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Fuzzy Technique Based Improved Academic Performance Evaluation System

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Abstract— In order to obtain a high degree of dependability and accuracy, we have developed an updated academic performance evaluation system based on fuzzy logic in this research, which involves adding more features. In order to achieve better performance, we have introduced more functionality in this paper. Our system takes into account not only the examination assessment pattern but also other academic activity-related data in order to approximate performance.

Keywords— **Academic Performance Fuzzy Logic, Membership Function**

I. INTRODUCTION

The quality of educational institutions is the foundation of social progress, and the education system is essential to the growth of nations and societies. Student performance is the single factor that determines an educational system's quality parameter. Since students are the country's future, the progression of their academic achievement is of utmost importance. The best approach currently in use for predicting unknown values, such as student behavior, is the fuzzy logic system. The primary concerns regarding academic success are those ambiguous values, such as semester exams, curricular activities, personality development, etc.

In student performance evaluation in particular, fuzzy techniques have been adapted for evaluation based on numerical scores obtained in an assessment and for assessing prior educational achievement based on evidence such as academic certificates. Much attention has also been given to adopting fuzzy approaches for the evaluation of teaching using a computer, in particular in Intelligent Tutoring Systems (ITS) and Computer Assisted Instruction (CAI). For instance, in fuzzy approaches were proposed for determining the level of a student's understanding of a certain subject matter in the context of ITS [1].

The focus of attention of this research work is an evaluation of student academic performance. It proposes the use of a fuzzy logic techniques and fuzzy rule induction approach to obtain user-comprehensible knowledge from historical data to justify any evaluation. This research work shows the advantages of the approach in student performance evaluation as it can be built not only based on information in a given dataset but also allowing expert knowledge to be added if such knowledge is available. Information induced

from the dataset, especially that not formerly known by experts in the domain, can be very useful in developing fuzzy models for practical applications [2].

II. RELATED WORK

Evaluation of student academic performance usually consists of several components, each involving a number of judgments often based on imprecise data. This imprecision arises from human (teacher/tutor) interpretation of human (students) performance. Arithmetical and statistical methods have been used for aggregating information from these assessment components. These methods have been accepted by many educational institutions around the world although there are limitations with these traditional approaches. In this proposed study, it is argued that the current method of classifying and grading student academic performance using arithmetical and statistical techniques does not necessarily offer the best way to evaluate human acquisition of knowledge and skills. It is expected that reasoning based on fuzzy models will provide an alternative way of handling various kinds of imprecise data, which often reflects the way people think and make judgments.

Academic performance evaluation using soft computing techniques inspired by the successful application of K-means, fuzzy C-means (FCM), subtractive clustering (SC), hybrid subtractive clustering-fuzzy C-means (SC-FCM) and hybrid subtractive clustering-adaptive neuro-fuzzy inference system (SC-ANFIS) methods for solving academic performance evaluation problems. Modeling of students' academic performance is a difficult optimization problem. We explore the applicability of K-means and FCM, SC, hybrid SC-FCM and SCANFIS clustering methods to the new student's allocation problem, which allocates new students into some classes that consist of similar students and the number of students in each class not exceeding its maximum capacity. The models were combined with fuzzy logic techniques to analyze the students' results.

III. PROPOSED WORK

- **TRADITIONAL APPROACH**

The aim and objective of this research is determining students' performance using a fuzzy logic model in place of Traditional pattern, the proposed approach addresses the below mention research questions [1]:

Figure 1: Fuzzy Expert System for Academic Performance Evaluation [1].

This is existing approach proposed by [1] in which they considered only examination pattern for student academic performance

Existing approaches of performance evaluation system only dealt with only examination pattern that is related to (semester exam) but some more important attributes like sports activities, curriculum and personality development (we can define it as a complete academic development or academic growth) which is missing in traditional evaluation system.

