The Assessment of Qur'an Reciting Competitions Using the Fuzzy Evaluation Method

Khairu Azlan Abd Aziz[1]*, Mohd Fazril Izhar Mohd Idris[2], Wan Suhana Wan Daud[3,] Abdul Muhaimin Tajaludin[4]

[1,2,4] Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Arau Campus, 02600 Arau, Perlis

[3]Institute of Engineering Mathematics, Universiti Malaysia Perlis, 02600 Arau, Perlis

Corresponding author: *khairu493@uitm.edu.my
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HIGHLIGHTS

- Fuzzy Evaluation Method was used to evaluate Qu'ran Recitation Competition.
- The evaluation is based on four factors, "Tajweed", "Tarannum", "Fasohah" and Vocal.
- The sample of this study is from Qur'an Recitation Competition in Klang, Malaysia

ABSTRACT

A Qur'an Reciting Competition evaluates a participant's performance based on several factors, including Tajweed, Tarannum, Fasohah, and Vocal Quality. Participants in the Qur'an Reciting Competition are usually assigned a point value of 100, with each point representing a linguistic word or label such as "Exceptional," "Excellent," "Fairly Good," and so on. Evaluating participant performance seems difficult because it involves human decision-making, which is imprecise, ambiguous, and unpredictable. This study employed the fuzzy evaluation method to assess participants' performance at a Qur'an Reciting Competition in Klang. In this manner, the membership function graph was used to determine the membership value of each satisfaction level. The satisfaction level of each participant's mark was then computed. At the end, the fuzzy markings with linguistic values would be obtained. The proposed method provides an alternative approach that is reasonable and intelligent in assessing competitors' performance. This method is practical because it can increase the satisfaction of participants and assist the panels in making more reliable decisions during the competition.

Keywords: Fuzzy evaluation method, membership function, satisfaction level, Qur'an recitation competition

INTRODUCTION

The meaning of the Qur'an to the life of a Muslim cannot be overemphasized. It is enough to mention that it is a guidebook which is responsible for the considerable success of the early Muslims (Gusau, 2012). In each sentence, passage and *surah*, the Qur'an contains precious literary elements which are like jewels; this is one of its miracles. The Holy Qur'an includes all the requirements for guiding and educating people in

social, individual, moral, legal, life and afterlife aspects. The Qur'an is a masterpiece of its own expectations with a distinctive style. From a literary point of view, it has an inimitable and astonishing style. It also refers to all individuals which makes it desirable for any reader or listener as it has a clear and intelligible language (Nayef & Wahab, 2018). In the following Qur'anic quotation, Allah (SWT) commands: (Q73:3). Muslims were involved not only in the memorization of the Quran from the time of Muhammad the Prophet (SAW), but also in its poetic beauty with expressiveness and unique interpretative characteristics. This is the result of intensive reciting study known as 'Tajweed' and 'Tarteel' with continuous practice, which is reciting (Gusau, 2012).

In order to instill the love of the Qur'an among Muslims, many parties have organized Qur'an reciting competitions at different levels. Qur'an reciting competition has a spiritual, educational, economic and social impact on the lives of the Muslim (Ummah, 2015). The organization has received an interesting response not only from Malaysia, but from all over the world. The first Malaysian Prime Minister, Tunku Abdul Rahman, founded the International Quran Reciting Competition, which has been held annually in Malaysia since 1961 (Yusof & Tawel, 2013). Each competition has its own different elements or criteria which are used to evaluate the participants. For the Quran reciting competition, there are 4 criteria that will be evaluated that will always be used throughout the reciting competition: Vocals, *Tajweed, Fasohah* and *Tarannum* (Malaysia, 2016). In the *Tajweed* section, the rules of *nun* and *mim Sakinah*, *tanwin, ra* and *lam* and other *Tajweed* rules are considered (Hassan & Zailaini, 2013). Reading the Quran is not like reading other normal books. In order to read so reliably correctly, it requires a series of conventions and special rules that are free from errors. In addition to long vowels and other morphological rules, these conventions include sound-pronouncing on the right track, and rules on when to stop and where to continue (Al-Jazi, 2017).

