Fuzzy Logic Approach in Virtual Learning

Muneera Abdul [1, a)], T.Nageswara Rao [1, b)], Y.V. Seshagiri Rao[2 c)]

JonnalagaddaVenkateswaraRao[3,d)], R.V.N.Srinivasa Rao[4,e)]

[1]*Department of Engineering Mathematics,* College of Engineering, *Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur, Andhra Pradesh, India*
[2]*Department of Mathematics, Vignan Institute of Technology and Science, Hyderabad, Telangana, India.*
[3] *Department of Mathematics, School of Science & Technology, United States International University, USIU-Africa, P.O. Box 14634 - 00800 Nairobi, Kenya.*
[4]*Department of Mathematics, Wollega University, Nekemte, Oromia,Ethiopia.*

[a)] Corresponding author: munny.aliet@gmail.com
[b)] tnraothota@kluniversity.in
[c)] yangalav@gmail.com
[d)] jvrao@usiu.ac.ke
[e)] rvnrepalle@gmail.com

Abstract. The learning procedure is an essential cognitive event. Our community is altering into intelligence and information society with new difficulties in all extents of life. One of the tasks will be that we need to keep managing E-learning system which have become persistent in educational context. This paper presents an idea of fuzzy set theory strategy in an online educational sector, which manage with the uncertainties in the representation of intelligence attainment and the decision making. Fuzzy logic concept is applied in generating student strategy and to make accessible proper instructing material to individual student as indicated by his/ her knowledge level. Fuzzy logic technique involves three procedures specifically fuzzification of all inputs, fuzzy inference process and a defuzzification system to get output in human understandable form. The fuzzy inference system will provide the final crisp output.

INTRODUCTION

Learning is the most common way of obtaining relative changes in knowledge, understanding, attitude, capacity, information and ability through experience. Our culture is moving into information society where the new chances and new difficulties in all elements of our life. The genuine educational developments manage with uncertainty in the human knowledge. Online learning situations are progressively turning into a significant piece of the education approach for online conveyance and adaptable training and learning. The reason for this article is to provide the elements of virtual certainty information and fuzzy logic hypothesis to plan a cooperative internet learning framework. The Purpose of education is to teach them how to learn, and assess then evaluate the development. In any education system the assessment and the evaluation are two major fundamental techniques. The computer program will identify the student's data and their intelligence levels to afford suitable teaching resources to each student. Using such an arrangement will allow users to change from one learning level to the other according to their learning levels and exam score in each chapter.

FUZZY CONCEPT

Fuzzy concept is one of the utmost appropriate implements to manage with imprecise Information and the development of making decisions in the instructive framework. This concept can also deal with some sort of uncertainty, imprecision that is inherent in human instinct. Generally, the usual languages are vague since most of the ideas in the real world have no boundaries in natural languages. In fuzzy logic these ideas will be converted

1st International Conference on Essence of Mathematics and Engineering Applications
AIP Conf. Proc. 2707, 020035-1–020035-8; https://doi.org/10.1063/5.0143204
Published by AIP Publishing. 978-0-7354-4516-1/$30.00

into fuzzy rules. These fuzzy rules mathematically characterize the fuzzy sets with degree of membership. Fuzzy logic is attaining popularity in innovative intelligent system as of its flexibility and simplicity.

Consider the linguistic variable Y as “learner average result”, then the terms {Unsatisfied, Fail, Average, Good, Very Good, Excellent} can be build. Now, if y is a component of a fuzzy Set, then the connected grade level of y with its fuzzy Set is signified by a membership function (MF) i.e.; μ(x), which can take values in the range 0 and 1.

THE FUZZIFICATION

Fuzzification of the programming presentation is attained by using input variables and membership functions (MF) in fuzzy sets. In the process of Fuzzification the actual (or) crisp values of data input are transformed as fuzzy values using fuzzy membership functions. This can be represented mathematically as Y = fuzzifier (y_0). Where y_0 is a crisp input value, Y is the corresponding fuzzy logic set and fuzzifier characterizes a Fuzzification function. There are various Fuzzification functions. Fuzzification of the input variable is finished by using variables as used in usual language in the following fig.1

