

LEARNING JAPANESE USING SPEECH RECOGNITION IN EDUCATIONAL GAMES

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ABSTRACT. *The learning objective of this paper is to produce Android-based educational games about basic Japanese language using speech recognition technology. The method in this study was carried out by the method of collecting data from literature review and questionnaires, while the development method was carried out using the GDLC (Game Development Life Cycle) method. From the results obtained from the 2 evaluations conducted, it can be seen that the knowledge of Japanese language increases at the basic level of about 66.5%. It was concluded that the application “NihonGO: Speech” can facilitate learning and interest in learning Japanese with a basic level of difficulty for the people of Indonesia.*

Keywords: Game, Android, Speech recognition, Japanese language

1. Introduction. In this 21st century, many new technologies have been developed. One of them is speech recognition. Speech recognition is a technological capability that can identify words and phrases in spoken sentences and convert them into a format that can be read by the machine or technology [1]. With speech recognition technology, conversations between machines and humans can be carried out.

Speech recognition technology is widely used on devices such as smartphones or PCs (Personal Computers) where there is several software that uses them such as Siri, Cortana and Google Assistant. Speech recognition has also started to enter the entertainment industry and is starting to expand. Some game developers have started using speech recognition as the main feature in the game, for example, *Verbis Virtus* on a PC or *Scream GO* on a smartphone.

Basically, the game was created as a means of entertainment only, it would be better if the game was created as a learning tool, so that players can be more creative in thinking and also produce the involvement of an individual to be happy in learning. This makes an individual more productive and encourages them to learn.

By using speech recognition on smartphones, especially the Android platform as a game media, users can interact with the application or software. In addition, by choosing the Android platform, it is hoped that it can reach the wider community, especially in Indonesian society. Figure 1 shows that Android users remain stable at above 56% and almost touch 70%. It can be concluded that the Indonesian market uses Android a lot.

Feature extraction technology for speech recognition is highly developed. It can be seen that with the masking effect technology, speech recognition which has high noise can also be detected very accurately with an accuracy of up to 97.16% [3]. This can happen