In a Qur'an Reciting Competition, there are always points that concentrate only on four elements, such as Vocals, *Tajweed, Fasohah* and *Tarannum*, when the participants, Qari and Qariah recite the Holy Qur'an during the competition. Participants perform their own performances in front of a panel of judges. This method of evaluation is recognized and has been applied by most of the Qur'an Reciting Competition Committees. However, based on the findings that have been made, this assessment approach does not seem like the best way to measure the participants' Qur'an reciting abilities since it contains elements of fuzziness. It is so difficult to measure subjective aspects as they tend to be ambiguous. This problem arises because individual panelists will have distinct attitudes, experiences and tolerance during the assessment process. The scores obtained will differ and thus, the average score which may include a decimal value will be taken. Since the 100-point evaluation approach is commonly used in terms of the nominal importance of the linguistic value, it will be difficult to define the linguistic values of the points. Most of the time, members of the panel will feel very dissatisfied with the results once all the participants have scored. In addition, participants will always consider the tournament to be unfair. Therefore, a more reliable method is needed to measure the performance of the participants other than the method that is often used to gauge reciting abilities.

In this study, the fuzzy evaluation method is applied to measure the performance of participants in the Qur'an reciting competition. The fuzzy method is used because it is more convenient to be applied compared to other artificial intelligence methods (Zaporozhko et al., 2020). The basic principle of the fuzzy evaluation method is to define the evaluation variables, the normal factor evaluation grades, membership and the weights (Wang et al., 2013). Fuzzy measurements are efficient and easy to apply over a specific set of tasks (Pape et al., 2013). The applications of fuzzy logic have been enhanced by today's technological growth. Fuzzy Logic is working its way forward in the decision-making and assessment areas of manufacturing (Patil et al., 2012). The analysis using a fuzzy method approach with the membership values

provides reliable results compared to the analysis using the mean and percentage of statistics (Yusoff et al., 2013).

RESEARCH METHODOLOGY

This section shows how the fuzzy evaluation method is used to assess the performance of participants in the Qur'an reciting competition. The sample of data has been taken from the head of jury who judged the Qur'an recitation competition at the Klang, Selangor high school level in 2013. The following methodology is utilized in this evaluating procedure.

Step 1: Normalizing the marks
The marks obtained by each of the students are converted to normalized values. A normalized value refers to a value in the range of [0, 1]. Table 1 tabulates the sample marks and the normalized values obtained by a student from two schools for all the criteria.

$$normalized\,value\,(NV) = \frac{marks\,obtained\,(MO)}{total\,marks\,(TM)}$$
(1)

where (NV) = normalized value for each criterion, (TM) = total marks and (MO) = marks obtained

Table 1: Samples of marks and normalized values

No.	School Name	Criteria	Total Marks	Obtained	Normalized Value
1	SMK JALAN KEBUN	Tajweed	40	31	0.78
		Tarannum	25	8	0.32
		Fasohah	20	11	0.55
		Vocal	15	9	0.60
10	SMK MERU	Tajweed	40	31	0.78
		Tarannum	25	10	0.40
		Fasohah	20	8	0.40
		Vocal	15	10	0.67

Step 2: Developing the graph of the fuzzy membership function.
The membership function graph is created in order to perform the fuzzification process. The input value is mapped to the membership graph function to obtain the fuzzy membership value for that specific input value. The level of satisfaction would be proportional to the value of each membership.

Table 2 depicts the twelve levels of satisfaction proposed for this study (Daud et al., 2011). The range of marks for each level of satisfaction is indicated by the degrees of satisfaction. The mapping function for the corresponding satisfaction standard defines the highest level of satisfaction as T (Xi) ranging from 0 to 1.

