Advance Technology for Kids to Improve Knowledge and Skills using Motion Gesture Recognition – Leap Mania

Conference Paper · December 2014

CITATION
1

READS
663

6 authors, including:

Sanvitha Kasthuriarachchi
Sri Lanka Institute of Information Technology
10 PUBLICATIONS **19** CITATIONS
SEE PROFILE

Dinuka Wijendra
Sri Lanka Institute of Information Technology
13 PUBLICATIONS **7** CITATIONS
SEE PROFILE

Advance Technology for Kids to Improve Knowledge and Skills using Motion Gesture Recognition – Leap Mania

K.G.M.P. Nandasiri[1], N.H.C.E.M. Nawarathna[2], M.M.R. Mohamad[3], H.M.C.K. Herath[4]

K. T. Sanvitha Kasthuriarachchi, Dinuka Wijendra

manoj09876@gmail.com[1], chamikara.nw@gmail.com[2], rifkymohamed1989@gmail.com[3], herath_chandana@yahoo.com[4] sanvitha.k@sliit.lk, dinuka.w@sliit.lk

Department of Computing, Sri Lanka Institute of Information Technology
Sri Lanka.

Leap mania is a gesture controlled e-leaning system which targets the nursery level kids to improve their knowledge and skills in a pleasurable learning environment. Game-based learning is becoming popular in the academic discussion of Learning Technologies. However, even though the educational potential of games has been thoroughly discussed in modern days, teaching to small kids became difficult due to the short attention spans of them. In addition to traditional methods of learning and teaching, such as reading books and newspapers, a huge variety of online educational resources are available to provide an atmosphere of fun and interactive designs to keep children engaged. However, there is no proper e-learning game tools with gesture control mechanism found among the tools and computer based applications for kids. This research focuses on building an enthusiastic and pleasurable learning environment to enhance the knowledge and skills of kids by implementing a game-based learning application using leap motion controller.

Keywords- E-learning, Leap Motion Controller, Gesture recognition

I. INTRODUCTION

Learning experiences of children in ages of 3, 4 and 5 have a prudent effect on both metal and physical development. These early interactions could be achieved from their schools as well as from home. Early learning experiences are crucial to the future well-being of children, and establish the foundation for the acquisition of knowledge and skills that will affect future learning and behavior. Teaching children can be difficult when it comes to traditional methods of teaching because they pay less attention and less attraction [1], [2], [3].

The most important aspect of these activities is to gain the child's interest and attention. Interesting activities are useful in increasing the child's attention span. Susan Pitman, Senior Research officer mentioned that "The learning process of children is accelerated by video games involving information, academic content and problem-solving. It will also be useful for the children who are suffering from learning difficulties" [4] [5] [6].

Currently, e-leaning became popular among the kids as the e-learning materials are frequently available in the internet and the interactive behavior of them. Since the research targets small kids in age level 3, 4 and 5, they would be getting the maximum output of the e-learning tool, if it would provide more convenient and enjoyable. Leap mania is being developed for the kids to achieve this goal.

Leap mania is a gesture controlled e-leaning system which could use to learn basic shapes, colors, English alphabetical letters and number through several game levels. This would be an interactive solution for the kids to develop their language skills, enactive skills and cognitive skills [7].

II. LITERATURE REVIEW

A. *Leap motion controller*

Leap motion controller is a small device for gesture based computer interaction. It consists of two monochromatic IR cameras and three infrared LEDs for the gesture recognition [8].

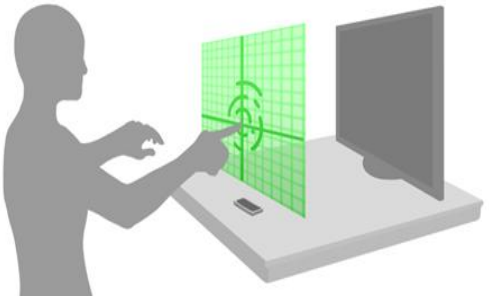

Figure 1: Leap Motion Controller

The LEDs generate a 3D pattern of dots of IR light and the cameras generate almost 300 frames per second of reflected data in the recognition. The leap motion controller creates an interface between the user and the monitor of the computer.

The device observes a roughly hemispherical area, to a distance of about 1 meter (3 feet). The LEDs generate a 3D pattern of dots of IR light and the cameras generate almost 300 frames per second of reflected data, which is then sent through a USB cable to the host computer, where it is analyses by the Leap Motion

controller software using "complex math" in a way that has not been disclosed by the company, in some way synthesizing 3D position data by comparing the 2D frames generated by the two cameras [7].