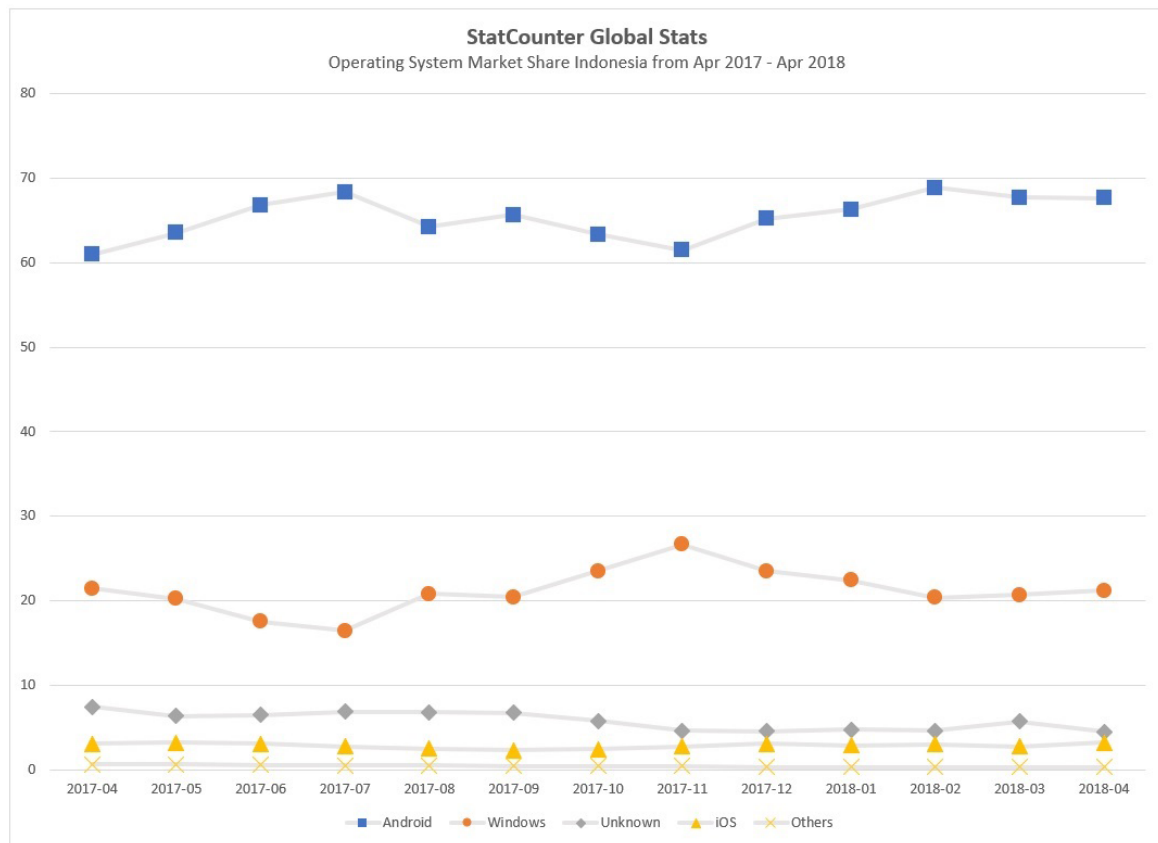


FIGURE 1. Statistics of Android users in Indonesia based on StatCounter [2]

because the complexity of a signal can be reduced using a masking effect during feature extraction which produces small features without reducing the quality of the sound.

Games that have an educational element are still less popular than other games such as Arcade or Adventure which are intended for entertainment or challenges. This can be clearly seen from the survey data from Survey Monkey in an article written by Tech in Asia [4]. Video games are still considered by some as a mere entertainment tool even though some games have actually shown the benefits of learning such as learning to count, the alphabet, animal names, or learning to memorize.

According to data from the “Survey on Japanese-Language Education Abroad” held by the Japan Foundation [5], more than 800,000 Indonesians are currently learning Japanese. Based on the survey results for that year, Indonesia was ranked second out of all countries in the largest number of people learning Japanese in the world after China. The response from the survey was interested in learning Japanese because they wanted to communicate in Japanese, were interested in the language, and wanted to interact with Japanese people through Japanese. This proves that Indonesia has a lot of interest in learning Japanese.

Hiragana and Katakana are the beginnings of Japanese, and usually Hiragana is learned first [6]. This can be seen from the form of letters, grammar, variety of language, and sentence structure used. If only compared to the form of letters, Japanese is very different from Indonesian which uses the alphabet. These things do not rule out that Indonesians find it difficult to adapt to Japanese. Therefore, in learning Japanese, Japanese letter recognition must be taught first. Therefore, learning Japanese characters starts with learning Hiragana and Katakana.

Based on the data and explanation above, a basic level Japanese educational game was created that uses speech recognition technology on the Android platform, with the hope of introducing speech recognition technology in the game and also adding interest and knowledge of Japanese. This application can also be used as a place to learn Japanese

in a basic way and can be used to increase interest in learning Japanese. This research was conducted at the Game Application & Technology Laboratory at Bina Nusantara University. This laboratory focuses on conducting research and making game applications that are useful for the community.

2. Literature Review. Text to Speech (TTS) is a technology that can convert text into voice using the Speech Synthesizer. The computer system used for Text to Speech purposes is called a Speech Synthesizer, and is usually implemented in software or hardware form [7]. The process of changing from text to speech can be seen in Figure 2. It begins by reading input from existing text. After that the text will be normalized to get the root word. After the normalization process is complete, the next process is continued by carrying out linguistic analysis to get how to pronounce each word correctly and after that the sound rendering process is carried out before finally the sound is outputted.

