

Design of English Conversation Edutainment Game for Japanese University Students

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Abstract

Japan is a country where most of its people cannot communicate in English despite having English education in schools until the university level. This is because Japanese English education mostly focuses on grammar and reading with very little oral practices in class. Moreover, the environment in Japan is not conducive to the improvement of English skills. This situation burdens and bores the students, resulting in students giving up learning English. Thus, in this study, we have developed an English conversation simulation game with an edutainment approach, aimed to help the Japanese improve their English conversational skills. Users can practice speaking in English with Artificial Intelligence (AI) chatbots available in the system. The system implements game elements such as survival and quests to keep the users engaged and entertained while practicing speaking in English at the same time. We have integrated free and open-source libraries to develop the graphics, voice-recognition, AI chatbots, and the text-to-speech system of the game. The English contents of the conversation available are common topics such as hobbies, food, and family. To ensure that the design and contents of the game are suitable for our target group, we did a test-play with Japanese university students as the participants. Then, a questionnaire was distributed. It was found that the sound recognition system needs to be improved. Improvements are made to the game based on the results.

Keywords: edutainment, foreign language learning system, English as a second language

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Introduction

Japan is a country where most of its people cannot communicate in English despite having English education in schools until the university level. According to an international company that specialized in language training, Education First (EF), Japan's English proficiency ranks 53 out of 100 countries and regions (Education First, 2019). Japanese students in Japan struggle to learn English because there is very minimal usage of English in their daily lives. This is because Japanese English education mostly focuses on grammar and reading with very little oral practices in class. This situation burdens and bores the students, resulting in students giving up learning English. The Ministry of Education, Culture, Sports, Science, and Technology Japan (MEXT) realized this and made reformations on English language education (2014a, 2014b) so that more discussions and English oral usage are promoted in the classroom. However, these improvements only focus on elementary students up to upper secondary students. No improvements are targeting the university students even though this group is the one going to face the hardships caused by globalization in the nearest future. This group needs support to improve their English proficiency.

Thus, we have developed a game which aims to provide the Japanese students with an environment that enables the Japanese to practice English conversation and also give support to help the improvement of English conversation skill. We chose to develop a game because digital games can achieve a combination of motivation, engagement, adaptation, and simulation (Mcclarty et al., 2012).

A Game with Edutainment Concept

Edutainment is a term comprising of two words, "education" and "entertainment". According to the *Longman Advanced American dictionary*, the word edutainment means "movies, television programs, or computer software that educate and entertain at the same time" (2000). Edutainment content aims to improve the learning process by making it entertaining and motivates the learner. A previous study done by Fallata (2012) showed that students who used edutainment software to learn English improved better than those who took conservative classes. Thus, in this study, we developed a game with an edutainment concept to provide students with interesting educational content in hopes to improve their English proficiency.

English Conversation Simulation Game

Figure 1 shows an overview of the game. To provide the Japanese students an environment that enables them to practice English conversation, the game developed in this study simulates real English conversation. A player can talk into the microphone and his voice will be dictated by the voice recognition system. The dictated sentence will then be passed as an input to the system. Artificial Intelligence (AI) in the form of chatbots will then respond accordingly to the player's sentence.

