Game education for child with disabled handle based on multimedia

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Abstract. Learning media is very influential on the interest of learning in children, especially in students. Many kinds of learning media, one of them using internet technology, computers and even mobile phones or smartphones that have a positive impact and have a negative impact. Learning media is also very influential in early childhood. Education at an early age is very important, especially for handicapped children who need more attention. Improving the effectiveness of learning should be improved to be easy to understand and not boring, then parents should improve in various ways. it includes academic education and creativity. The development of interactive multimedia learning technology allows the introduction of speech recognition technology into the application. Speech recognition is a voice command to operate a computer. Because speech recognition is a process for converting acoustic signals (sound) through a microphone as a computer operation command or writing a word (dictation). So in operation, users no longer need to use the cursor or press the keyboard. Through voice commands, users can operate the learning media..

1. Introduction

Early childhood is an individual who is experiencing a very rapid process of growth and development. It is even said to be a leap in development, because that is an early age said to be the golden age (golden age) which is a very valuable age compared to later ages. Early childhood (aged 0-6 years), it is easy to capture and remember the lessons taught by the teacher. Early childhood does not like the teacher who teaches the lesson with a serious method. Usually early childhood prefer to learn while playing (Wardhanie, 2011) That is very needed by early childhood especially for young children who suffer from hand disabilities. They more need special guidance for learning early childhood lessons.

Improving the effectiveness of learning should be improved so that it is easy to understand and not boring, so parents must improve in various ways. this includes academic education and creativity. The development of interactive learning multimedia technology has made it possible to incorporate speech recognition technology into the application. Speech recognition is a voice command to operate a computer, because speech recognition is a process to convert an acoustic signal (voice) through a microphone as a computer operating command or write words (dictation). So in operation, users no longer need to use the cursor or press the keyboard. Through voice commands, users can operate the learning media (widaryanto, 2015). For example in existing research, namely the use of speech recognition in spaceship counting games (hans alfon ericksoon, 2016).

Based on the problems and previous studies, what will be done is to build word recognition games for early childhood, especially children with hand disabilities using speech recognition technology to

present learning and games using sounds from children. Children can learn the introduction of several words with English material, one of which is the introduction of color words (colors) and fruit (fruit) with sequential learning from letter recognition to several words. Accompanied by an innovative game that also uses sound as input from this game that is by inputting sound, to start learning and playing and also playing games. It aims to increase the effectiveness of learning by visualizing interactive learning so as to increase the enthusiasm of early childhood learning for people with disabilities.

2. Fundamental

There are many fundamental theory that supported this journal research. The theory are :

2.1 Early Childhood

John Locke, a philosopher from England illustrates a small child as a person who is still clean and sensitive to various stimuli. Any stimulation, whether good or bad will be received by early childhood with a little filter, whether it is also received consciously or settles in the subconscious. That is why it is often said that children are accomplished learning. According to the 2003 National Education System Law, children aged 0-6 years are called early children. Age 0-6 years is an age called the golden age or golden age because at this time, children experience a process of rapid growth and rapid and rapid development that will not be replaced in the future. Early childhood is divided into 3 stages, namely:

a) The period of infancy from birth to 12 months (1 year);
b) Childhood or toddler age 1-3 years;
c) School period from 3-6 years old;

2.2 The Child with Special Needed

In the big Indonesian dictionary, abnormal words are interpreted to be incompatible with unusual circumstances, have neglect and are not normal. In the RI law No.2 of 1989 concerning the national education system it is emphasized that children or students who have physical and mental neglect are referred to as extraordinary children. While in RI law No.20 of 2003 concerning the National Education System, children who have physical and mental neglect are referred to as children with special needs.

The development of early childhood there is a normal running both in terms of physical and psychological, there is also an abnormal going on in terms of physical and psychological terms that make them into the category of early childhood with special needs. Sevara is simple, early age children with special needs are children aged 0-6 years who experience developmental disorders that are significantly different from normal children so that in their daily lives and in various activities they require special treatment from others. (Novan Ardy Wiyani, 2014).