- **PROPOSED SYSTEM**

The proposed technique has given extra attention to such attributes because making academic evolution is not only based semester exam, the success of system increase by increasing number of parameter. In the proposed approach we have taken following parameters for performance measurement,

- Semester Exam Performance
- Sports Activities
- Cultural Activities
- Social Awareness

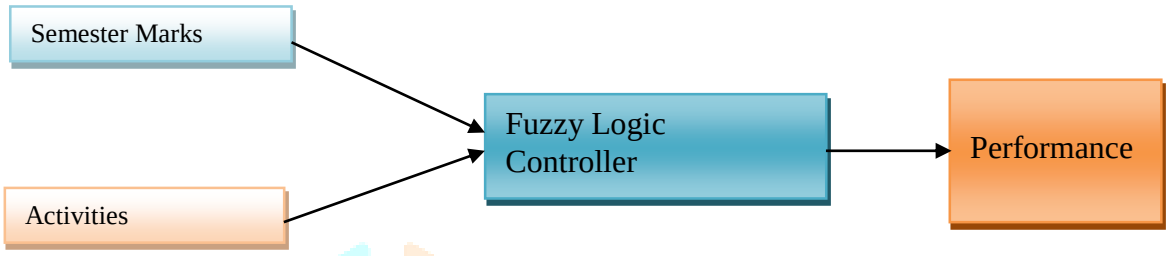

Figure 2: Fuzzy Expert System for Enhanced Model for Academic Performance Evaluation (Single Version)

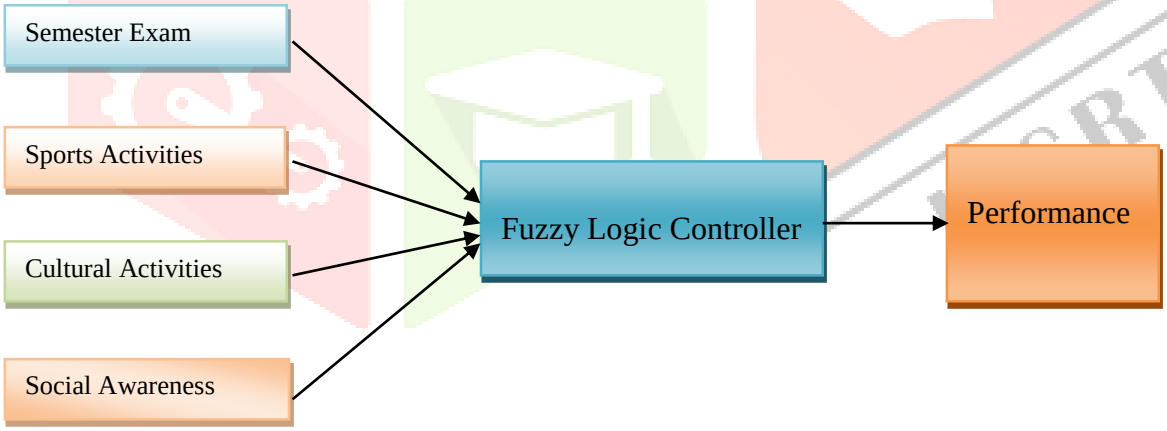

Figure 3: Fuzzy Expert System for Enhanced Model for Academic Performance Evaluation (Activities Split Version)

IV. FUZZY LOGIC CONTROLLER

The proposed view of system, this system consist of basic three blocks

- Fuzzy Input (Semester Marks, Activities)
- Fuzzy Logic Controller
- Fuzzy Output : In term of performance

Academic Performance Evaluation with Fuzzy Logic Controller :