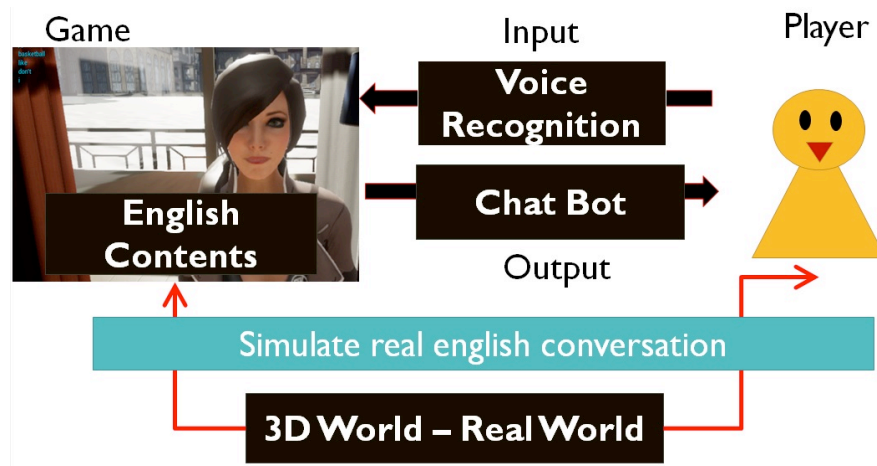


Figure 1: Game Overview

Development Tools

Free tools and open-source libraries were used to develop the graphics, chatbots, voice recognition and text-to-speech functions of the game. Table 1 shows the tools and open-sources that were used to develop the game.

Graphics	Chat Bot (AI)	Voice Recognition	Text-to-Speech	Plugins	Coding
Unreal Engine Game Engine Tool	Bruce Wilcox's ChatScript	Carnegie Mellon University's Open Source PocketSphinx	Carnegie Mellon University's Open Source Flite	Shane Colby - Speech Recognition Plugin	Visual Studio C++
				Skeskinen – Unreal Mimic Text-to-Speech Plugin	

Table 1: Free tools and open-source libraries used for development

Acoustic Models

The game provides two Pocket Sphinx acoustic models for the recognition process. The first one is the original American English model and the second one is an adapted acoustic model. This adapted model was created in hopes to cater to the low recognition rate of the original American model when dictating English spoken by Japanese speakers. The Japanese have a unique accent when speaking in English where they pronounce “L” as “R”. This hinders the recognition of the system and lowers the success rate of dictation. Thus, in effort to increase the success of recognition of the system, we have made an adaptation of the original American acoustic model using the data from Speech Resources Consortium database of Japanese speaking in English consisting of English sentences (806 different sentences) read by 10 Japanese University students (5 men and 5 women). The player can change the acoustic model during run-time according to their needs.

Player Support Elements

There is an assistant bot named Yuu in the game that functions to give support to the player. Yuu can define a word from the dictionary. It also can give information from Wikipedia on a subject requested by the player.

Educational Elements

The educational elements available in the game are Conversation, Shopping, and Sentence List.

Conversation

The player can talk to the characters available in the game about daily life topics such as family, food, and hobbies. There are a total of 7 characters in the game each with unique topics for the player to engage in a conversation with. Figure 2 shows the player in a conversation with a character, Alicia.

Shopping

The player can buy things from the characters in the game. The player should say sentences containing either the word “buy” or “shop” to start shopping mode. For example, a player can say “I’ve come to shop” or “I’ve come to buy something” to open up the shopping window as shown in Figure 3. The player can then ask the character for certain items by saying sentences such as “Please give me a sandwich.” Items available on sale include coffee, sandwich cakes, and cookies.



Figure 2: Conversation with a bot

Sentence List

At the end of a day inside the game, before the player goes to sleep, a list of sentences said by the player on that day will be shown (Figure 4). This allows the player to look back at their sentences and see where their weaknesses are and what they should improve.