Table 2: Standard satisfaction levels and the corresponding degrees of satisfaction

Satisfaction Levels (X_i)	Degrees of Satisfaction	Maximum Degrees of Satisfaction $T(X_i)$
Exceptional (ET)	80%-100% (0.8-1.0)	$[T(X_1)] = 1.0$
Excellent (EX)	75%-79% (0.75-0.79)	$[T(X_2)] = 0.79$
Very Good (VG)	70%-74% (0.7-0.74)	$[T(X_3)] = 0.74$
Fairly Good (FG)	65%-69% (0.65-0.69)	$[T(X_4)] = 0.69$
Marginally Good (MG)	60%-64% (0.6-0.64)	$[T(X_5)] = 0.64$
Competent (CT)	55%-59% (0.55-0.59)	$[T(X_6)] = 0.59$
Fairly Competent (FC)	50%-54% (0.5-0.54)	$[T(X_7)] = 0.54$

Marginally Competent (MC)	45%-49% (0.45-0.49)	$[T(X_8)] = 0.49$
Bad (BD)	40%-44% (0.4-0.44)	$[T(X_9)] = 0.44$
Fairly Bad (FB)	35%-39% (0.35-0.39)	$[T(X_{10})] = 0.39$
Marginally Bad (MB)	30%-34% (0.3-0.34)	$[T(X_{11})] = 0.34$
Very Bad (VB)	0-29% (0-0.29)	$[T(X_{12})] = 0.29$

Step 3: Calculating the degree of satisfaction
In this step, the degree of satisfaction which is denoted by $D(C_i)$ is evaluated by:

$$\text{Degree of satisfaction } D(C_i) = \frac{y_1(Tx_1) + y_2(Tx_2)........y_{12}T(x_{12})}{y_1 + y_2 + ...y_{12}} \tag{2}$$

where y = degree of membership value and $T(X)$ = the maximum degree of satisfaction

Step 4: Evaluating the Final mark
For the final step, the final scores or marks are calculated using the following formula:

$$F(S_k) = \frac{w_1 D(C_1) + w_2 D(C_2) + w_3 D(C_3) + w_4 D(C_4)}{w_1 + w_2 + w_3 + w_4} \tag{3}$$

where w is the sum of marks that reflects the number of criteria.

Table 3: Fuzzy grade sheet

No	Criteria	Fuzzy Membership Value												Degree of Satisfaction	Final Mark
		VB	MB	FB	BD	MC	FC	CT	MG	FG	VG	EX	ET		
1	C_1	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9	y_{10}	y_{11}	y_{12}	$D(C_1)$	$F(S_1)$
	C_2	:	:	:	:	:	:	:	:	:	:	:	:	$D(C_2)$	
	C_3	:	:	:	:	:	:	:	:	:	:	:	:	$D(C_3)$	
	C_4	:	:	:	:	:	:	:	:	:	:	:	:	$D(C_4)$	

FINDINGS AND DISCUSSIONS

To illustrate this method of evaluation, examples of marks for a student are taken from Table 1. Figure 1 shows the membership function graph that is produced to carry out the fuzzification procedure in Step 2.
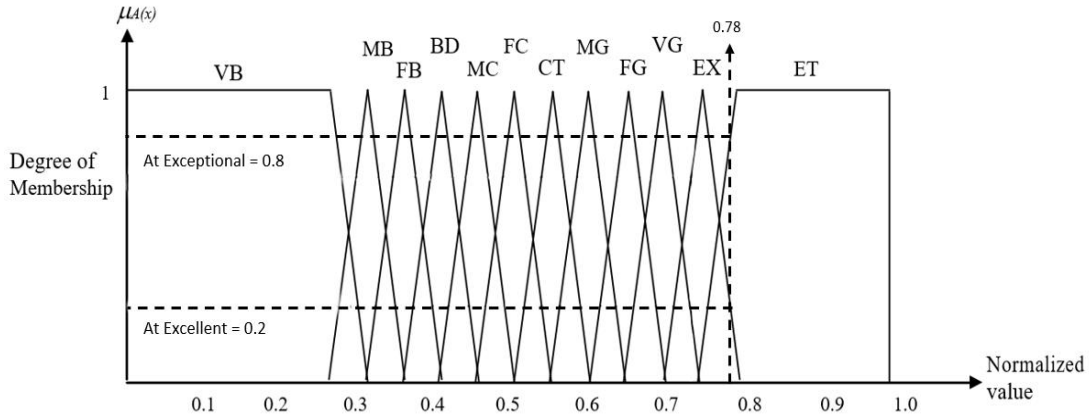
Figure 1: Membership functions for satisfaction level of Qur'an Reciting Competition