1. Fuzzification
2. Inference Rule

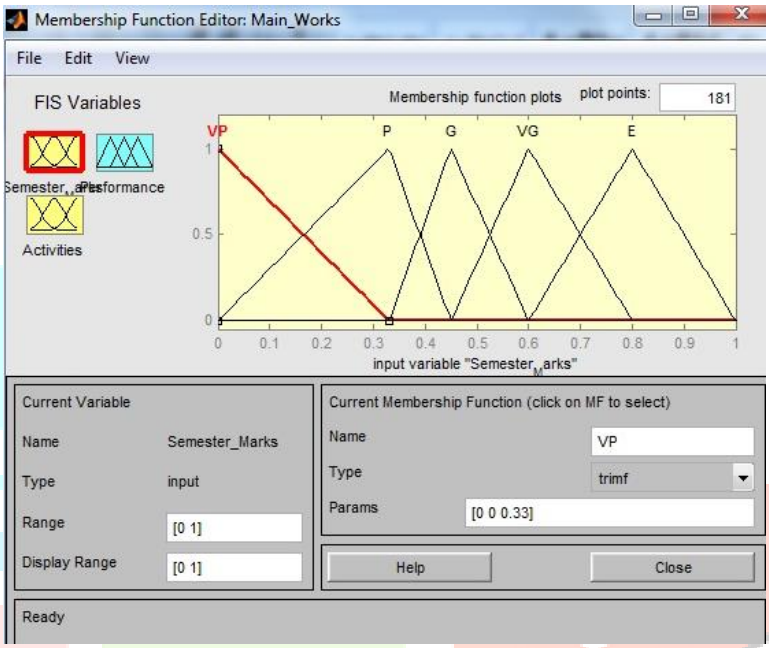

Figure 4: Fuzzy members function for Semester marks

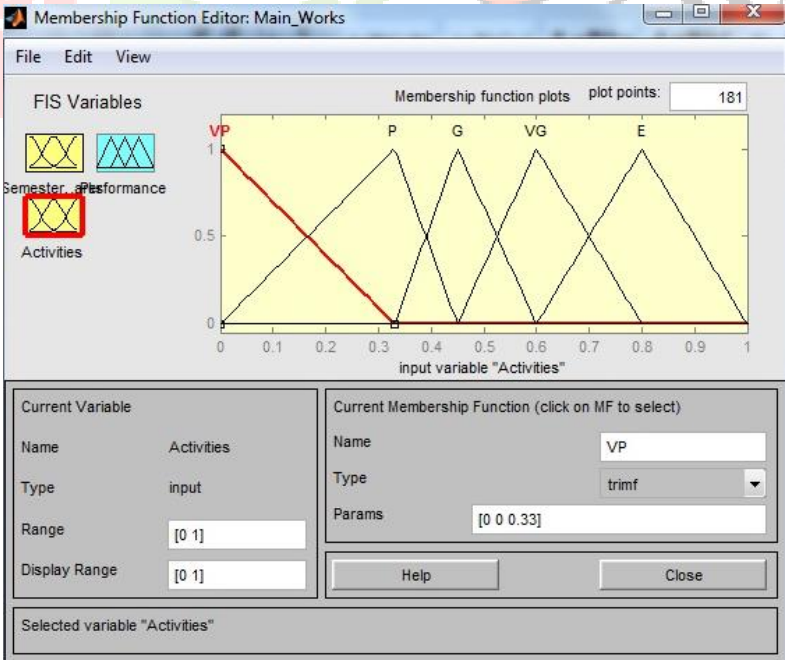

Figure 5: Fuzzy members function for Activities

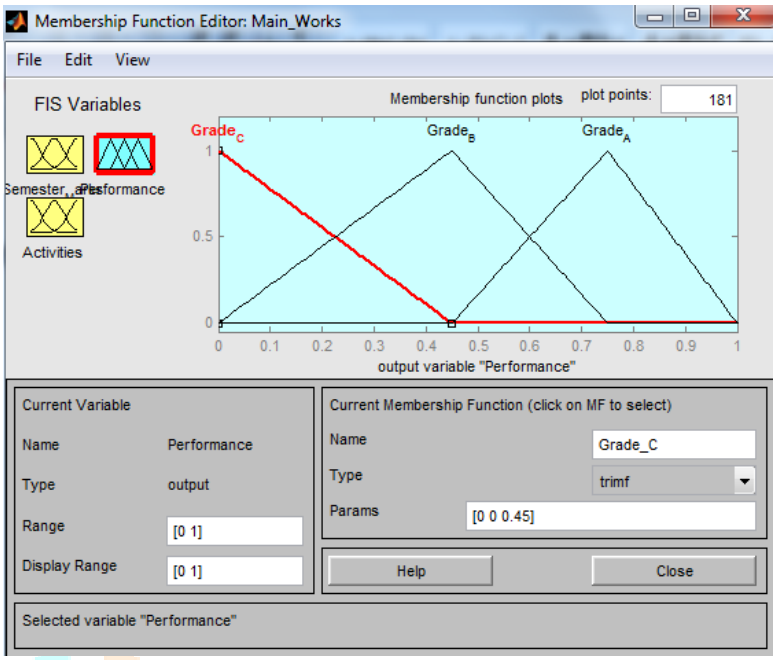

Figure 6: Fuzzy members function for Performance

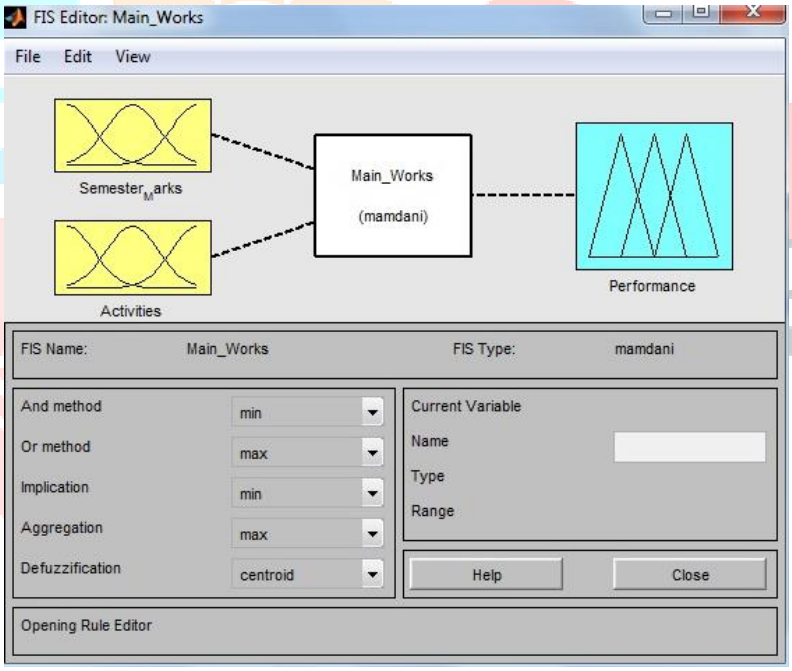

Figure 7: Complete View of Fuzzy Input and Output

V. FUZZY INFERENCE RULE

Table 1: Fuzzy set of input variable (Semester Marks, Activities)

Linguistic Variable	Interval
Very Poor (VP)	[0.0, 0.0, 0 .33]
Poor (P)	[0.0, 0 .33, 0 .45]
Good (G)	[0.33, 0.45, 0 .60]
Very Good (VG)	[0.45, 0 .60, 0 .80]
Excellent (E)	[0.60, 0.80, 1]

Table 2: Fuzzy set of Output variable (Performance)

Linguistic Variable	Interval
Grade C	[0.0, 0.0, 0 .45]
Grade B	[0.0, 0 .45, 0 .75]
Grade A	[0.45, 0.75, 1]

