An Interactive Learning Application for Kindergarten Kid Using Leap Motion

Goi Kok Pin[1], Hoshang Kolivand*[2]

[1]*Department of Software Engineering, Faculty of Computing, Universiti Teknologi Malaysia, 81310 Johor Bharu, Johor, Malaysia*
kokpin100@hotmail.com,

[2]*MaGIC-X (Media and Games Innovation Centre of Excellence) Universiti Teknologi Malaysia*
Institute of Human Centred Engineering
81310 Skudai Johor MALAYSIA
kolivand@magicx.my

Abstract

Nowadays, educational interactive application plays an important role in helping children in their learning. It is because children now are addicted to electronic game and cannot focus on their studies. Besides that, most of kindergarten teachers now are still using traditional teaching which is through verbal communication without any interaction activity. Therefore, an interactive learning application for kindergarten kids is developed. In order to develop this interactive application, waterfall model is chosen as the methodology. Preliminary investigation and data collection is conducted. Then, the application flow and user interface are constructed. After that, the development based on application design is carried out. Once the development is done, the testing is carried out and 3 of kindergarten kids are chosen randomly as testers. As a result, there are 3 type of games that had been developed. One of the games is number game which will provide mathematical question that only cover addition and subtraction operation. The another game is colour game which will provide colour word question and the last game is shape game e which will provide 3 basic shapes and user to place it into correct hole in wooden board. By using this interactive application, students or kids are able to learn more effectively because they are participating themselves on the game by moving their hand to control to answer the question prepared in the application
.
Keywords: Unity , Interactive Application, Leap Motion

1.0   Introduction

The process of learning is a complex cognitive task, so they need a lot of motivation to cope with it. Therefore, learning application now has played an important role for student now especially kindergarten student in order to motivate them in their learning. Indeed,

children and adolescents now like computer game or electronic game very much, this can easily be observed in our daily life.

Indeed, they are many educators or teacher that advocate the use of learning application in school or pre-school. In Malaysia, some of school have used some educational software as teaching material but some of educational application seem do not motivate the student in their learning. It is because some of learning application are lack of interesting learning content. The learning application should be implemented interesting interactive activity such as game activity because the student can participate and not only keep seeing on the screen, so that they will not feel boring. With self-participation, the student is able to learn more because they have to figure out what going on when they play the applicationIn order to actualize the aim, the following objectives that need to be fulfil are to investigate game elements as teaching material for kids,to design and develop an interactive learning leap motion application for kids and to implement Leap Motion in the interactive learning application

The main problem that will be focused is the problem of ineffective learning only through verbal communication without interactive activity for kindergarten student Nowadays, most of the children or kids now are addicted to the interesting game in the technology gadgets. The child aged 2–17 years in America plays video games for 7 hours a week as stated by the research by Gentile & Walsh (2002). Lieberman et al. (1998) shown that children who frequently use computers to play games have poorer performance than the children who use computers for schoolwork. Due to addiction technology gadget, most of kids now cannot focus on their study because most of kindergarten teacher teach using approach which is focus more on use of speed instead of interactive activity.

According to McNeill in 1992, gesture and speech should bring out meaning that is not fully captured in one modality. He had given an example which is teaching children to tie their own shoes. It is hard to understand if the children are only being told the way or explanation of the action. For example, when a parent tries to demonstrate the action of tying shoes and give explanation at the same time. It is easier to be understand because with the demonstration, children are able to imagine the step of tying shoes instead of only listening explanation With demonstration, kid is able to imagine the way of tying of a shoes. It is because most of kid should be learning through imagitive play. They are able to learn fast where there is instruction with demonstration. Therefore, in order to achieve an effective teaching, teacher and parent need conduct some interactive educational game for kids in order to improve the learning of their kid

2.0   Methodology

In this project, waterfall model had been chosen as methodology to develop this application.There are 4 phases for system framework as shown in **Figure 1**. These 4 phases are:
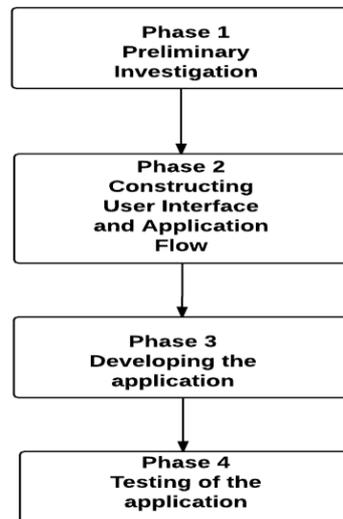
Figure 1 System Framework

3.0 Result

a) User Interface

User interface in game scene will be main screen which is the first screen when user start the game as shown in Figure 2, option screen as shown in Figure 3 which user can edit volume of sound, game select scene as shown in Figure 4 which user can choose game to enter game , achievement scene as shown in Figure 6 which user can view their achievement after finish game, game pause and timer user interface as shown in Figure 5 which user can pause the game and view the time.
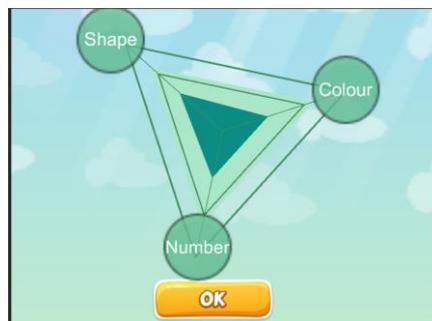

Figure 2 Main Menu Scene   **Figure 3** Option Scene

Figure 4 Game Select Scene

Figure 5 Game End Panel

Figure 6 View Achievement Scene

b)**Number Game**

The number game scene will consist of three 3D button and mathematical question will be shown in the screen. User are required to answer the question that are prepared on the board by touching the button as shown in Figure 7

Figure 7 Number Game Scene

c) Shape Game

In shape game scene, there will be different type of shape placed at the specific position. User is required to pick up the shape and put it in the correct hole in wooden board as shown in Figure 8.