Figure 1 represents the satisfaction levels of Excellent and Exceptional, which reflect the degree of membership of 0.2 and 0.8, respectively for the normalized value of 0.78 from the first criterion. The degree of satisfaction with criterion 1 is calculated as follows using equation 2:

$$D(C_1) = \frac{(0.2)(0.79) + (0.8)(1.0)}{0.2 + 0.8} = 0.96 \tag{4}$$

Finally, the participant's final mark for all criteria is calculated using equation 3:

$$F(S_1) = \frac{(40)(0.96) + (25)(0.37) + (20)(0.60) + (15)(0.65)}{100} = 0.694 \tag{5}$$

Based on the final mark, the participant from SMK Jalan Kebun is given a fuzzy linguistic term of Very Good at 1.0. Furthermore, the final grade can be calculated as 69.40 (multiplied by 100%), which corresponds to the linguistic phrase "Very Good." The details of the fuzzy marks produced by this evaluation method are shown in Table 4.

Table 4: The samples of fuzzy marks of SMK Jalan Kebun in 2013

No	Criteria	Fuzzy Membership Value												Degree of Satisfaction	Final Mark
		VB	MB	FB	BD	MC	FC	CT	MG	FG	VG	EX	ET		
1	C_1	-	-	-	-	-	-	-	-	-	-	0.2	0.8	0.96	0.6940
	C_2	-	0.4	0.6	-	-	-	-	-	-	-	-	-	0.37	
	C_3	-	-	-	-	-	-	0.8	0.2	-	-	-	-	0.60	
	C_4	-	-	-	-	-	-	-	0.8	0.2	-	-	-	0.65	
10	C_1	-	-	-	-	-	-	-	-	-	-	0.2	0.8	0.96	0.6945
	C_2	-	-	-	0.8	0.2	-	-	-	-	-	-	-	0.45	
	C_3	-	-	-	0.8	0.2	-	-	-	-	-	-	-	0.45	
	C_4	-	-	-	-	-	-	-	-	0.4	0.6	-	-	0.72	

Table 5: Results for 13 participants obtained from fuzzy and non-fuzzy methods for Klang 2013

School	Non-Fuzzy Method		Fuzzy Evaluation Method	
	Final Mark	Linguistic Term	Final Mark	Linguistic Term
1.	59	Competent	0.6940	Very Good at 1.0
2.	65	Fairly Good	0.7545	Excellent at 0.2, Exceptional at 0.8

3.	60	Marginally Good	0.7095	Very Good at 0.6, Excellent at 0.4
4.	61	Marginally Good	0.6625	Fairly Good at 0.6, Very Good at 0.4
5.	87	Exceptional	1.000	Exceptional at 1.0
6.	62	Marginally Good	0.6895	Very Good at 1.0
7.	46	Marginally Competent	0.5095	Fairly Competent at 0.6, Competent at 0.4
8.	64	Marginally Good	0.7595	Excellent at 0.6, Exceptional at 0.4
9.	49	Marginally Competent	0.5395	Competent at 1.0
10.	59	Competent	0.6945	Very Good at 1.0
11.	70	Very Good	0.7895	Exceptional at 1.0
12.	71	Very Good	0.7905	Exceptional at 1.0
13.	46	Marginally Competent	0.5095	Fairly Competent at 0.6, Competent at 0.4

Table 6: Results for 11 participants obtained from fuzzy and non-fuzzy methods for Klang(P) 2013