2.3 Games

Games are a medium for playing activities. Play activity is an activity that includes solving problems that become challenges of the game, by following certain rules. Games become interesting because the challenges and rules in the game are packaged in a certain scenario. From one side, the activity of playing games is seen as an unproductive activity. However, on the other hand playing games can be seen as a learning activity. This happens because players are required to learn the ways that must be done to conquer the challenges given. Thus, by including learning content in it, the game can be used as an instructional system. (Affan Mahtarami, 2010).

2.3.1 *The Types of Genre Game*

In a journal written by Putra (2016) states that according to Expro (2010) there are types of games as follows: (Vicky, 2012).

a. Action Games

Action game or action game involving human players who shoot a number of opponents or objects.

b. Fighting Games

Fighting games involving characters who fight are usually hand to hand, in one-on-one combat situations. The warriors are usually represented as human or animated characters.

c. First Person Shooter (FPS)

FPS (First Person Shooter) is a type of shooting game with the appearance of the game that is the character that we are playing, usually the perspective only shows the hands and weapons only. This fps game has missions for a specific purpose. The hallmark of this game is the use of long-range weapons.

d. Third Person Shooter

TPS (Third Person Shooter) is a game that has a characteristic similar to FPS that usually has a shooting gameplay except that the point of view used in this game is a third person looks half body.

e. Strategy

Strategy games emphasize the use of strategies that are contrary to fast action or the use of quick reflexes. In this game, players need to solve the problem of resource allocation, and organizing defenses and attacks.

f. Tycon

Tycoon is a game that makes us a businessman who will develop a property to be developed until it sells well.

g. Racing

Racing Game is a game or a type of vehicle racing game that is played by controlling our vehicle to win a race

h. Adventure

Adventure games are different from action games. They put more emphasis on stories, plots and puzzle solving than just capturing, shooting, capturing, or running away. Human players have to solve puzzles while adventuring. These game settings often lead to certain historical periods and places, such as the Middle Ages or Arthurian English, or thematically related to content. types like Science Fiction, Fantasy, or Espionage.

i. Sport

Sports games are adaptations of real world sports or variations of them.

j. Education

Educational games are games that are explicitly designed for educational purposes, or that have educational value. All types of games can be used in an educational environment. Educational games are games that are designed to help users learn about certain subjects, expand concepts, strengthen development, understand historical or cultural events, or assist users in learning skills when users play. Educational game is a game designed to teach humans about certain topics and teach them skills. Educational games are interactive games that teach users goals, rules, adaptations, problem solving, interactions, all represented as a story.

2.4 Speech recognition

Automatic speech recognition (ASR) is a technology applied to software to receive input in the form of spoken words. This technology allows a device to recognize and understand a word spoken by digitizing words and matching the digital signal with a certain pattern stored in a device. The words spoken are converted into a group of numbers which are then adjusted to certain codes to identify those words (hans alfon ericksoon, 2016). Speech recognition used in this word recognition game is a plugin from Unity. In use speech recognition will send the sound received to the server to be processed into text. (hans alfon ericksoon, 2016).

3. Metodology

Materials used by the author to conduct research are several literary readings including, reference books about color recognition, fruit for children, journals and scientific articles relating to early childhood abilities, children with hand disabilities, about educational games and about Automatic Speech technology Recognition (ASR).

3.1. Research Framework

The framework of this study will be presented in the form of a flowchart below:

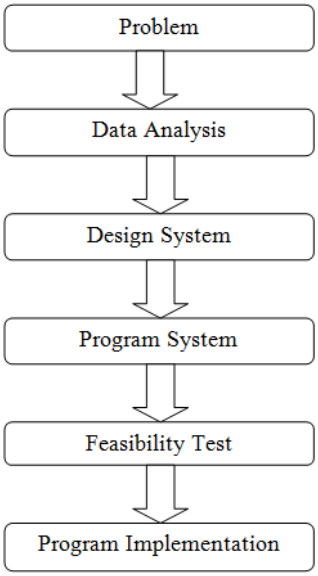

Figure 1. Research Framework

3.2. Design System

There are several design systems in this picture, and the namely are : Flowchart, Use Case, and Finite State Machine (FSM).