Method of Proposed Fuzzy Expert System

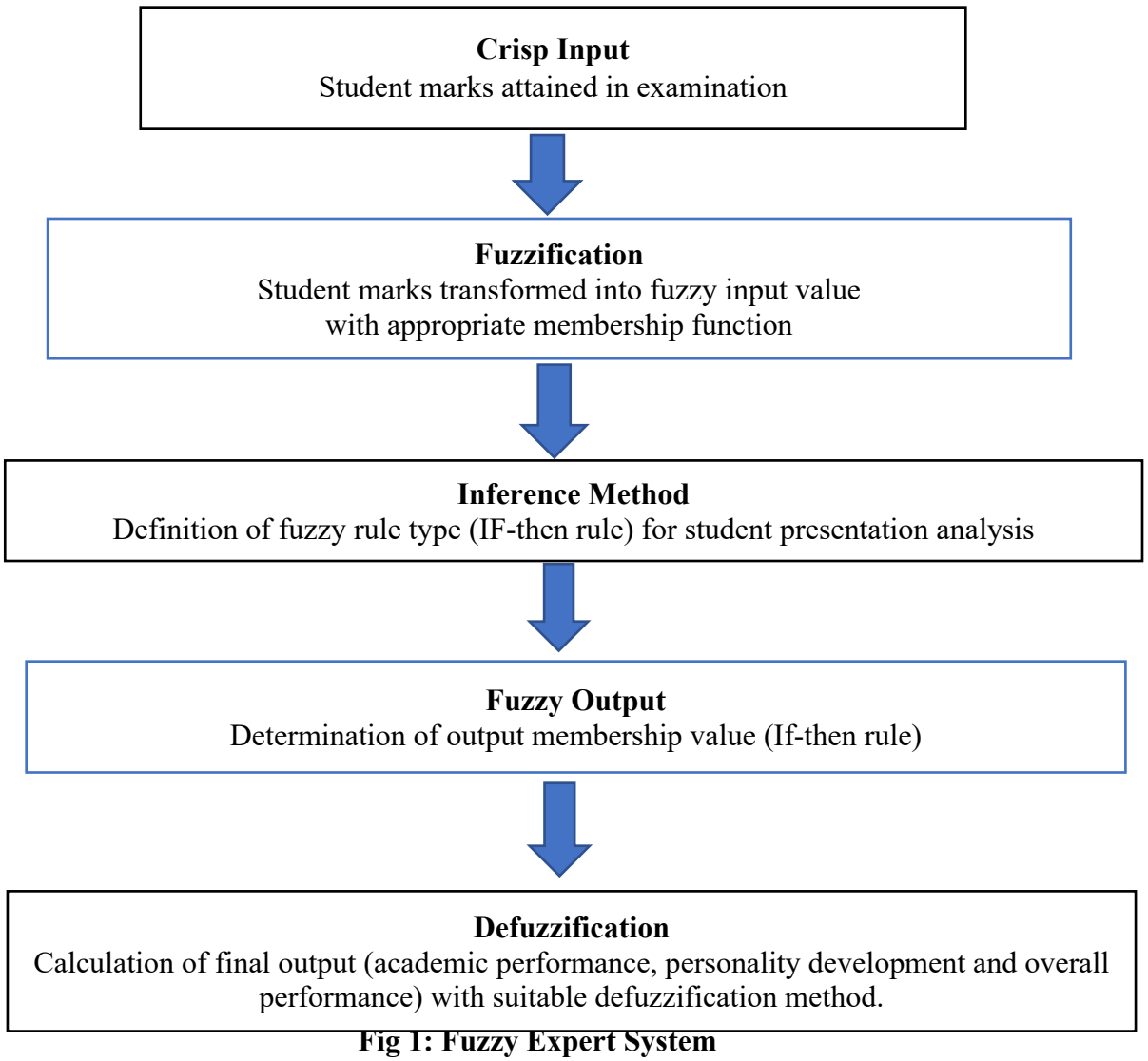

Fig 1: Fuzzy Expert System

FUZZY INFERENCE SYSTEM (FIS)

This study will focus into the FIS, which is the most general applications of fuzzy set theory and fuzzy logic. FIS is a rule-based classification that obtains if- then rules established from human intelligence and experience. FIS is the procedure of formulating the mapping from assumed input(s) to output(s) using fuzzy logic. This mapping provides a source from which decisions can be made. It has originated effective applications a varied variety of fields, such as data classification, automatic control, decision analysis, robotics, expert systems, and pattern recognition. The FIS system with crisp inputs and outputs develops a nonlinear mapping from its inputs space to the output space. This mapping practiced by a number of fuzzy if – then rules, each of which defines the local behaviour of the mapping. In specific, the antecedent of a rule describes a fuzzy region in the input space, whereas the consequent specifies the output in the fuzzy region.

