Evaluation of Student Ability in Laboratory of Electronics Engineering Department with Fuzzy Logic Calculation

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Article Information	ABSTRACT
	Instructive frameworks normally utilize old-style strategies for execution assessment. In this framework, understudy execution relies upon Quiz outcomes and is assessed uniquely as progress or disappointment. Elective, non-traditional execution assessment strategies might be utilized, like fuzzy rationale, a numerical procedure of set-hypothesis that can be applied to many types of dynamic remembering research for designing and man-made brainpower. This review proposes another presentation assessment technique dependent on fuzzy rationale frameworks. Understudy execution of Control Technique Laboratory in University State of Padang Technical Education Faculty, electronics engineering Department, was done with fuzzy rationale and it was contrasted and old-style assessing strategy. Study Quizs are notes in which twenty understudies took the control procedure lab course. Assessment of the outcomes showed varieties among the traditional and fuzzy rationale techniques. In spite of the fact that exhibition assessment utilizing fuzzy rationale is confounded and requires extra programming, it gives some assessment benefits. fuzzy rationale assessment is adaptable and gives numerous assessment alternatives, while the old-style strategy holds fast to consistent numerical estimation. At the implementation stage, the instructor liable for the lab implementation can alter the scopes of participation capacities and rules, allowing non-homogenous yet adaptable and target execution assessment.

1. INTRODUCTION

Estimation of instructive execution is generally communicated mathematically, in view of assessment outcomes. Traditional assessment hence comprises of a judgment dependent on the quization of understudy outcomes against set up execution standards.

Estimation and assessing are inspirable and significant pieces of the instructive interaction. Assessing understudy Quiz scores is performed utilizing different techniques[1].

Utilizing current, old style assessment frameworks, instructive achievement or disappointment is in this way dependent on division through certain scoring edges. For quizple, in research center implementations, an understudy scoring over 50 is assessed as effective, however is generally ineffective. In any case, in lab implementations, assessment of understudy execution dependent on inflexible scoring rules may not be proper.

Fuzzy rationale hypothesis arose during the 20th century and, by the start of the twenty-first century, was anticipated to be applied widely in many fields[2]. One of the utilizations of the fuzzy rationale hypothesis is the estimation and assessment in instruction. In this specific circumstance, the point of this paper is to characterize the "effect of the fuzzy rationale hypothesis on the estimation of understudy's presentation"[3]. The utilization of fuzzy rationale models alfews more adaptable types of assessment. electronics engineering control lab is one of the courses given in branches of electronics engineering, Electronics and Computer Education. electronics engineering control lab in University State Of Padang is perhaps the main course since it has a common sense concentration and is intently identified with industry[4][5].

2. RESEARCH METHOD

2.1 Group of Study

The review bunch included 6th term understudies of electronics engineering at the Technical Faculty of University State of Padang, Padang. The review utilized Quiz scores which twenty understudies took the control method lab course.

2.2 Fuzzy Logic

The fuzzy rationale set was presented in 1965 as a numerical method to address phonetic dubiousness[6]. As per the fuzzy rationale idea, components and rules can be characterized without specific cutoff points. fuzzy rationale is exceptionally helpful for resolving certifiable issues, which for the most part include a level of vulnerability. The demonstrating of numerous frameworks includes the thought of some questionable factors. The measurable vulnerabilities related with these factors are taken care of through likelihood hypothesis[7]. There likewise exists non-factual vulnerability (as 'ambiguity' or 'imprecision') related with numerous factors. These factors and their effects on the framework are characterized in semantic terms. This type of vulnerability can be taken care of in a levelheaded system of 'fuzzy set hypothesis'[8]. One might say that likelihood manages factual vulnerability, though fluffiness has been presented as a method for addressing and controlling non-measurable vulnerability[9]. It isn't generally significant to

relate vulnerability to recurrence[1]. fuzzy rationale utilizes factors like "few", "typical", "upper" instead of "yes/no" or "valid/bogus" factors. fuzzy sets are dictated by participation capacities. The enrollment capacity of a fuzzy set is communicated as $\mu A(x)$ and participation level of its fuzzy not really settled as a number somewhere in the range of 0 and 1. In the event that factor x most certainly has a place with set A, $\mu A(x)$ is 1 and in the event that it certainly doesn't have a place with set A, $\mu A(x)$ is 0. A upperer participation work esteem (up to a worth of 1) shows that factor x has a more grounded level of enrollment to set A[10], [11]. Limit states of the participation capacity can be communicated with adaptable design in fuzzy sets. The main distinction among customary sets and fuzzy sets is the enrollment work. While conventional sets can be described by just a single participation work, fuzzy sets can be portrayed by various enrollment capacities[12]

2.3 Ability Evaluation with Fuzzy Logic

The implementation of a fuzzy model comprised three stages:

1. Assurance of use rules and induction strategy
2. Defuzzification of execution esteem

Understudies sit two Quizs, so there are two info factors. The yield variable is the exhibition esteem, which is dictated by fuzzy rationale (picture 1).
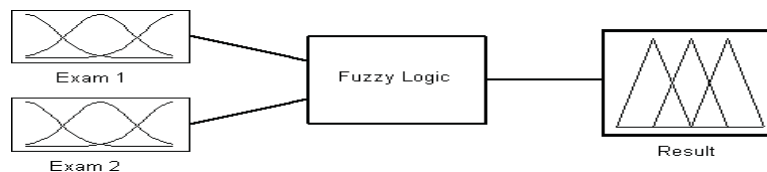

Figure 1. Determination of Students' Ability Using Fuzzy Logic

2.3 The Aim of the Study

The point of the review is to decide understudies' presentation utilizing a fuzzy rationale model instead of old-style evaluation strategies. The review expected to address the accompanying quizination questions:

2.4 Fuzzification of quiz outcomes and ability grade

Fuzzification of Quiz outcomes was done utilizing input factors and their participation elements of fuzzy sets. Every understudy has two Quiz outcomes, the two of which

structure input factors of the fuzzy rationale framework. Each information variable has five triangle enrollment capacities[13].

At first, participation capacities have a similar span, so the two Quizs have same weighted normal. The fuzzy arrangement of information factors is shown Table 1.

Table 1. Fuzzy logic list of expressions and symbols

Expression	Symbol	Normal
Very Few	VF	(0, 0, 25)
Few	F	(0, 25, 50)
Normal	N	(25, 50, 75)
Upper	U	(50, 75, 100)
Advanced	A	(75, 100, 100)

1. Is there any contrast among old style and fuzzy rationale assessment techniques?
2. Is there any distinction in appraisal outcomes among traditional and fuzzy rationale assessment techniques?
3. What are the remarks of scholastics about these two strategies?

It is seen that Quiz notes can have a place with a couple of participation works however their enrollment weighting of every enrollment capacity can be unique (picture 2).
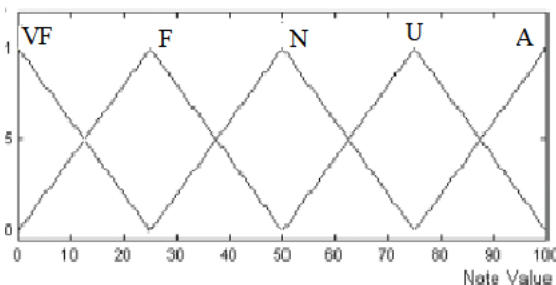

Figure 2. Membership Functions of Quiz 1 and Quiz 2

For quizple, while a score of 25 just has a place with the "few" enrollment work, a score of 30 has a place with both "few" and "Normal" participation capacities, yet is weighted all the more intensely inside the "few" enrollment capacities than the "Normal" enrollment work.

The yield variable, which is the exhibition esteem, is named "outcome" and has five enrollment capacities. For reasons of comfort inside the implementation, a worth reach somewhere in the range of 0 and 1 was picked (Table 2 and picture 3).

Table 2. Fuzzy logic list of declaration and mark

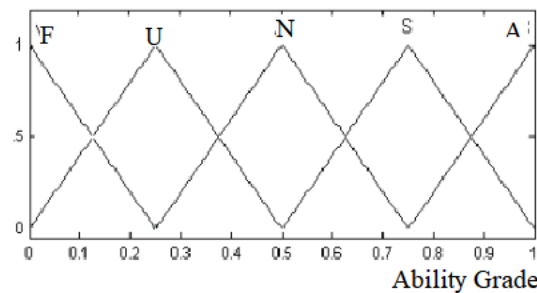| Linguistic Declaration	Mark	Interval
Failed	F	(0, 0, 0.25)
Unsuccessful	U	(0 0 25 0 5)
Normal	N	(0.25, 0.5, 0.75)
Success	S	(0.5, 0.75, 1)
Advance	A	(0.75, 1, 1)

Figure 3. Membership Functions of Ability Grade

3. RESULTS AND DISCUSSION

The standards decide info and yield enrollment works that will be utilized in derivation measure. These principles are etymological and furthermore are named "Assuming Then" rules[14].