3.2.1 Flowchart

Following the General flowchart system design of this research :

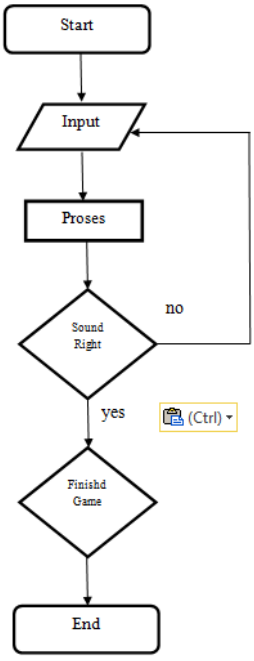

Figure 2. Flowchart Game

Figure 2 shows the game starts by selecting the game according to the material that has been studied first. To starst the game, which is using voice input. Likewise with how to play that is by inputting the sound from the user and the sound will be processed to match whether it is correct. If true, it will go to the next game and vice versa if it is wrong, there will be a reminding sound and the user must input the new sura until completing the game. This General Flowchart have many part, there are :

a. Flowchart Learn and Submenu Learn

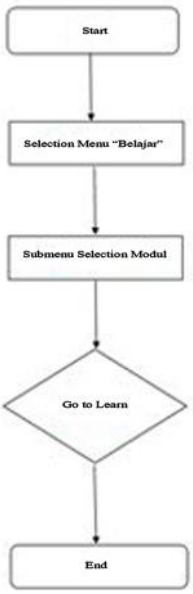

Figure 3. Flowchart Learn

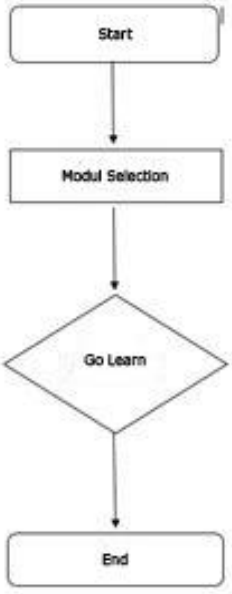

Figure 4. Flowchart Submenu Learn

b. Flowchart Play and Submenu Play

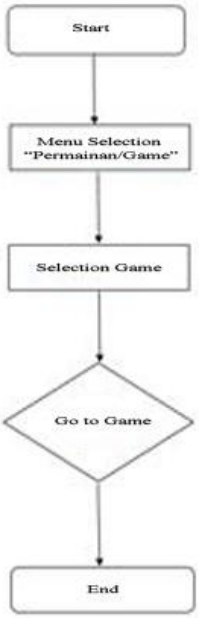

Figure 5. Flowchart Play

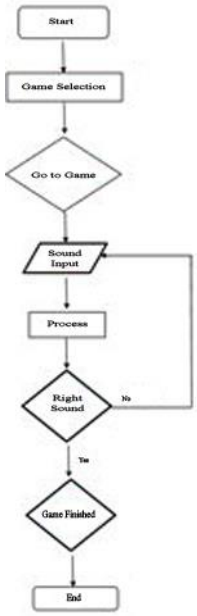

Figure 6. Flowchart Submenu Play

Figure 5 shows the selection of the game menu, namely by selecting a menu and selecting submenu which later contains a game that is available to play according to the learning material. And Figure 6 shows how to play in the game menu, which is by choosing a game that is suitable with the material that has been studied, then the user will play the game using sound

3.3. Use Case

This is use case for this game :

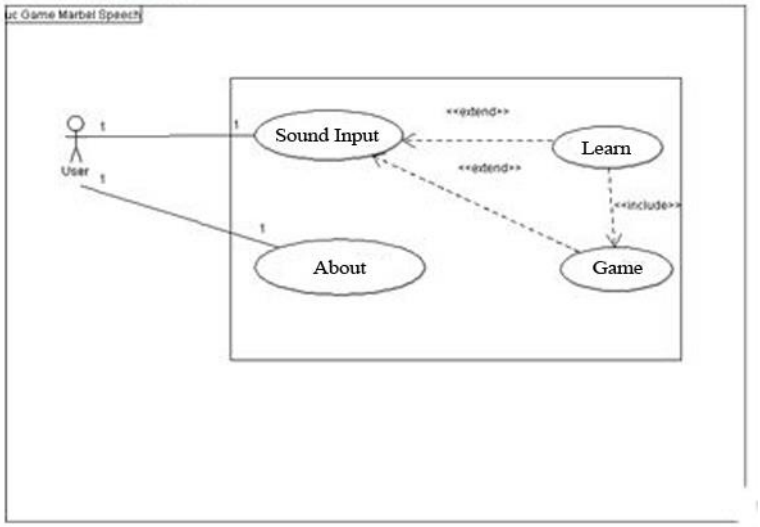

Figure 7. Use Case Game

Figure 7 shows how users input words using sound, then the sound will be processed and recognized, if appropriate, it will bring up the results and move to the next level.