Figure 8 Shape Game Scene

d) Colour Game

Colour will be randomly generated and displayed on the screen. Three answers which are display in text will be on the screen. User is required to select the correct answer among the three choices as shown in Figure 9

Figure 9 Colour Game Scene

4.0   Discussion

Interactive learning Leap Motion application is standalone system made to help kindergarten kids' learning. The application consists of 3 game elements which are colour , number and shape. For colour game, the colour will be randomly picked from 9 colour in Table 1 and it will be shown in the wooden board and user is required to answer with the correct colour word as shown in Figure 10. Ten questions are needed to be answered to end the game. While for number game, the system will generate 10 mathematical questions for user to answer and the questions will only cover addition and subtraction operation as shown in Figure 12. For the shape game, the system will randomly pick 3 shapes from 10 basic shapes as shown in Table 2 and the 3 shapes will be randomly placed at different position. User is required to pick up the shape and match each of them into correct hole in the wooden board as shown in Figure 11. Besides, once the user finish game, user is able to view their achievement. A radar diagram will be shown and the score that obtained in the game will be represented by the radar diagram.

Figure 10 Colour Game Scene
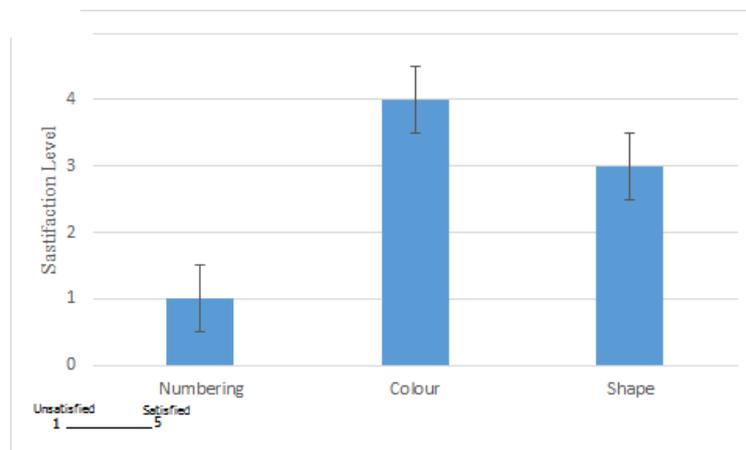

Figure 11 Colour Game Scene

Figure 12 Number Game Scene

Table 1 Shape List

No	Shape
1	Circle
2	Oval
3	Hexagon
4	Octagon
5	Rectangle
6	Rhombus
7	Square
8	Star
9	Trapezium
10	Rectangle

Table 2 Colour List

No	Colour
1	Red
2	Orange
3	Green
4	Yellow
5	Blue
6	Black
7	Purple
8	Grey
9	Brown

Figure 13 Satisfaction level of every obstacle

In Figure 13, it shows the satisfaction level of every obstacle which are obtained from the questionnaire answered by kindergarten kids. Most of them prefer more on colour. It is because the colour is attractive and they are more familiar with colour. The second in satisfaction level is the shape. They like to play this game because they can pick up the shape and move it using the virtual hand. However, the numbering is the lowest satisfaction because they do not like to answer mathematical question. They need to think and calculate in a paper

when they are answering these question. Therefore, they take longer time to answer some of mathematical question. The number obstacle scene is less attractive to attract kids to answer the questions

5.0   Conclusion

Interactive learning Leap Motion application has successfully achieved all of the objectives. Three games which based on the colour, number and shape had been successfully developed. A waterfall model and the graphical user interface for this application had been designed through the implementation of the Software Design Document (SDD).

This system would he bringing advatanges to kids. It is because by using this application, kids not only can play the game, but at the same time they can also learn about number , colour and shapes. With this interactive application, kids will not feel bored about learning.

References

Bodrova, E., & Leong, D. J. (2003). The importance of being playful. *Educational Leadership, 60*(7), 50–53

Gentile, D. A., & Walsh, D. A. (2002*). A normative study of family media habits*. Journal of Applied Developmental, 23, 157–178.

Ginsburg, K. R. (2007). The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics, 119*, 182 191.

Lieberman, D. A., Chaffee, S. H., & Roberts, D. F. (1988*). Computers, mass media, and schooling: Functional equivalence in uses of new media*. Social Science Computer Review, 6, 224–241.

Egenfeldt-Nielsen, S. (2005). *Beyond edutainment: exploring the educational potential of computer games*. University of Copenhagen, Copenhagen.

McNeill, D. (1992). *Hand and mind: what gestures reveal about thought.* University of Chicago Press.