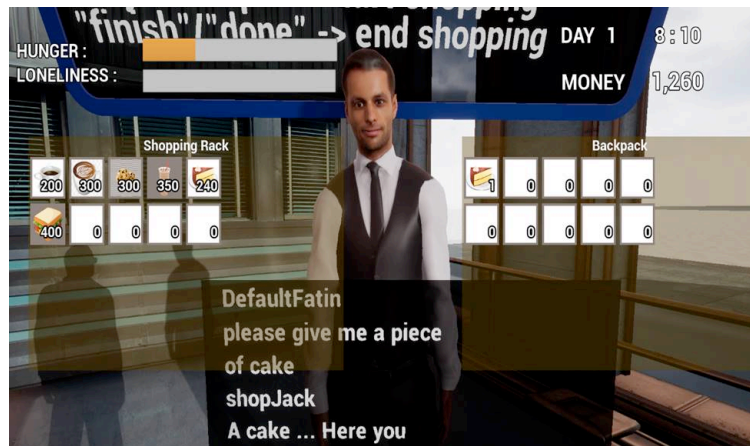


Figure 3: Shopping window

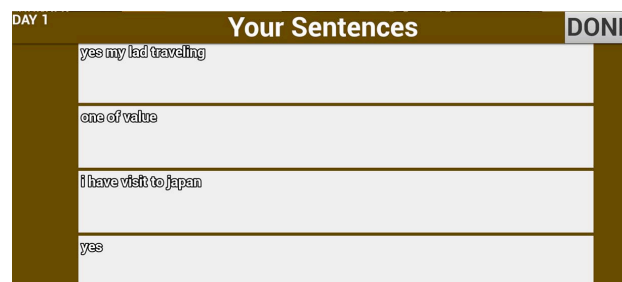


Figure 4: List of the player's sentences

Entertainment Elements

The entertainment elements of the game are survival, quiz, and quests.

Survival

In the game, the player has two status bars. The hunger bar will slowly fill up as time passes. The player has to survive in the game by making sure that their hunger bar does not fill up to its max (Figure 5). This can be done by eating food that can be bought from the characters in the game. The loneliness bar fills up when the player does not interact with other characters. Once the loneliness gauge fills up, the hunger gauge will fill up 3 times faster. This feature was added to make sure that the player has to engage in conversation with the characters in the game in order to survive.

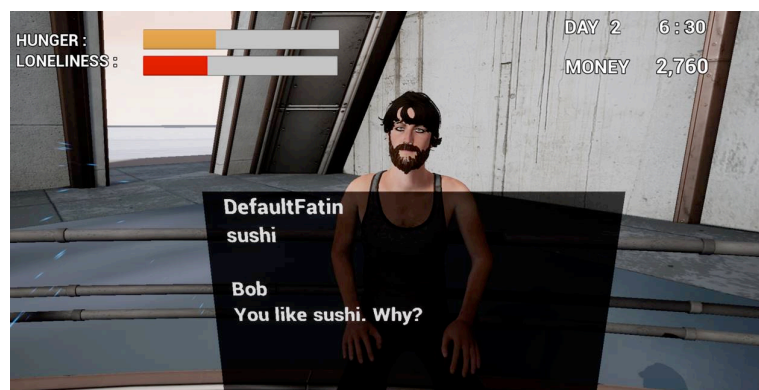


Figure 5: Hunger and loneliness bars

Quiz

The player can play a quiz with Yuu, the assistant robot. Yuu will ask the player the present, or the past tense of a verb. If the player answers correctly, his score will increase (Figure 6).

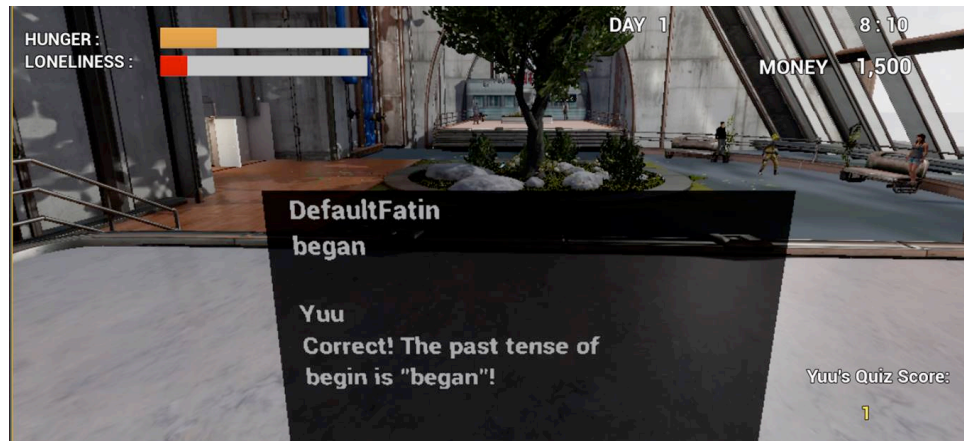


Figure 6: Quiz with Yuu

Quests

There are several quests available for the player to complete (Figure 7). There are relationship type quests, shopping type quests, and conversation topic type quests.

