Sound matching on the translation of Al-Quran ayat as a learning media for children using mobile-based fast fourier transform and divide conquer algorithm

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Abstract. In this paper, a sound matching application was built on the pronunciation of Ayat Al-Quran as a learning medium for children using the Fast Fourier Transform (FFT) Algorithm and Divide Conquer (DC) that support learning independently. The system built in the final project is to utilize the Google API feature on android as voice matching. Furthermore, the incoming sound will convert into text form using the Google API. The conversion method used is a Fast Fourier Transform (FFT). The valuation method, Divide Conquer is used by calculating the sound proximity value of the Google API conversion results by matching Arabic text in the database. Based on the testing that has been done on the system testing. The results of the test found 61.1% accuracy for the appropriate reading and 38.9% for inappropriate reading.

1. Introduction
Speech recognition is a process of recognizing letters, words or sentences that are spoken. Voice recognition is better known as Automatic Speech Recognition (ASR) [1,2]. Automatic Speech Recognition (ASR) has been widely applied in everyday life, for example, is the operation of a smartphone that is run through automatic commands (voice recognition) [3,4]. Makharijul huruf (Places of Articulation) is the place where the letter is released when the letter is pronounced. The letter of origin is the basis for reading verses from the Quran [5–7]. Errors in Makharijul huruf (Places of Articulation) can cause differences in meaning or meaning errors in the verse being read [8].

Some previous studies regarding the application of the Qur’an [9,10]. Some previous studies regarding the application of the Qur’an, but no one has discussed the Sound Matching on The Translation of Al-Quran Verse. Generally, the method of learning to read the Quran is used accompanied by a companion teacher who is proficient in their field. In this project, a sound matching application was built on the pronunciation of Ayat Al-Quran as a learning medium for children using the Fast Fourier Transform (FFT) Algorithm and Divide Conquer (DC) that support learning independently. The system built in the final project is to utilize the Google API feature on android as voice matching. Furthermore, the incoming sound will convert into text form using the Google API. The conversion method used is the Fast Fourier Transform (FFT).
2. Methodology
Speech recognition is a process of recognizing letters, words or sentences that are spoken [11]. The introduction of sound patterns is recognized in various levels of tasks, the introduction in the level of acoustic signals in the form of test levels in the arrangement of sub-word units in the form of phonemes, words, phrases, and sentences. The recognition of vocal letter sounds is the basis of speech recognition because the arrangement of words is an arrangement of several letters one of which is vowel letters so that if obtained the basic principle of the process of recognition of vowel sounds can be used in further research [12]. Speech Recognition Scheme can be seen in figure 1.

3. Results and discussion
3.1. Menu interface
The following is a menu display that consists of Figure 2 is main menu interface, Figure 3 is read test menu, Figure 4 is dictionary menu and figure 5 is guide menu.
Figure 2. Main menu.

Figure 3. Read test menu.

Figure 4. Dictionary menu.
3.2. Application system testing

Application System Testing is done by a black box method where testing focuses on the process of running the system being developed. Identify the extent to which the system matches the system's functional specifications.

| Code | Scenario                              | Result | Information                              |
|------|---------------------------------------|--------|------------------------------------------|
| Req1 | Click Recitation of the Verse of the Koran | ✔      | Successfully opened the main page        |
| Req2 | Click Test Read                       | ✔      | Successfully opened the Al-Quran verse page |
| Req3 | Click Material                        | ✔      | Successfully opened the makhirj reading law page |
| Req4 | Click About                           | ✔      | Successfully opened a page about         |
Table 2. Process page testing.

| Code  | Scenario                              | Result | Information                                      |
|-------|---------------------------------------|--------|--------------------------------------------------|
| Req 1.1 | Showing verses of the Koran         | ✓      | Successfully opened the Verse Al-Quran Reading page |
| Req 1.2 | Click Read                          | ✓      | Successfully opened google speech and voice input |
| Req 1.3 | Click Continue                      | ✓      | Successfully opened the next page of the Al-Quran verse |

Table 3. Testing of users.

| Code  | Scenario                              | Result | Information                                      |
|-------|---------------------------------------|--------|--------------------------------------------------|
| Req 1.1 | Provide graduation of the Quran reading grade | ✓      | Successfully gives the Al-Quran reading value |
| Req 1.2 | Displays an error value for the wrong pronunciation of makhraj | ✓      | Successfully displayed a makhraj error |

4. Conclusion

Based on the results of application testing it can be concluded that Fast Fourier Transform algorithm has the role of extracting sound into frequency and numbers assisted by Speech Recognition feature to convert to text form and Divide and Conquer the role of matching Arabic text from the conversion of Speech Recognition Google API with Arabic text samples in the database. Based on the testing that has been done on the system testing. The results of the test found 61.1% accuracy for the appropriate reading and 38.9% for inappropriate reading.

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