuzzy logic and standard logic,” Int. Jrnl. of Man-Mach. Stud., Vol. 15, 1981, pp. 213-220.
[13] S. Haack, ”Do we need fuzzy logic?” Int. Jrnl. of Man-Mach. Stud., Vol. 11, 1979, pp.437-445.
[14] T. Radecki, ”An evaluation of the fuzzy set theory approach to information retrieval,” in R. Trappl, N.V. Findler, and W. Horn, Progress in Cybernetics and System Research, Vol. 11: Proceedings of a Symposium Organized by the Austrian Society for Cybernetic Studies, Hemisphere Publ. Co., NY: 1982.
[15] R. Kruse, J. Gebhardt, F. Klawon, ”Foundations of Fuzzy Systems”, Wiley, Chichester 1994
[16] Zimmermann H.J., *Fuzzy Sets, Decision Making and Expert Systems*, Boston, Kluwer 1987
[17] M. Hellmann, ”Classification of fully polarimetric SAR for Cartographic Applications”, *DLR Forschungsbericht FB–2000–19*, PhD thesis, DLR, Oberpfaffenhofen, Germany,
18] Alcala, R., Casillas, J., Cordon, O. and Herera, F. (1999). Approximate Mamdanitype Fuzzy Rule-Based Systems: Features and Taxonomy of Learning Methods, Unpublished Technical Report, Department of Computer Science and Artificial Intelligence, Universidad de Granada.

Authors Profile:-

1) SIRIGIRI PAVANI: received M.Phil. in Computer Science from Dr.C.V.Raman University, Bilaspur and presently working as Research Scholar at Dr. C.V. Raman University. Her interests are Fuzzy logic, Data Mining and Web Technologies.

2) P.V.S.S.GANGADHAR: Presently working as Scientist “C” at National Informatics Centre (NIC), Ministry of Information Technology & Communications, Government of India. His Research interests are Data Mining, web Technologies, Fuzzy logic and e-governance.

3) KAJAL KIRAN GULHARE: received M.Phil. in Computer Science from Dr.C.V.Raman University, Bilaspur and presently working as Research Scholar at Dr. C.V. Raman University. Her interests are Fuzzy logic, Data Mining and Web Technologies.