1. If quiz1 is VF and quiz2 is VF then, at that point outcome is F
2. If quiz1 is VF and quiz2 is F then, at that point outcome is F
3. If quiz1 is VF and quiz2 is N then, at that point outcome is U
4. If quiz1 is VF and quiz2 is U then, at that point outcome is U
5. If quiz1 is VF and quiz2 is A then, at that point outcome is N
6. If quiz1 is F and quiz2 is VF then, at that point outcome is F
7. If quiz1 is F and quiz2 is F then, at that point outcome is U
8. If quiz1 is F and quiz2 is N then, at that point outcome is U
9. If quiz1 is F and quiz2 is U then, at that point outcome is N
10. If quiz1 is F and quiz2 is A then, at that point outcome is N

11. If quiz1 is N and quiz2 is VF then, at that point outcome is U
12. If quiz1 is N and quiz2 is F then, at that point outcome is U
13. If quiz1 is N and quiz2 is N then, at that point outcome is N
14. If quiz1 is N and quiz2 is U then, at that point outcome is S
15. If quiz1 is N and quiz2 is A then, at that point outcome is S
16. If quiz1 is U and quiz2 is VF then, at that point outcome is U
17. If quiz1 is U and quiz2 is F then, at that point outcome is N
18. If quiz1 is U and quiz2 is N then, at that point outcome is S
19. If quiz1 is U and quiz2 is U then, at that point outcome is S
20. If quiz1 is U and quiz2 is A then, at that point outcome is A
21. If quiz1 is A and quiz2 is VF then, at that point outcome is N
22. If quiz1 is A and quiz2 is F then, at that point outcome is S
23. If quiz1 is A and quiz2 is N then, at that point outcome is S
24. If quiz1 is A and quiz2 is U then, at that point outcome is A
25. If quiz1 is A and quiz2 is A then, at that point outcome is A

In some criteria for similar revenue sharing operations are dynamic, it is important to select only one registration value. This interaction is known as "fuzzy selection" or "fuzzy reasoning". Some authors, such as Mamdami, TakagiSurgeno, and Zadeh, have developed many techniques for fuzzy dynamics and fuzzy reasoning. The current overview uses the method proposed by Mamdami shown in Equation (1) [15]

$$\mu_c(y)= \max_k [\min [\mu_{A1} (input (j))]] \ k= 1,2\ldots\ldots.r$$

This clear expression makes the work of earning income an incentive for dynamic principles. When the principle is dynamic, the AND activity is applied among inputs. A more humble valuation of the information has been rejected, and the inscription has not been set on the stone as the stock value of that standard earnings. This strategy has been reworked to ensure that yield registrations are not finalized for all standards. In summary, you can graphically apply AND (min) activities among inputs, or potentially (max) tasks among yields.

3.1 Determination of ability grade

Subsequent to finishing the fuzzy choice cycle, the fuzzy number acquired should be changed over to a fresh worth. This cycle is entitled defuzzification. Numerous strategies have been created for defuzzification. In this review, a "Centroid" (Center of Area) procedure was applied, which is quite possibly the most widely recognized method. After defuzzification measure, acquired fuzzy number is

mathematical picture. The fresh worth is determined as beneath (picture 4, Equation 2) [2]
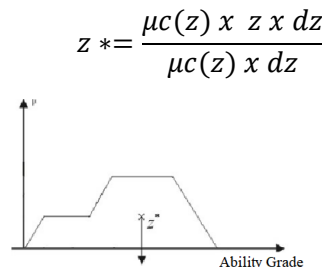
$$z *= \frac{\mu c(z) \; x \;\; z \; x \; dz}{\mu c(z) \; x \; dz}$$

Figure 4. Defuzzy With Centroid method

3.2 Implementation Of Fuzzy Logic

Table 3 shows the scores accomplished by 20 understudies in quiz 1 and quiz 2. For every understudy, both Quiz scores were fuzzified through the participation capacities recently depicted in area 3.2 (Rules and Inference). Dynamic participation not really set in stone as per rule table, utilizing the Mamdami fuzzy choice strategy. The yield (execution esteem) was then defuzzified by ascertaining the middle (centroid) of the subsequent mathematical shape. This succession was continued utilizing the Quiz scores for every understudy.

Table 3. quiz scores and calculated ability grades

No	quiz 1	quiz 2	Ability Grade	No	quiz 1	quiz 2	Ability Grade
1	76	19	0.222	11	14	76	0.184
2	78	90	0.58	12	46	31	0.484
3	48	88	0.623	13	44	67	0.657
4	47	13	0.233	14	20	78	0.256
5	56	74	0.576	15	66	12	0.500
6	20	27	0.421	16	89	58	0.534
7	18	61	0.539	17	89	64	0.391
8	75	18	0.776	18	90	64	0.406
9	10	97	0.670	19	79	57	0.386
10	41	56	0.542	20	83	100	0.830