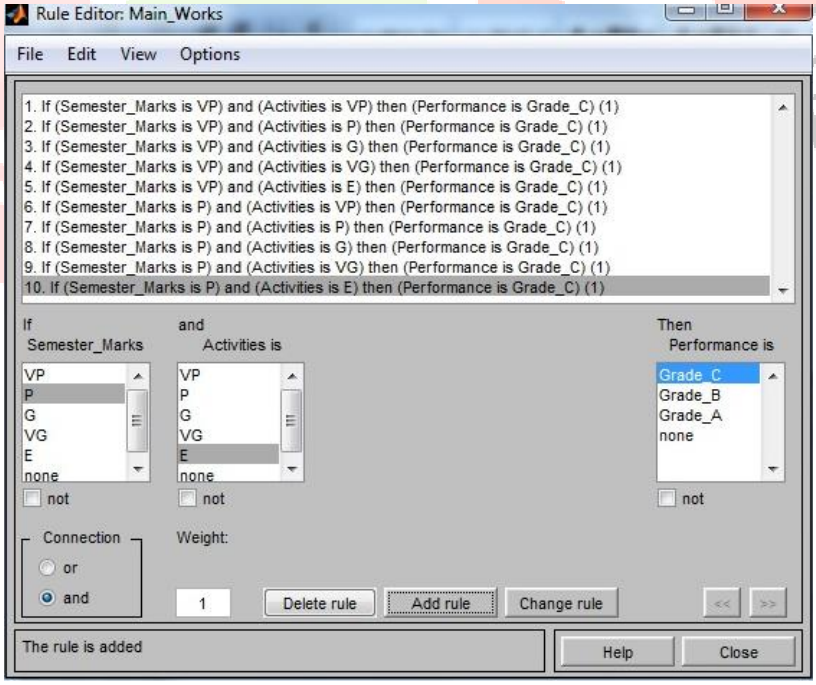

Figure 8: Fuzzy Rule Set (i)

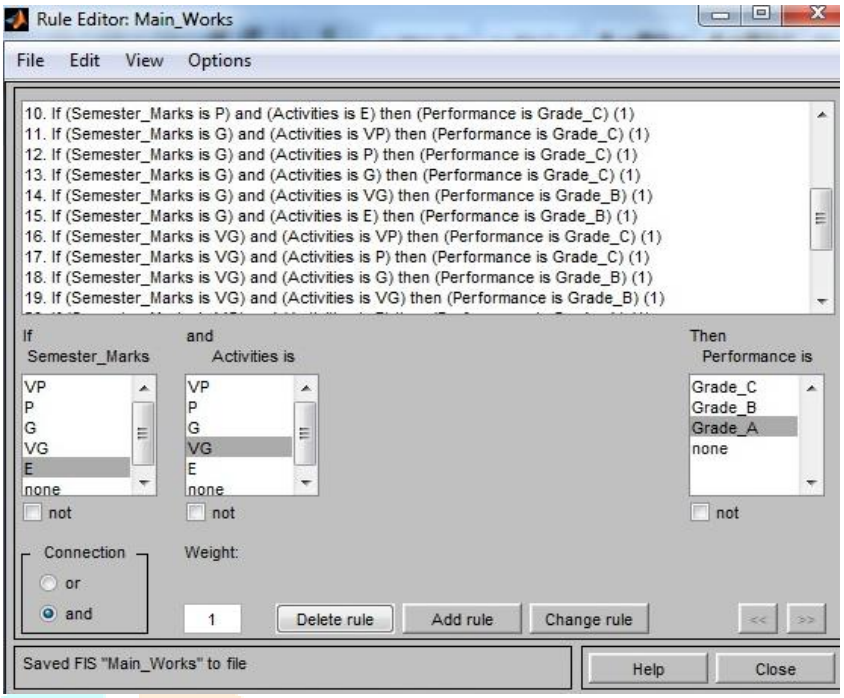

Figure 9: Fuzzy Rule Set (ii)