3.4. Finite State Machine (FSM)

1. Scene Learn

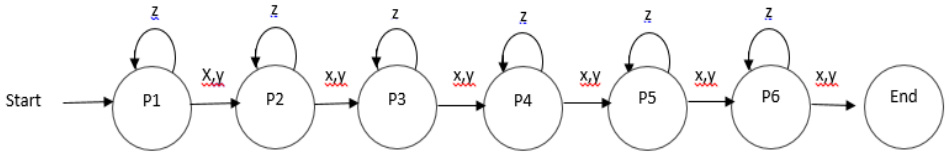

Figure 8. FSM Scene Learn

Q = {P1, P2, P3,P4,P5,P6 End}
Σ = {x, y, z}
S = {P1}
F = {End}
δ = {((P1, x), P2), ((P1, y), P2), ((P1, z), P1), ((P2, x), P3), ((P2, y), P3), ((P2, z), P2), ((P3, x), P4), ((P3, y), P4), ((P3, z), P3), ((P4, x), P5)), ((P4, y), P5)), ((P4, z), P4)), ((P5, x), P6)), ((P5, y), P6)), ((P5, z), P5)), ((P6, x),End), ((P6, y), End)), ((P6, z), P6))}

Figure 8 shows the flow in the learning scene. So the user inputs their sound (x), and gestures / clicks on the button (y) in the learning menu to open or study some material and if it fails (z) recognize the sound entered, it will re-enter the sound. Likewise in learning the second material and so on.

2. *Scene Play*

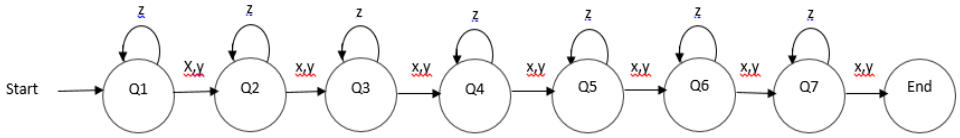

Figure 9. FSM Scene Play

{Q1, Q2, Q3,Q4,Q5,Q6 ,Q7, End}
{x, y, z}
{Q1}
{End}
{((Q1, x), Q2), ((Q1, y), Q2), ((Q1, z), Q1), ((Q2, x), Q3), ((Q2, y), Q3), ((Q2, z), Q2), ((Q3, x), Q4), ((Q3, y), Q4), ((Q3, z), Q3), ((Q4, x), Q5)), ((Q4, y), Q5)), ((Q4, z), Q4)), ((Q5, x), Q6)), ((Q5, y), Q6)), ((Q5, z), Q5)), ((Q6, x),Q7), ((Q6, y), Q7)), ((Q6, z), Q6)), ((Q7,x),End),((Q7,y),End),((Q7,z),Q7)}

Figure 9 shows the plot in the game scene. So the user inputs their sound (x), and moves / clicks on the button (y) in the learning menu to open or play a game or quiz in the game menu and if it fails (z) recognize the sound entered, it will re-enter the sound. Likewise in the second game and so on.

3. *Scene Word Recognition*
There are 2 word recognition in this game, letter and fruit. Figure 9 shows FSM Letter recognition and Figure 10 shows FSM fruit recognition.