The two sources of info had same triangle enrollment capacities. Along these lines, supplanting quiz 1 with quiz 2 would not change the determined presentation esteem (for quizple (45 and 65) and (65 and 45)). On the off chance that the evenness or the worth scope of the enrollment capacities isn't equivalent, one of the Quizs impacts the yield execution esteem than the other. For instance, how about we change the participation capacities and worth scope of quiz 2 (picture 5), while retaining the original criteria for quiz 1. With this arrangement, the grade range of normal membership function shrinks, the top grade of L membership function is moved to 20, the top grade of H membership function is movedto 80, and grade ranges of VL and VH membership functions are moved to 40 and 60, respectively.
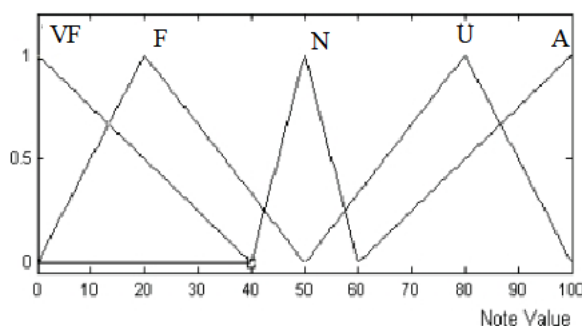

Figure 5. Arrangement Membership Functions for Quiz 2

Point of this course of action in quiz 2 is to punish scores under 50 and to compensate scores over 50. The present circumstance can be found in Table 4. For Quiz scores under 50, execution esteems diminished and for Quiz scores over 50, execution esteems expanded. There is no change for scores of 50, since this is the limit of the breaking point esteem. picture 6 shows the dynamic standards and execution esteem acquired for Quiz scores of 45 and 65.
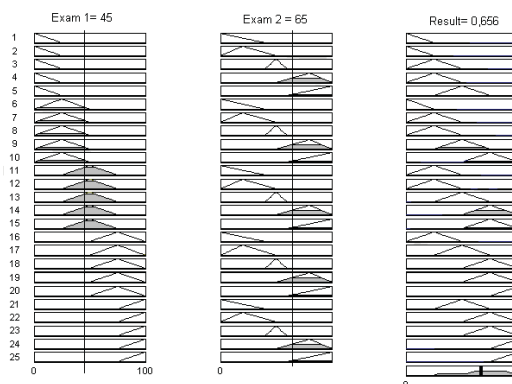

Figure 6. Active Rules and Ability Grade for Quiz Scores of 45 and 65

In this situation, rules 9,10,14 and 15 are dynamic and toward the finish of defuzzification, a presentation worth of 0.656 is gotten.

Table 5 shows the execution scores using the old-fashioned method and fuzzy rational strategy. For correlation, we use traditional techniques to separate the regular score into 100 and recognize it as 0.5 whenever possible. In the Fuzzy 1 situation, all the participation abilities of the two Quizs are very similar, but in the Fuzzy 2 situation, the registration elements of Quiz 2 have changed. Table 5 shows the direct relationship among traditional strategies and Fuzzy 1. If the second study succeeds with traditional assessment methods, they are also effective in the fuzzy 1 situation. Investigating traditional strategies in the Fuzzy 2 situation reveals inconsistencies in presentation values. For more than 50 notes, the Fuzzy 2 exhibit value is more modest than traditional methods. In any case, the appreciation for the presentation is greater than the old-style strategy for values above 50.

Table 5. Execution Scores

No	quiz 1	quiz 2	Ability Grade	No	quiz 1	quiz 2	Ability Grade
1	29	33	0.223	11	73	12	0.213
2	56	33	0.588	12	82	97	0.648
3	64	20	0.634	13	39	83	0.859
4	14	77	0.332	14	41	39	0.345
5	56	78	0.657	15	60	69	0.767
6	94	15	0.215	16	10	89	0.655
7	59	39	0.935	17	91	12	0.453
8	46	77	0.675	18	37	79	0.678
9	59	13	0.674	19	61	28	0.653
10	41	24	0.549	20	17	80	0.487

For example, replacing 34 in Quiz 1 with 60 in Quiz 2 does not work with traditional techniques, but is fruitful in a fuzzy 2 situation. We met with the State Electronics Engineering Board of the University of Padang and received some information on the assessment of ambiguous rationale for conducting a second study. When using the two evaluation strategies, the view of scholasticism was different. Some evaluated the potential adaptability of fuzzy rational methods, while others suffered because it was difficult to provide an estimate of undergraduate grades. Running estimates using a computerized PC framework should solve these problems. Overall, fuzzy-based performance assessments are useful for research centers, but they can also be used for fictitious quiz pull performance assessments.

4. CONCLUSION

When the results are evaluated, the results are distinguished among the old-style approach and the proposed fuzzy rational strategy. Old-style strategies adhere to consistent numerical principles, but fuzzy rationale assessments have extraordinary adaptability. During the implementation phase, course organizers can change rules and attendance to create different levels of appreciation for their behavior, but use similar principles and registration options for all new students taking similar quizzes. Is important. It is also important for first graders to understand the assessment model before taking the exam. Therefore, members of the school board need to discuss with each other and take into account rules, registration abilities, and some other criteria.

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