Fuzzy Inference system is designated as follows.

1. A rule base comprising a number of fuzzy if – then rules
2. A database which describes the MF of the fuzzy sets which is used in fuzzy rules.
3. A decision-making part which accomplishes the inference processes on the rules.
4. A fuzzification interface which converts the crisp inputs into degrees of contest with linguistic values.
5. A defuzzification interface which transform the fuzzy outcomes of the inference into a crisp output.

The database and the rule base are jointly stated to as the knowledge base. Fuzzy if – then rules are terminologies of the form: If u is A Then v is B. Here u & v are input and output linguistic variables. A and B are labels of fuzzy sets categorized by suitable MF. A is premise and B is consequent parts of the fuzzy rule. Fuzzy values A and B are defined by the MF. The forms of (MF) membership functions are distinct and depends on problem.

FUZZY DECISION SUPPORT

The adaptable instructive construction gives s simple method for making plausible change starting with one learning level then onto the next learning level as indicated by the student foundation. In the present situation, three instructive ways are depicted.

Learning Path (A): This comprises a prompt of instructive unit, which is very adequate for top notch students.

Learning path (B): This comprises the ordinary data as that it is given by the educator for standard students.

Learning Path (C): This comprises a total data which empowers the learning system for novices.

The process of this classifications can be concise as follows.

1. Pre-exam should be held by the framework to indicate the information grade (or) level of the student which grants her/him to get into the underlying instructive chapter.
2. Provide the forward learning conferring to the present instructive level (or) grade of the student.
3. Here Framework will exam the capacity of student at every instructive chapter to refresh her/his model to determine the new-fangled learning way for the subsequent instructive chapter.
4. Conferring to her/his test in the existing instructive unit, the student with grade (GD) Good or (VGD) Very Good can alter from information level (C) to (B) or from level (B) to (A) in the following instructive chapter.
5. If the exam outcome at a specific instructive part is not satisfied then the student at the information level A or B will stay at similar instructive part and learning way C irrespective of her/his learning way.
6. If the outcome of the student at information level (C) is fail then the framework will recommend the student to leave this instructive level.

DECISION MAKING DEPENDING ON FUZZY RULES

The information associated to the dynamic strategy may be addressed by the set of fuzzy rules. As a rule, a standard implication statement communicating the learning level, test outcome and learning way in the subsequent instructive chapter shown in the following fig 2 to fig 5.

Table. (1). Rules of fuzzy decision making.

	CLA	CLB	CLC
TE	NLA	NLA	NLB
TVG	NLA	NLA	NLB
TG	NLA	NLB	NLC
TP	NLB	NLC	NLC
TF	NLB	NLC	NLC
TU	NLC	NLC	OUT

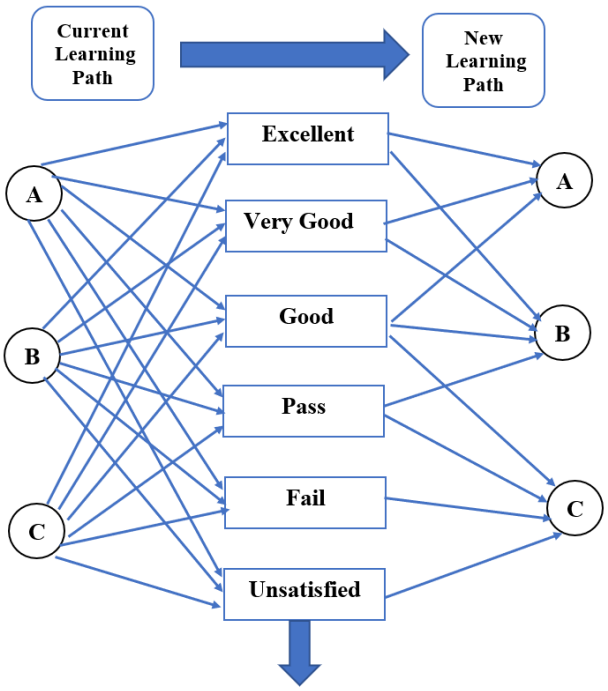

Fig.2. Layout of decision-making process.