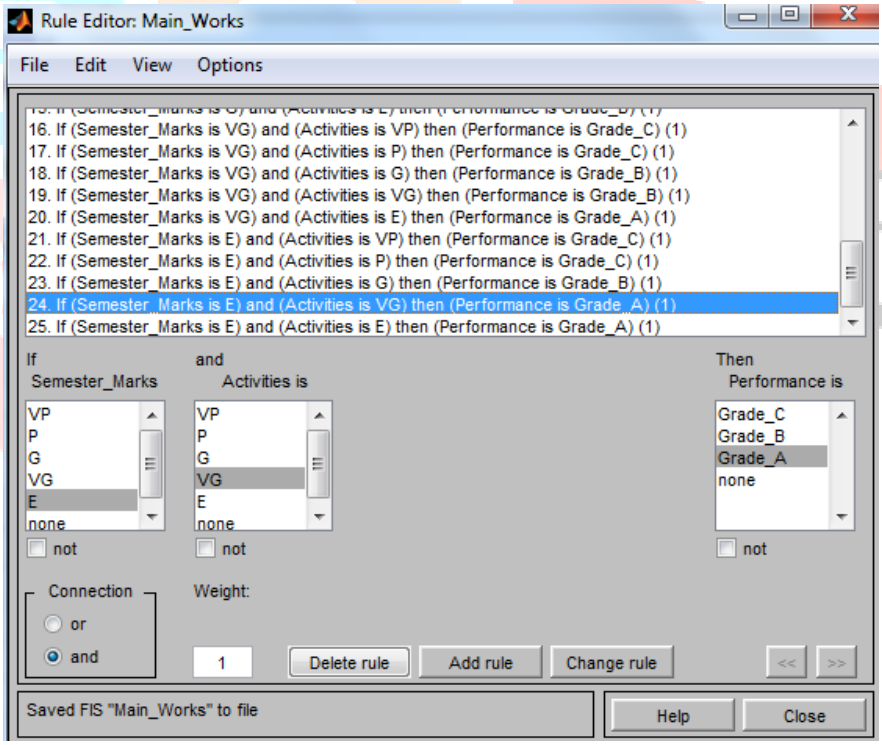

Figure 10: Fuzzy Rule Set (iii)

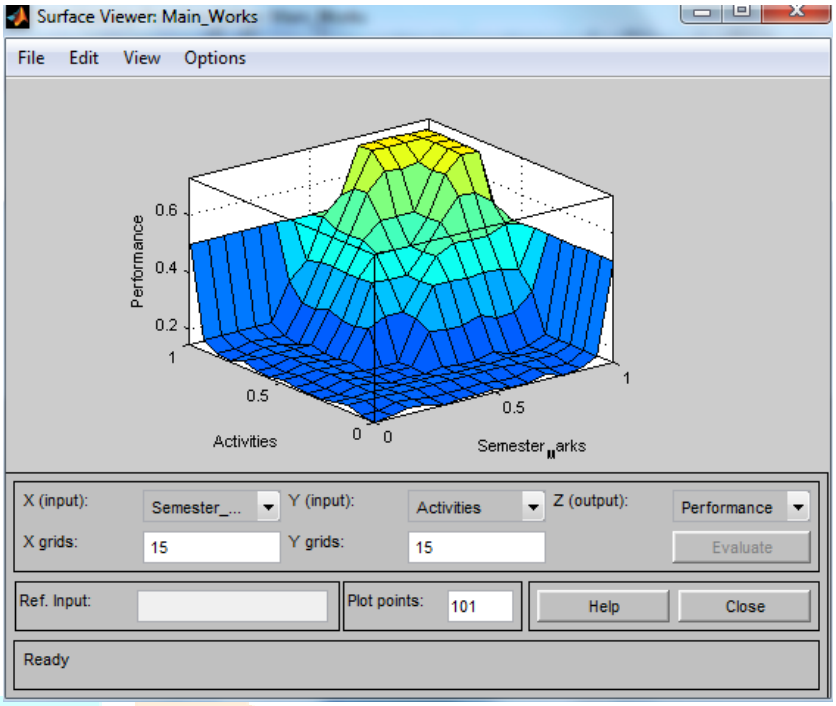

Figure 11: Surface View

VI. EXPERIMENT RESULTS

We have simulated the proposed work in MATLAB environment. Result set produced by fuzzy system is given below:

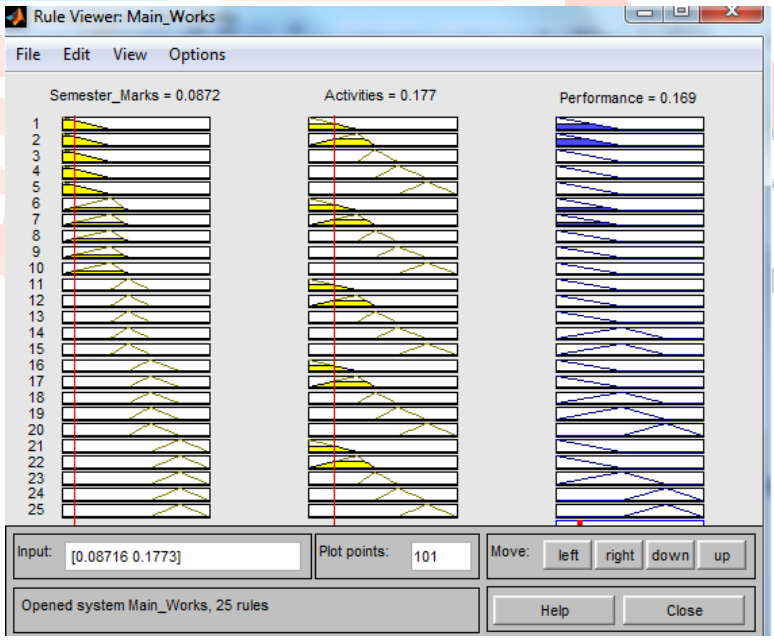

Figure 12: Performance View_1

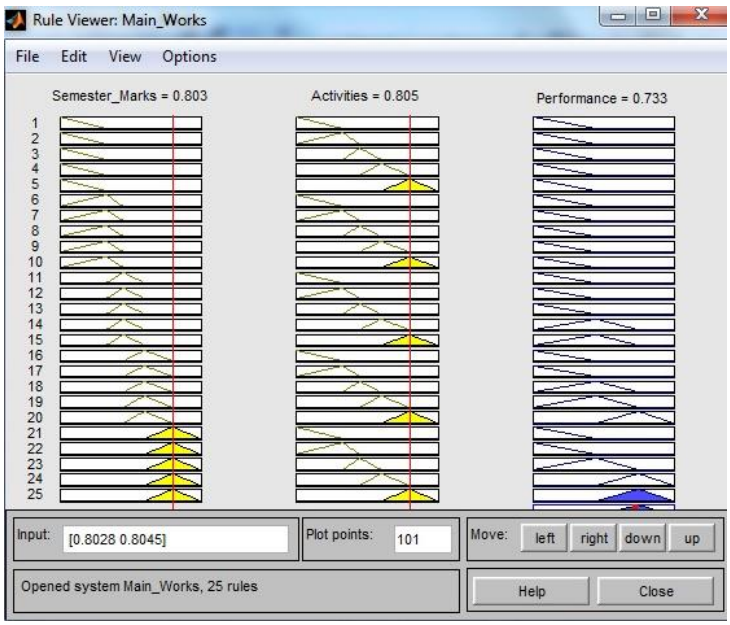

Figure 12: Enhanced Performance View_2

VII. CONCLUSION

In this research, we present a fuzzy method for evaluating students' academic achievement. Our designed system performs better than the fuzzy system when the results are analyzed [1] [9]. Instead of focusing solely on evaluations based on semester exams, we have improved student academic performance by taking into account significant academic traits that are pertinent to students.

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