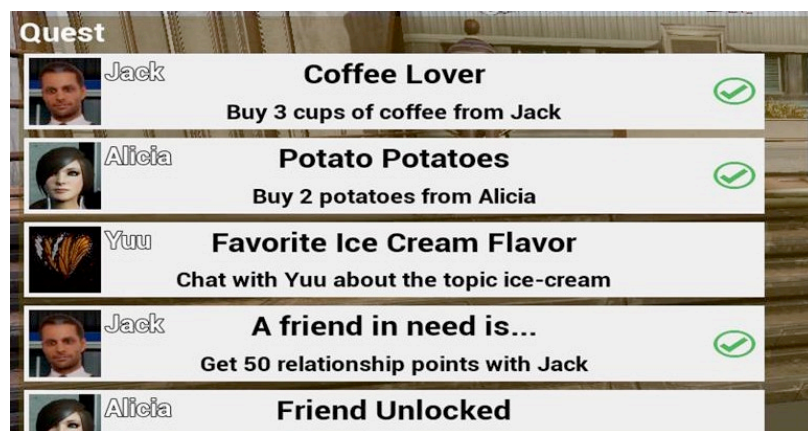


Figure 7: A part of the quests available

Experiments

To assess the word accuracy of the adapted acoustic model for the Japanese English speaker and to test the suitability of the game developed, two different experiments were conducted.

Experiment 1: Word Accuracy

This experiment was carried out to test the word accuracy of the acoustic models; the original American English model and the adapted model for the Japanese.

Participants

The subjects that participated in this experiment were 19 Japanese students of the University of Toyama from different courses and departments.

Procedure

- (1) Subjects were asked to have a pre-decided conversation with a character in the game using the adapted acoustic model.
- (2) The sentences said by the subjects were dictated by the recognition system
- (3) Subjects' sentences were logged
- (4) Word accuracy is calculated by referring to the log
- (5) Steps (1) to (4) were repeated using the original American English acoustic model.

Results and Discussion

Figure 8 shows the word accuracy (WA) comparison of both acoustic models.