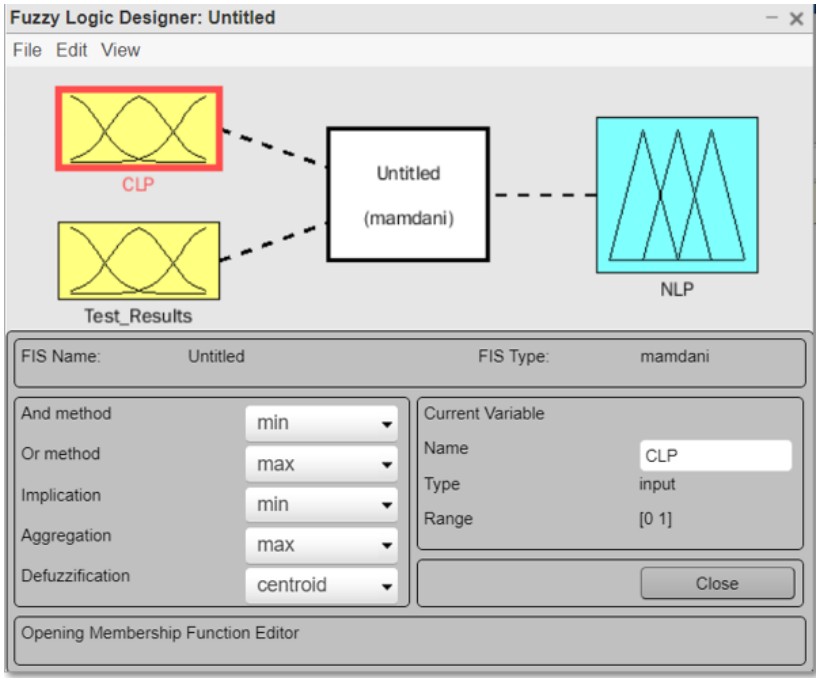

Fig.3. FIS (Fuzzy Inference System) with Input and Output

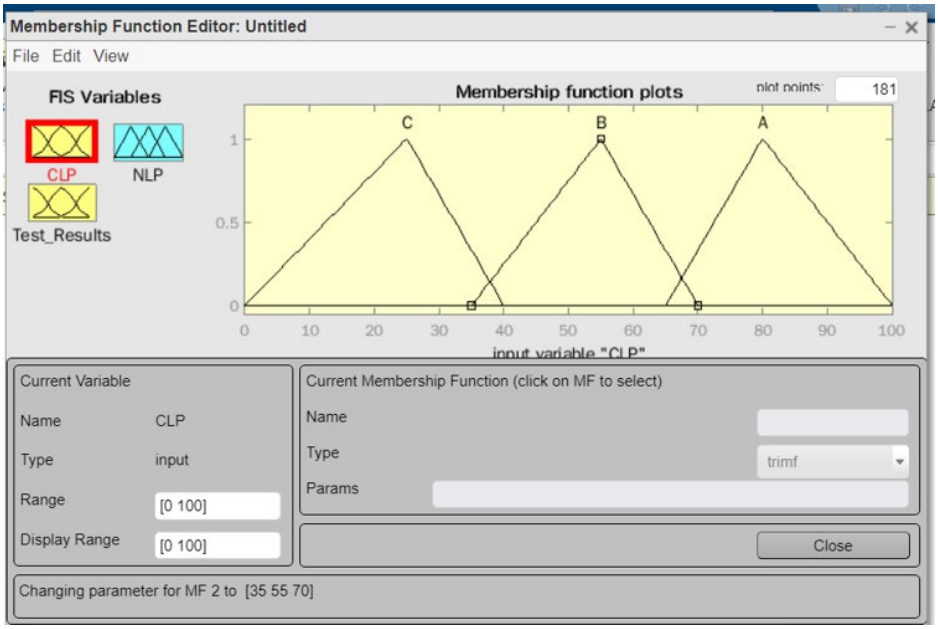

Fig. 4. Membership function of input variable Current Learning Path (CLP)