School	Non-Fuzzy Method		Fuzzy Evaluation Method	
	Final Mark	Linguistic Term	Final Mark	Linguistic Term
1.	78	Excellent	0.8425	Exceptional at 1.0
2.	64	Marginally Good	0.7305	Very Good at o.2, Excellent at 0.8
3.	86	Exceptional	1.000	Exceptional at 1.0
4.	68	Fairly Good	0.7965	Exceptional at 1.0
5.	56	Competent	0.6115	Marginally Good at 0.6, Fairly Good at 0.4
6.	59	Competent	0.6415	Fairly Good at 1.0
7.	75	Excellent	0.8360	Exceptional at 1.0
8.	72	Very Good	0.8395	Exceptional at 1.0
9.	71	Very Good	0.8000	Exceptional at 1.0
10.	60	Marginally Good	0.7035	Very Good at 0.8, Excellent at 0.2
11.	72	Very Good	0.8325	Exceptional at 1.0

Table 7: Results for 10 participants obtained from fuzzy and non-fuzzy methods for Klang 2015

School	Non-Fuzzy Method		Fuzzy Evaluation Method	
	Final Mark	Linguistic Term	Final Mark	Linguistic Term
1.	87	Exceptional	1.000	Exceptional at 1.0
2.	72	Very Good	0.8005	Exceptional at 1.0
3.	71	Very Good	0.7905	Exceptional at 1.0
4.	51	Fairly Competent	0.5615	Competent at 0.6, Marginally Good at 0.4
5.	79	Excellent	0.8795	Exceptional at 1.0
6.	81	Exceptional	0.8655	Exceptional at 1.0
7.	75	Excellent	0.8195	Exceptional at 1.0
8.	44	Bad	0.4905	Fairly Competent at 1.0
9.	40	Bad	0.4525	Marginally Competent at 0.8, Fairly Competent at 0.2
10.	69	Fairly Good	0.7605	Excellent at 0.6, Exceptional at 0.4

The computation in the fuzzy evaluation technique is based on fuzzy sets with a range of [0, 1]. However, the marks can be converted to a percentage. As shown in the Table above, the fuzzy marks obtained are clearly higher than the non-fuzzy marks. Aside from that, the linguistic terms of the fuzzy approach are more detailed because they include the degrees of satisfaction for each linguistic term. Using this information, we are able to describe each participant's performance during the competition compared to the typical final mark of the non-fuzzy method. In other words, using the satisfaction levels, this approach can be used to compare the performances of participants who have the same final linguistic terms. For example, Table 5 shows that participant 1 and participant 10 had the same total marks of 59 using the non-fuzzy method. Despite having the same normalized value for the first criterion, the other three criteria had different normalized values in Table 1. In the second and final criteria, participant 10 had a higher normalized value than participant 1. Thus, both participants differed in the degree of satisfaction for most criteria with the support of the fuzzy grade sheet. Table 4 shows that the final mark for participant 1 was

0.6940 while participant 10 scored 0.6945. Although the difference of 0.0005 is extremely minor, it has a significant impact on the rank position.

CONCLUSION

The analysis of a competitor's performance is important in enhancing the evaluation of a competitor's efficiency. The participants' performances are expressed in the form of scores and linguistic terms, which include aspects of ambiguity. In this study, the performances of competitors in the Qur'an Reciting Competitions held in Klang in 2013 and 2015 were evaluated using the fuzzy evaluation method. The assessment procedure was effectively done with the aid of the membership function graph and the fuzzy grade sheet for any type of criteria (*Tajweed, Tarannum, Fasohah* and Vocal Quality). Furthermore, the use of linguistic terms will encourage the participants to work harder since every point will be counted in order to achieve the highest level of performance. Hence, this technique which is deemed to be more reliable and practical could be used as an alternative method for assessing the competitors. We believe that the fuzzy evaluation method is able to improve the reliability of the assessment of the competition's existing procedures, resulting in a better outcome that can distinguish competitors' abilities based on ranking.

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CONFLICT OF INTEREST DISCLOSURE

All authors declare that they have no conflicts of interest to disclose.

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