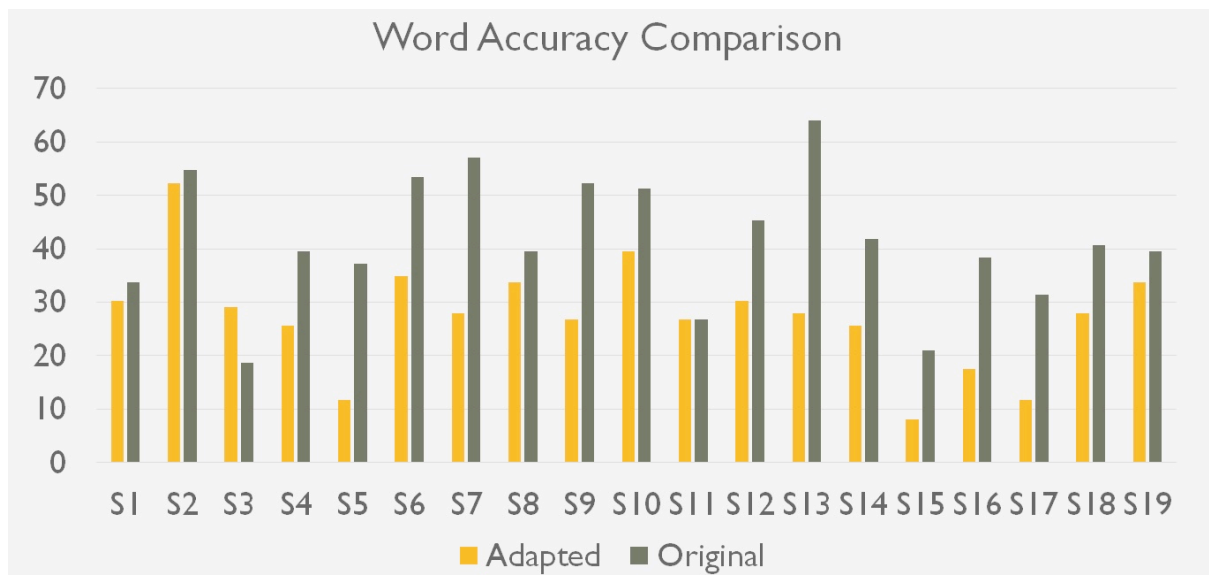


Figure 8: Word Accuracy comparison of the acoustic models

From the result, it is clear that the original American English acoustic model has better WA than the adapted acoustic model. The adapted model failed to improve the recognition rate of English spoken by Japanese speakers. We think that the method of adapting an original acoustic model with data of Japanese speaking in English is not efficient. In our next step, we plan to create a new acoustic model from scratch by gathering the data of 200 Japanese reading English sentences for a minimum of 20 minutes. A major improvement needs to be done to provide a voice recognition system that is able to dictate the sentences spoken by Japanese speakers with a strong accent. Failing to provide such a voice recognition system means that the system will not be able to cater to the needs of the target group.

Experiment 2: Game Suitability

This experiment aims to see whether the game developed in this study is suitable to be played by the target group which is Japanese university students.

Participants

8 Japanese students of the University of Toyama participated as subjects in this experiment.

Procedures

- (1) Subjects were asked to play the game for 30 minutes for 7 times on different days
- (2) A questionnaire was distributed on the last day

Results and Discussion

All 8 participants were asked to choose the statements that best described their feelings. Figure 9 shows the response of the subjects to Q1, “Do you think the game is interesting?” and we can see that more than 50% of the subjects think that the game was interesting. Only 1 subject responded negatively with “boring” to the question. After the questionnaire, we confirmed the answer with the subject and he stated that he felt the game was boring because the system failed to recognize almost everything that he said. This resulted in him could not enjoy the game well. This fact calls for the need to provide a recognition system with a better success rate.

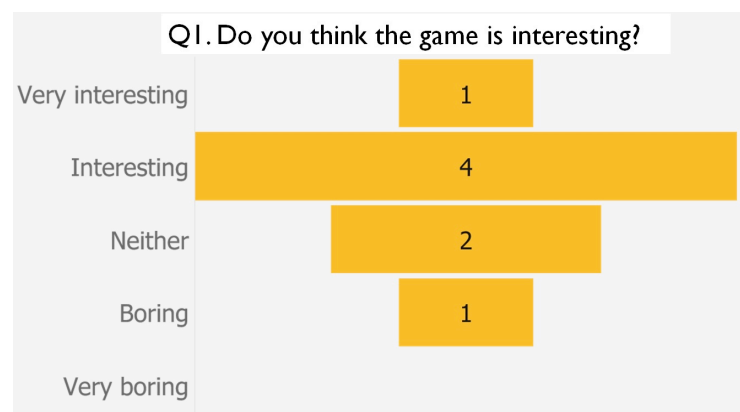


Figure 9: Result for Q1

Q2, shown in Figure 10, questioned the subjects as to whether they felt 30 minutes to play the game as long. From the result, 7 out of 8 (87.5%) of the subjects did not feel that the 30 minutes as long when they played the game. This proves that the game was interesting for most of the subjects so they could enjoy 30 minutes of gameplay without becoming bored. The remaining 1 subject was the person whose pronunciation could not be recognized by the system so he could not play the game well thus the response.