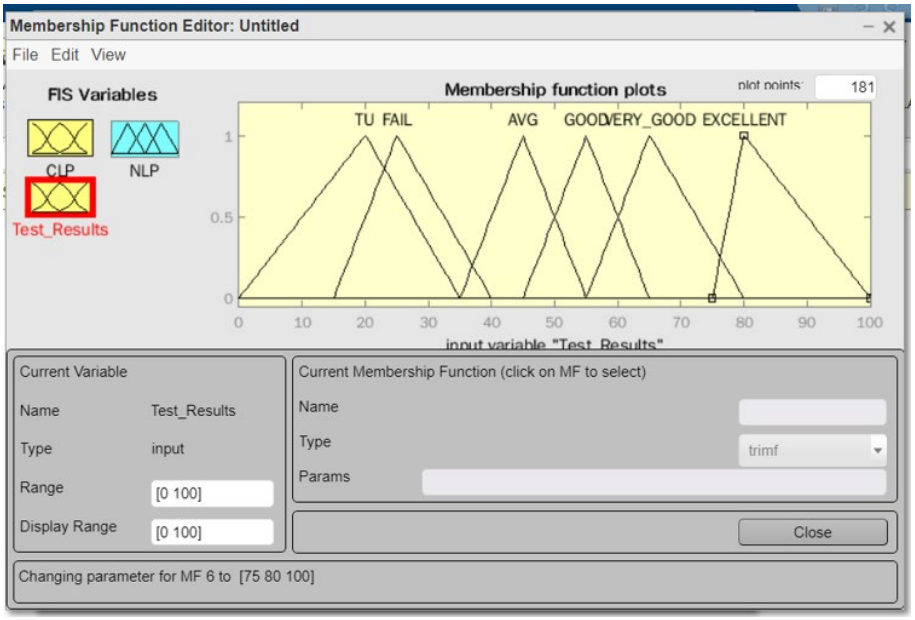

Fig. 5. Membership function input variable Test Results.

Rule is “IF CLB AND TVG THEN NLA”.

That means if the current learning level or path (CL) is the path (B) and the test (T) is Average (AVG) then the subsequent learning level or path (NL) is path (C). Here by these procedure, 18 fuzzy rules associate the current learning level (CL) and the test outcome are used in fig 6.

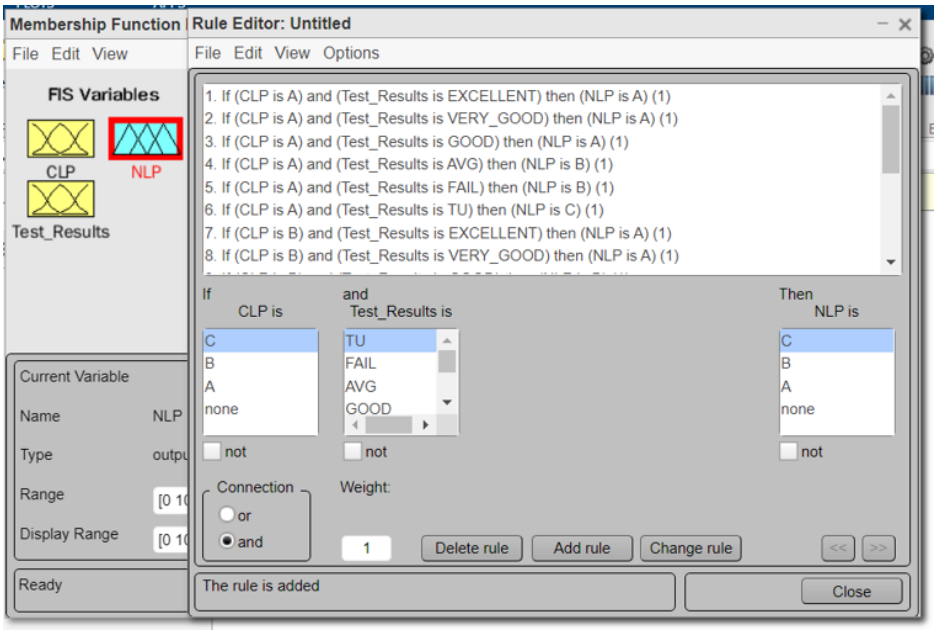

Fig. 6. Fuzzy Rule editor of FIS System

Here we can see the performance of fuzzy rules. By using Mamdani method results were defuzzificated. The area between input and output axes of MF are shaded in accordance with the defuzzifier. The surface view is also presented below Fig7 and Fig 8.