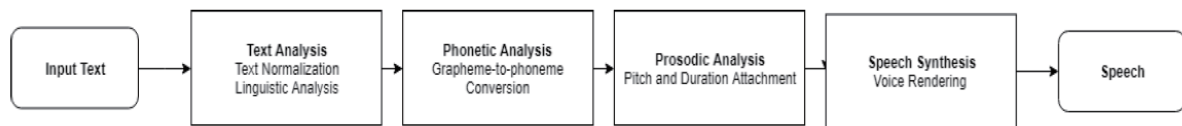


FIGURE 2. Text to Speech

There are 4 types of writing in Japanese [6], namely

1) Hiragana

Hiragana is a cursive writing set consisting of 46 phonetic characters that express all Japanese sounds. Hiragana is used mainly to write the grammatical parts of original Japanese sentences and words that do not have kanji.

2) Katakana

Katakana is a set of stiff/angular writing consisting of 46 phonetic characters, generally used to write foreign words and to indicate emphasis.

3) Kanji

Kanji are characters that come from ancient China that represent ideas and sounds, and they are used for most of the nouns, verbs and other “content” words. There are 2,131 “common usage” kanji for ninth grade schoolchildren to learn.

4) Romaji

Romaji is a Roman (Latin) letter used to write Japanese. Romaji is used in textbooks and dictionaries for foreigners wishing to learn Japanese (and for Japanese wishing to learn western) but its use in colloquial written Japanese is somewhat limited to things like company names and acronyms.

In this study conducted by Amalo et al. [9], they tested English learning with Visual Novel Games using speech recognition and learning using conventional methods or the usual way. The result is that the Visual Novel Game which uses speech recognition produces higher scores, compared to learning with conventional methods.

In a study conducted by Haristiani et al. [10], they found a method to increase the ability to learn Japanese vocabulary. The study was also completed with a pretest, posttest, and also a questionnaire. The results of the pretest and posttest were confirmed that using interactive media had an effective impact, namely increasing the students’ ability to remember Japanese vocabulary. The questionnaire also gave positive responses from students that the media was interesting, easy to use and also useful for learning Japanese vocabulary.

3. Research Method. Game Development Life Cycle (GDLC) is an application design method that is devoted to game development. Initially, this GDLC originated from an application design method called software development life cycle, but this method is not

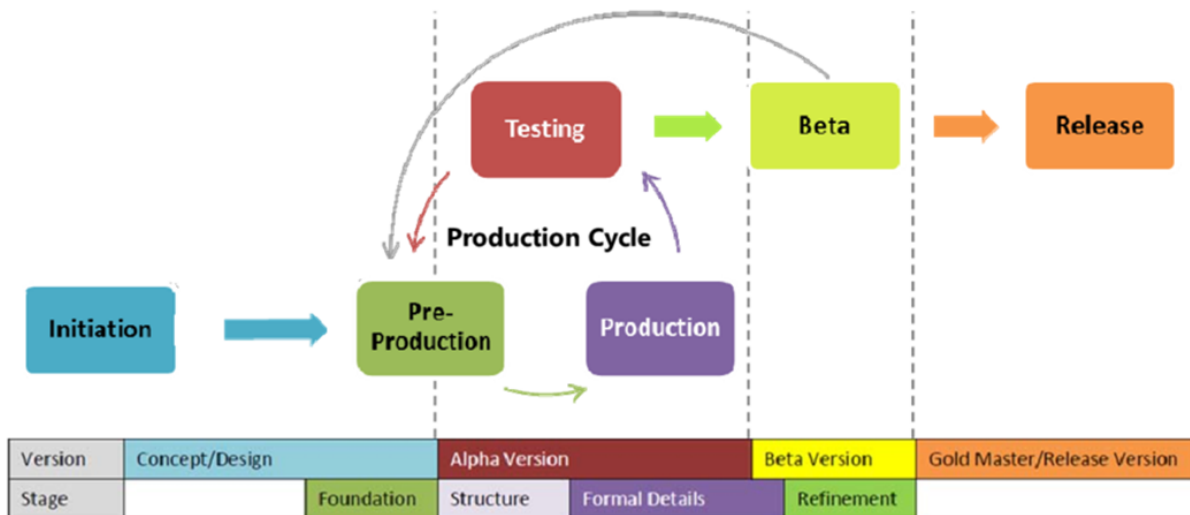


FIGURE 3. Game development life cycle [8]

sufficient for the development of a game [8]. How the GDLC works can be seen in Figure 3.