B. *Hand Gestures*

In passing signals to the system through the leap motion controller, various hand gestures were used [9], [10].

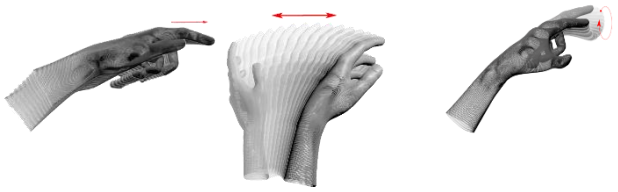

Figure 2: Click, Swipe and Circle Hand gestures

III. METHODOLOGY

The system has been developed according to the iterative waterfall pattern. After performing the feasibility study the system analysis step was carried out.

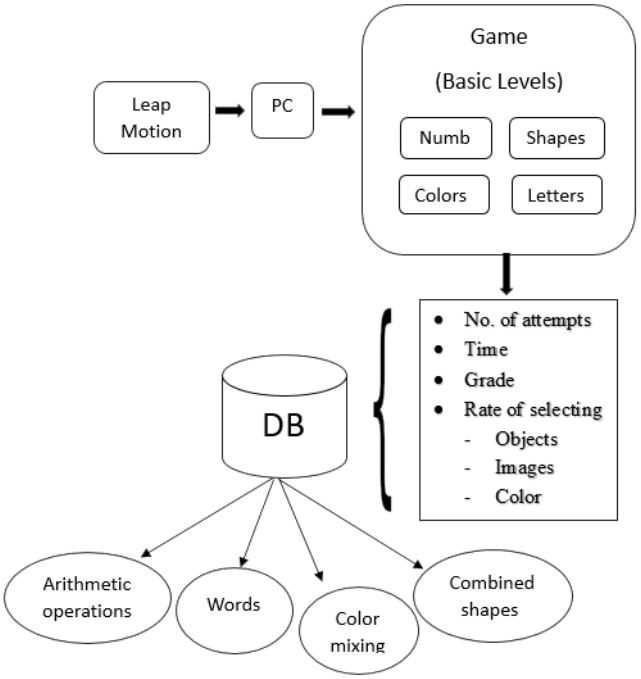

Figure 3: The System Architecture

A. *Design*

The initial task of the development of the software was selecting the most suitable methodology or the development model to the software. There were some specific tasks to perform, since the success of the entire project depends on this development methodology. All the graphical interfaces including pictures and animations have been developed using Unity game engine and the system is connected with the leap motion controller through C# programs.

As shown in figure3, the system was modeled and the game environment was designed with multiple gaming levels.

B. *Implementation*

The basic or initial levels were categorized to learn different colors, different shapes, English alphabetical letters and numbers from 1 to 10. Once the user finishes a basic level of a category, he/ she would be able to navigate to an advanced level of the same category. In order to perform it, system stores the behavior of the user in basic levels in the database. After a user completes an activity they will receive points based on their performance. That will be a motivated factor to continue towards the next level of the game.

All user interfaces have been developed using attractive pictures, animations and with background music to get the full attention of the kid to the system.

C. *Testing*

Testing phase has been happening throughout the application development process from the starting point and the requirements gathering and analysis phases by themselves. The key to successful testing, according to the development methodology that's being used is to complete all testing concept conceiving and test framework design before the implementation phase is over. Testing has conducted as mentioned in the implementation phase to ensure that the implementation is always in line with the requirement specifications. Unit testing, Module testing, Integration testing, and System testing has been done by the members of the research group. The User Acceptance testing has been done by using a target group.

IV. RESULTS AND DISCUSSION

Leap Mania is a kids' pre education game based e-learning system which generated an interesting learning environment for them to learn different colors, different shapes, English alphabetical letters and numbers.