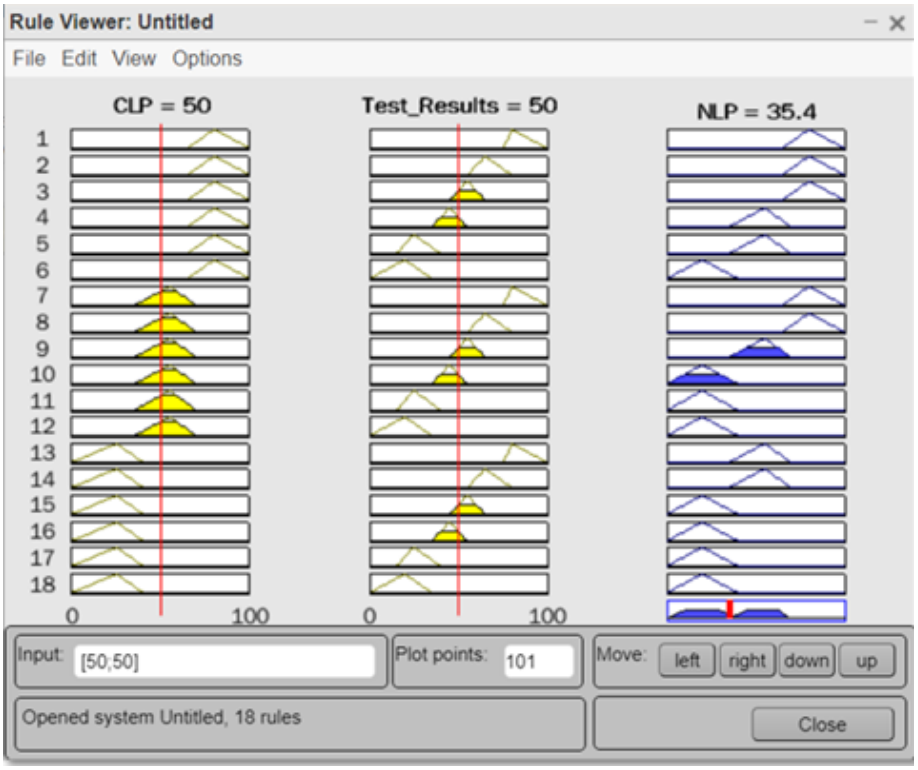

Fig. 7. Fuzzy Expert System Rule View

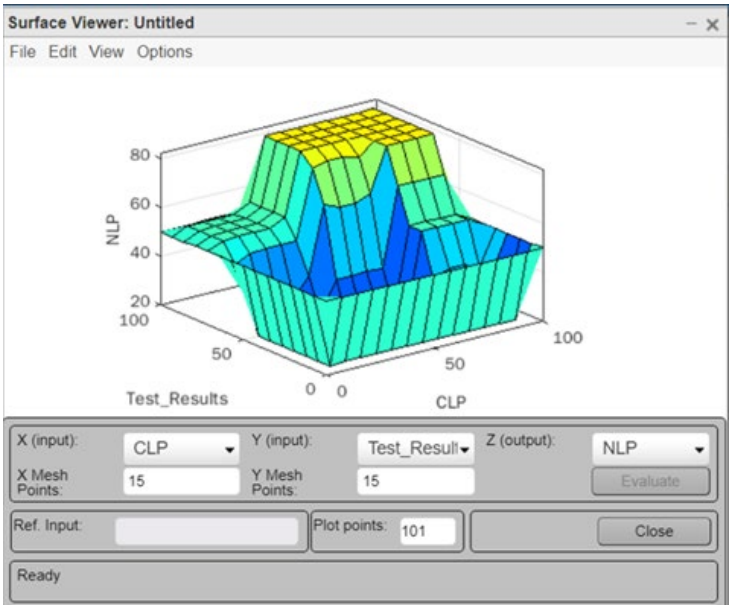

Fig.8. Fuzzy expert system Surface View.

CONCLUSION

This article emphases the significance of involving the fuzzy set logic in leaner demonstrating and the decision-making procedure in E- learning frameworks. In such a classification, the teaching material can be incorporated with on-line demonstration through virtual conditions. Furthermore, modelling and displaying in view of fuzzy logic effectively contribute in managing the vague data. The dynamic strategy in this framework is occurred by the genuine information level of the student. The online reality structure gives a strong schooling device that can uphold clients in learning and preparing through a PC associated and a few exceptional gadgets. So, this study presents the incorporation of fuzzy set logic into valuation of student's programming presentation grades. The choice of fuzzy inference rule is very important while designing a fuzzy interpreter system. The existing technique provides us with a simple way to describe meaningful fuzzy rules.

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