There are 6 stages in application planning using GDLC.

1) Initiation

Initiation is the first stage in this method. This method aims to make a rough concept of the game you want to make. This method also uses data collection methods that aim to obtain the required data as a reference.

2) Pre-Production

Pre-Production is the first phase in the production stage. In this stage there is game design and game prototype creation. Game design here includes genre, gameplay, mechanics, storyline, characters, challenges, fun factor, technical aspects, and elements. Game design was then entered into the Game Design Document (GDD). The prototype aims to show the main mechanics of the gameplay, and the basic structure aims to fulfill the “fun” aspect of playing. If this stage has been completed and there are no more revisions, it will be added to the GDD.

3) Production

Production is the main stage which includes merging assets and source code. This stage repairs the structure with full mechanics and assets. In addition, game balancing implementation, performance improvements, bug fixes and new feature additions are also carried out at this stage. This stage ends when the game has been fixed and complies with the updated GDD.

4) Testing

Testing is a stage to try out the usability and whether the game can be played. This testing itself can be referred to as alpha. In the alpha stage, games that have passed the production stage will be tried to look for possible problems such as bugs, crashes, and glitches. The result of this stage is getting a bug report, request for change, or a team decision to go to the next stage. The results of this stage cause it to enter the next stage (beta), or to repeat to the production cycle stage.

5) Beta

Beta is the phase where people from third parties are involved in game testing. This stage is not different from the testing stage, it is just that the people involved in game testing are different. The purpose of this stage is the same as the previous stage, which is to find problems in the game, but there is another goal, namely to get feedback in the form of expressions from outside parties. The output received from this Beta is to

get feedback and/or a bug report. The results of this stage can lead to entering the final stage (release) or repeating the production cycle.

6) Release

Release is the last stage in the GDLC where the finished game is released to the public. Releases here involve product launches, project documentation, maintenance planning, and game expansion.

4. Result and Discussion. User evaluation and application evaluation were carried out twice, namely before and after playing the game NihonGO: Speech. This questionnaire was conducted on June 24th 2019 to June 27th 2019. There were 67 respondents who filled in before playing the game NihonGO: Speech and 32 respondents filled in after playing the game NihonGO: Speech. This research only uses data from people who do both questionnaires: the questionnaire before playing the game and the questionnaire after playing the game.

Figure 4 shows that none of the respondents stated that they have an interest in Japanese on a scale of 1 before and after playing the game NihonGO: Speech. 2 respondents stated that they have an interest in Japanese on a scale of 2 before playing the game NihonGO: Speech and 1 respondent has an interest in Japanese on a scale of 2 after playing the game NihonGO: Speech. 8 respondents stated that they have an interest in Japanese on a scale of 3 before playing the game NihonGO: Speech and 5 respondents stated that they have an interest in Japanese on a scale of 3 after playing NihonGO: Speech. There were 11 respondents who stated that they had an interest in Japanese on a scale of 4 before playing the game NihonGO: Speech and 10 respondents who stated that they had an interest in Japanese on a scale of 4 after playing the game NihonGO: Speech. For interest in Japanese on a scale of 5, there were 11 respondents before playing the game NihonGO: Speech and there were 16 respondents after playing the game NihonGO: Speech. Based on the data provided by respondents, it can be concluded that the interest in Japanese has increased after playing NihonGO: Speech.