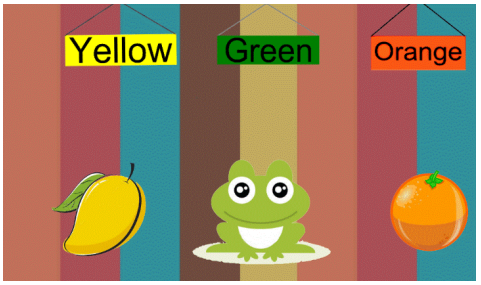

Figure 4: Leaning Colors

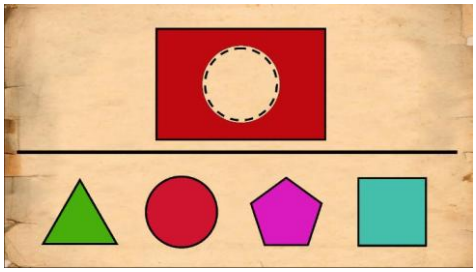

Figure 5: Leaning Shapes

Figure 6: Leaning Numbers

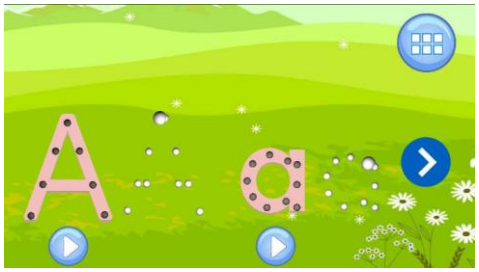

Figure 7: Leaning Letters

IV. CONCLUSION AND FUTURE WORK

Child education is different from adults and should be perfectly planned and done because, the mind of a child is very sensitive and it will be developed through the experience they grab from their early learning stages. They do not get things in a serious mind set. Therefore, child education is one of the important parts of a child and it has to be done in a very careful manner.

With the rapid growth of technology, nowadays children are challenged to catch up the tools in latest technology. They need learning aids that enable them to stay with the world trends. It's a common social problem that parents do not have time to dedicate for their kids' learning but also are not updated and competent enough with the technology to support the learning needs of their pre-school child. Tablets and associated technologies are progressively admired across the world due to various reasons.

The development of software that operates on tablets is becoming a growing area of research. This research focused on investigating how to support self-learning of modern-day pre-school kids and the development of a desktop gaming application incorporating the identified features.

V. ACKNOWLEDGEMENT

We, as the IT-14-099 Project group wish to convey our special gratitude to Mr. Jayantha Amararachchi, Lecturer-in- Charge of the module Comprehensive Design and Analysis of Projects (CDAP), for furnishing us with necessitated guidance and proper coordination in order to make our project a success. Very special thanks to our supervisor of this project, Ms. K. T. Sanvitha Kasthuriarachchi who guide us and advice to achieve our objectives. She motivated us always work in this project. Her kind corporation of these projects milestones is encouraging us to work hard in this project. We also would like to thank her for everything from the start of our project to the end. And then, we would like to thank to our co - supervisor of this project, Ms. Dinuka Wijendra for cooperate with us to complete this project and she help us to understand the unclear theories which needed to complete the project. And also she encourage us from start to end to go towards the success of our project. Also, we would like to take this moment to thank to our examiner of this project Mr. Nuwan Kodagoda for guiding us for further references and methodologies. Finally, we must mention our families and colleagues for their cooperation and supports to completing this project. We may unable to success without their kind guidance on this project.

REFERENCES

[1] Jackie Paxton, Teresa Shoemake, "Fun Ways to Increase Children's Attention Span", Presentation to the (ACEI) Annual International Conference and Exhibition (2007).

[2] "Home Health & Education Publications", Attention Deficit Hyperactivity Disorder (ADHD) [Online], Available:http://www.nimh.nih.gov/health/publicatio ns/attention-deficit-hyperactivity-disorder/complete- index.shtmlMobi. [Accessed: February 06, 2014]

[3] Jackie Paxton, Teresa Shoemake, "Fun Ways to Increase Children's Attention Span", Presentation to the (ACEI) Annual International Conference and Exhibition (2007)

[4] "Early Education Technology",[Online] ,Available, http://www.newamerica.net/ blog/early-ed-watch/2008/making-most-early-education technology-1597 [Accessed: February 10, 2014].

[5] Susan Pitman, "The impact of media technologies on child development and wellbeing", Oz Child (August, 2008).

[6] Gee, J. P. (2003). What video games have to teach us about learning and literacy (1st Ed.), New York: Palgrave Macmillan.

[7] Bruder G., Steinicke F., Stuerzlinger W. Effects of Visual Conflicts on 3D Selection Task Performance in Stereoscopic Display Environments. Proceedings of IEEE Symposium on 3D User Interfaces (3DUI); Orlando, FL, USA. 16–17 March 2013; pp. 1–4.

[8] "Leap Motion controller", [Online], Availablehttps://www.leapmotion.com. [Accessed: February 2, 2014].

[9] C. Chua, H. Guan, and Y. Ho. Model-based 3d hand posture estimation from a single 2d image. Image and Vision Computing, 20:191 – 202, 2002.

[10] N. Shimada, Y. Shirai, Y. Kuno, and J. Miura. Hand gesture estimation and model refinement using monocular camera-ambiguity limitation by inequality constraints. In Proc. of Third IEEE International Conf. on Face and Gesture Recognition, 1998.