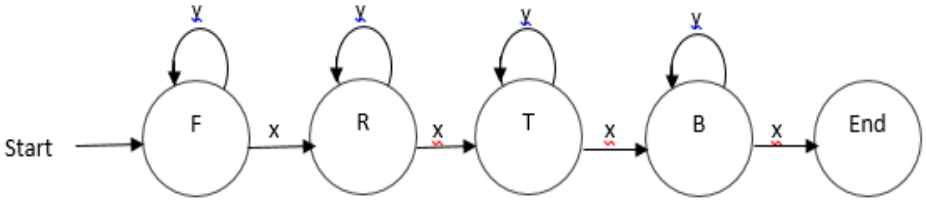

Figure 10. FSM Scene Letter Recognition

Q = {F,R,T,B, End}

Σ = {x, y}

S = {F}

F = {End}

δ = {((F, x), R), ((F, y), F), ((R, x), T), ((R, y), R), ((T, x), B), ((T, y), T), ((B, x), End), ((B, y), B)}

Figure 10 shows the speech recognition flow. So the user inputs his voice (x), without clicking to open guessing the letters that are already on the display and if it fails (y) recognize the sound entered, it will re-enter the sound. Likewise with the second question and so on until the game ends.

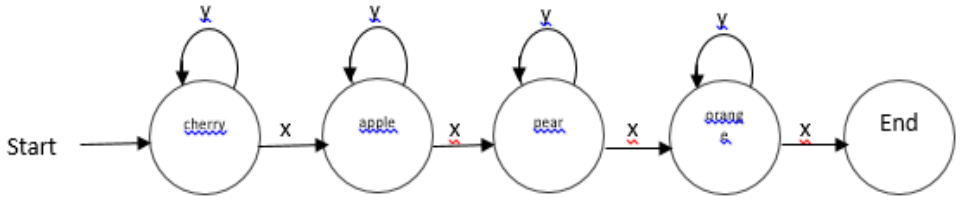

Figure 11. FSM Scene Fruit Recognition

Q = {cherry,apple,pear,orange, End}

Σ = {x, y}

S = {cherry}

F = {End}

Figure 11 shows the speech recognition flow. So the user inputs his voice (x), with no click to open guessing the wxcord on the display and if it fails (y) recognizes the sound entered, it will re-enter the sound. Likewise with the second question and so on until the game ends.

4. Result

This word recognition game in English is a learning application that is suitable for early childhood accompanied by parents to get more insight into learning English that is packaged interactively by displaying learning starting from the basic recognition of letters and how to read it, writing in small letters and there are some games that are suitable for children with special needs, especially children with disabilities.

a. Interface Main Menu

Figure 12. Main Menu

The main display of this application which consists of learning menus, games, about, help and close.

This button is used to enter the learning menu which contains learning animations with interactive sounds from each material.

This button is used to enter the game menu which contains a game that uses Speech Recognition to play it.

This button contains information about the application and the application maker.

This button is used to exit and close the application.

b. Interface Menu Learn

Figure 13. Interface Menu Learn

c. Interface Learn Letter

Figure 14. Interface Learn Letter

Figur 14 displays several examples of consonant letters with writing how to read them and lowercase letters to differentiate the writing of uppercase and lowercase letters alternately accompanied by sound to find out how to read them.

d. Interface Vokal Letter

Figure 15. Interface Vokal Letter

e. Interface Playing Guess the Letter

Figure 16. Interface Guess the Letter

f. Interface Playing Guess the Fruit

Figure 17. Interface Guess the Fruit

g. User Testing

User testing is done by testing the application with the user directly, this is done to find out whether the application is feasible to use. The main purpose of this trial is to find out the problems that exist in the application when used by users. The author will summarize the problem by asking 3 questions with a score of 1-25 with 4 respondents. With the score description as follows:

5 - 10 = Less
11 - 15 = Enough
16-20 = Good
21 - 25 = Very Good

The questions that will be asked are as follows:

- Is this application easy enough to use?
- To what extent does this application help early childhood sufferers with hand disabilities be able to learn to recognize English words?
- Do the results displayed by the application match your needs / desires?

Table 1. Evaluation Result

		Question		
		A	B	C
Respondent	1	20	25	25
	2	25	20	20
	3	24	20	24
	4	25	25	25
Total		94	85	94

Average percentage = (number of grades) / (many scores) x 100%
Average percentage = 273/300 x 100% = **91%**

Based on the table above, it can be concluded that the trial application runs smoothly with a success of 91%, it can be concluded that the Alfa Speech game application has decent quality.

5. Summary

In accordance with the results of the discussion that has been done, it can be concluded that:

1) With the English word recognition application, it can help early childhood learn English and help add vocabulary around them in English.
2) With the input in the form of sound to help early childhood sufferers with hand disabilities in playing games that are in the application.

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