Figure 5 shows that none of the respondents stated that they were not very interested in learning Japanese before and after playing the game NihonGO: Speech. 2 respondents stated that they were not interested in learning Japanese before playing the game NihonGO: Speech and 1 respondent stated that they were not interested in learning Japanese

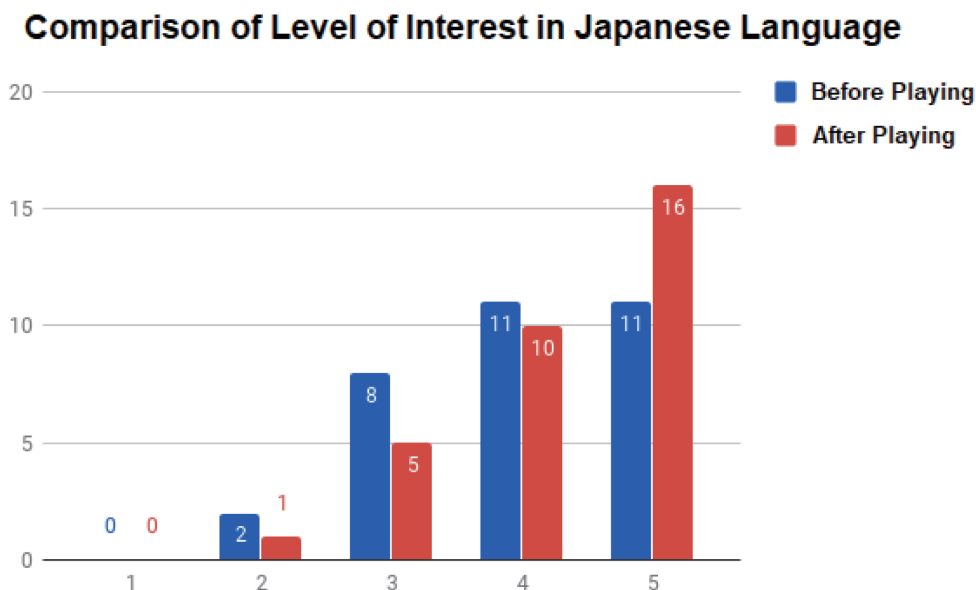


FIGURE 4. Comparison of level of interest in Japanese language

Comparison of Level of Interest in Learning Japanese Language

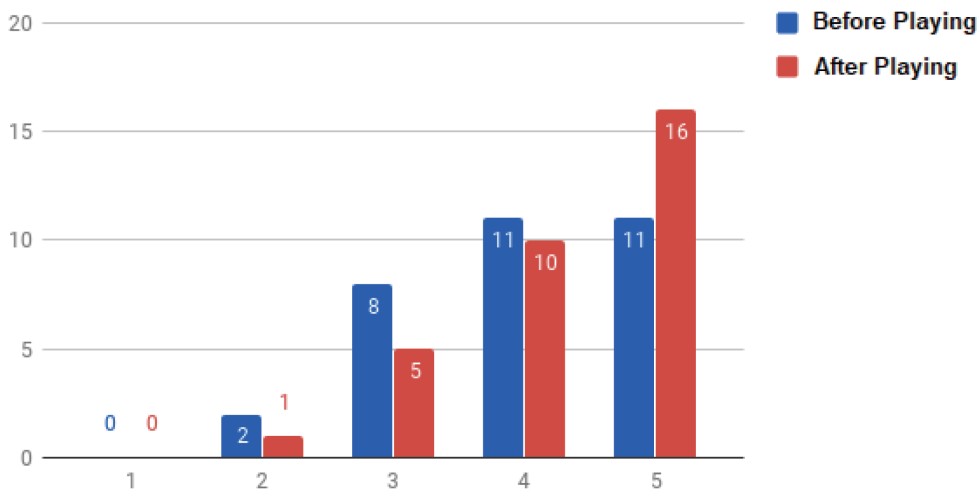


FIGURE 5. Comparison of level of interest in learning Japanese language

Comparison of Level of Knowledge of Japanese in Basic Level

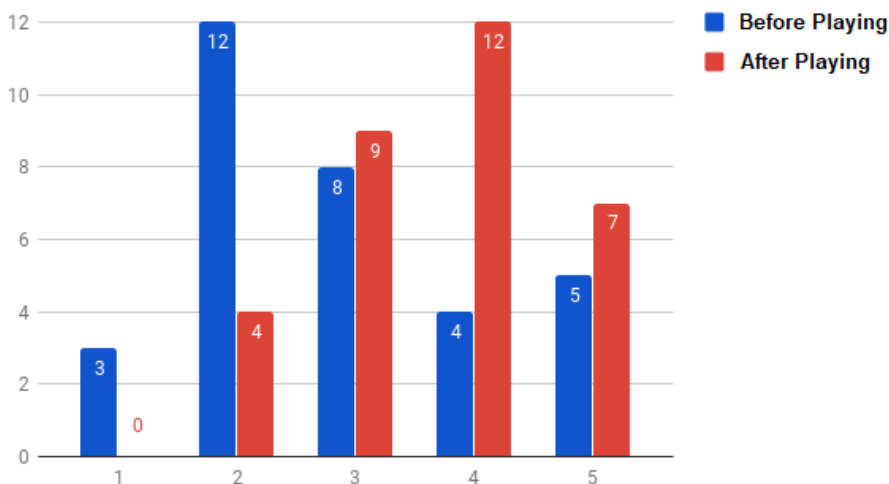


FIGURE 6. Comparison of level of knowledge of Japanese in basic level

after playing the game NihonGO: Speech. 8 respondents stated that they are normal in learning Japanese before playing the game NihonGO: Speech and 5 respondents stated that they are normal in learning Japanese after playing NihonGO: Speech. There were 11 respondents who expressed interest in learning Japanese before playing the game NihonGO: Speech and 10 respondents who expressed interest in learning Japanese after playing the game NihonGO: Speech. Interest in learning Japanese on a scale of 5 is very interested, there were 11 respondents before playing the game NihonGO: Speech and there were 16 respondents after playing the game NihonGO: Speech. Based on the data provided by respondents, it can be concluded that interest in learning Japanese has increased.

Data in Figure 6 shows that there are 3 respondents who do not know Japanese at all at the level before playing the game NihonGO: Speech and there are no respondents who do not know basic Japanese after playing the game NihonGO: Speech. There were 12 respondents who answered that they knew little about basic Japanese knowledge before playing the game NihonGO: Speech and there were 4 respondents who answered that they