Shown in Figure 11 is the result of Q3, “Do you think the game is difficult?” with all of the participants responded that the game was difficult to play. After the questionnaire, we confirmed with the subjects about this and most of them said that it was hard to trigger the conversation or the shopping mode with the bots. Referring to this feedback, we have made the requirement to start the conversation and shopping mode with the bots easier for the Japanese. For example, we added the word “arrow” as another requirement to start a conversation alongside the only requirement “hello”.

A few of them said that they wanted more support such as hints on what possible sentences they can make or meaning of the bot’s sentences in Japanese. This signals to us that the support functions of the game are not enough to enable the players to enjoy the game to the fullest. More support should be included in the game in future work. One of the subjects gave some ideas to add rewards for quests completed and more mini-games to make the game more interesting. We plan to add these to the future development of the game.

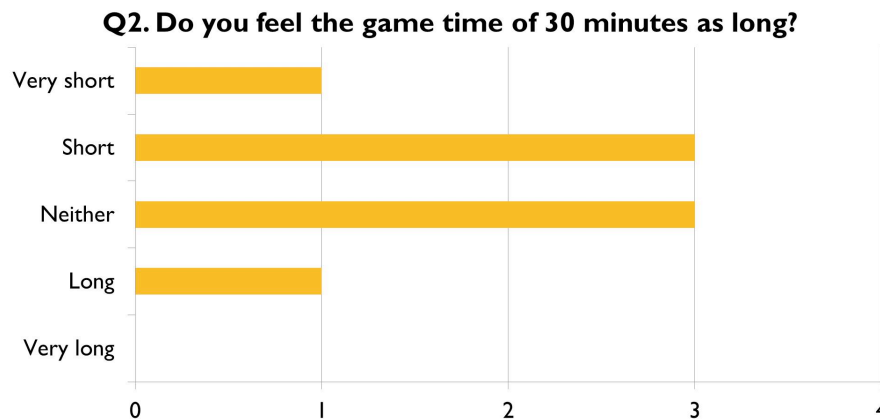


Figure 10: Result for Q2

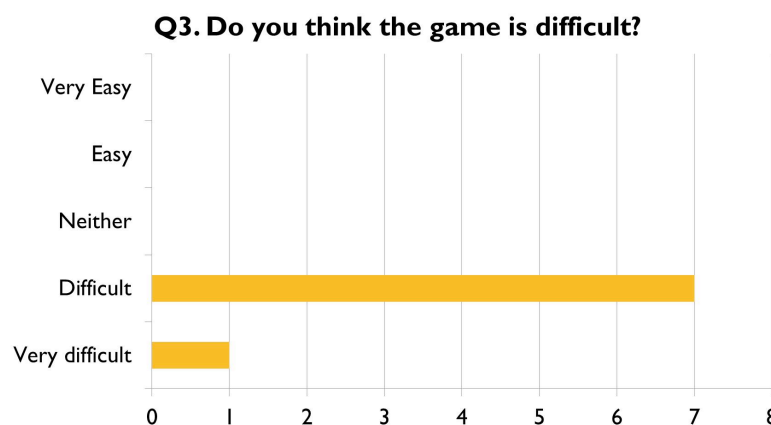


Figure 11: Result for Q3

Conclusion

Japanese university students need support to improve their English proficiency level. In this study, we developed an edutainment game that simulates English conversation by using chatbots. To test the voice recognition system of the game and the suitability of the game for the target group, 2 experiments were conducted. As a result, it was

found that the word voice recognition system of the game needs major improvement to enable Japanese with a strong accent to be able to play the game. It was also found that the game is interesting and playable for Japanese university students but still lacks ample support to help them improve their English skills. Based on the feedback gotten from the questionnaire, improvements were made to the game.

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