knew little knowledge of basic Japanese after the NihonGO: Speech game. 8 respondents stated that respondents knew enough in basic Japanese before playing the game NihonGO: Speech and 9 respondents stated that they knew enough basic Japanese after playing the game NihonGO: Speech. 4 respondents stated that the respondents had good knowledge of basic Japanese language before playing the game NihonGO: Speech and there were 12 respondents who answered both basic level of Japanese knowledge after playing the game NihonGO: Speech. Before playing the NihonGO: Speech game, there were 5 respondents who stated that their basic level of Japanese knowledge was very good and there were 7 respondents who stated that they had very good knowledge of basic Japanese after playing the game NihonGO: Speech.

Based on the data above, it can be concluded that the game NihonGO: Speech can help knowledge of Japanese at the basic level of respondents, because there are changes before and after playing the game NihonGO: Speech, from not knowing Japanese at all basic levels, until the respondent states that the respondents have very good knowledge of basic Japanese language.

5. Conclusion. Based on the results of the analysis and design of the NihonGO: Speech game, it can be concluded that the educational games created can increase one's interest and interest in learning Japanese. In addition, knowledge of Japanese at the basic level has also improved. With the addition of learning materials at a higher level, it can be ascertained that one's knowledge of Japanese will increase by itself. Speech recognition technology really helps a person in learning Japanese because in learning Japanese, one can immediately learn the correct pronunciation. This research can be developed by learning writing letters in Japanese and implementing image recognition to determine the level of accuracy of the writing.

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