VISUAL PERCEPTION DIAGNOSTIC TOOLS FOR AUTISM CHILDREN: VI-PER GAMES

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Abstract: *Early identification and diagnosis are the solutions to get students on the right road in dealing with the problems related to autism and overcoming them. The objective of this paper is to share the development of autism diagnostic tool using games method as a tool for special education teachers to diagnose visual perception problems among autistic students. The diagnostic tools known as Vi-Per Games was developed based on the ADDIE model. These diagnostic tools show that it can assist and help teachers to diagnose their autistics students without the needs for teachers to have some experience and knowledge of diagnosing visual perception. This prototype will be a high-tech solution to diagnose visual perception problems designed for autistic children.*

Keywords: Autism, Serious Games, Special Education, Visual Perception Problem

INTRODUCTION

According to Howlin P., Goode S., Hutton J., and Rutter M. (2004), the number of diagnosed autistic children is increasing. Autism is undetected from birth (Wan and Hisham, 2013) and only when the child is around 18 months of age a brain disorder could be detected (Kanner, 1967). Autism means a condition that causes children to concentrate in their own world. Autism interferes with mental development of children incorporating speech, communication, social interaction, thinking, behavior and emotions. Autism Spectrum Disorder (ASD) is a distributive developmental disorder within individuals in numerous degrees of impairment (Sicile, 2004). For example, although these autistic people look well, their gross motor control is lacking, by and large, they loves to interact with technology and video games and become attached to a particular interest like dinosaurs, trains or outer space. Children with ASD symptoms had more learning problems and other developmental delays. The visual perception problem is very common in autistic children and they often have difficulty in recognizing, remembering, organizing and interpreting visual images. As a result, they are easily confused in situations that involve using written or pictorial symbols for learning (Kurtz, 2006).

This paper aims to review current serious games for autism proposing a new development framework and to describe the development of prototype Vi-Per Games. This paper has been divided into four parts. The first section deals with introduction, Section II describes the related works of serious games for autism and Section III presents the proposed development framework model. Finally, Section IV describes the development of prototype and the last section V concludes the paper and suggests future work for research.

Related works

Recently, therapy and education which include learning and training are the two main purposes for autism serious games development. Autism serious games for therapy have been done with the main purpose therapy for communication

skill, visual motor coordination, social skill, sensory integration, concentration and social behaviors. Teaching and learning process by using serious games for education will help educators and students.

Currently, there are not many research on serious game used as a tool to diagnose and assess visual perception problem for autistic children. Visual perception serious games will be a technological solution to diagnose autistic children's problems. The list of serious games for autism was proposed and adapted by Helmi AMN, Faaizah S, and Naim CP (2012a), Helmi AMN, Faaizah S, and Naim CP (2012b), and Helmi AMN, Faaizah S, Naim CP, Nur FY, Mariana Y, Khoo LMS, and Kamaruzaman J. (2013). Table 1 and Table 2 shows list of serious games for therapy and education for autistic children.

Table 1- Serious games for therapy of autistic children

NO.	PURPOSES/ OBJECTIVES	AUTHOR
1	E-learning environment	Artoni S, Buzzi MC, Buzzi M, Ceccarelli F, Fenili C, Rapisarda B, and Tesconi M (2012).
2	Teaching facial expression	Jain S, Tamersoy B, Zhang Y, Aggarwal JK, and Orvalho V (2012).
3	Interaction skills measurement	Bartolome NA, Zorrilla AM, and Zapirain BG (2013)
4	Increasing intelligibility in speech	Sharmin M, Rahman A, Ahmed M, Rahman M, and Ferdou S (2011).
5	Speech delays	Hailpern J, Harris A, and La B (2012)
6	Learning emotional and social skills	Yan (2011)
7	Teaching social conversation skills	Zancanaro M, Giusti L, Bauminger ZN, Eden S, Gal E, and Weiss PL (2014)
8	Exploring motion-based touchless games	Bartoli L, Corradi C, Garzotto F, and Valoriani M (2013)

Table 2- Serious games for education of autistic children

NO.	PURPOSES/ OBJECTIVES	AUTHOR
1	Teaching emotion	Abirached B, Zhang Y, and Park J (2012).
2	Social skills	Hourcade J, Bullock RN, and Hansen T (2012).

3	Teaching vocational and daily living skills	Bereznak S, Ayres K, Mechling L, and Alexander J (2012)
4	Teaching basic skills	Hulusica V and Pistoljevic N (2012).
5	Learning facial expressions	Hansen OB, Abdurihim A, and McCallum S (2013).
6	Learning emotion expression	Piana S, Stagliano A, Camurri A, and Odone F (2013).
7	Natural social engagement	Chukoskie L, Soomro A, Townsend J, and Westerfield M (2013)
8	Developing social skills	Chen (2013)
9	Emotional learning environment	Bertacchini F, Bilotta E, Gabriele L, Vizueta DE, Pantano P, Rosa F, Tavernise A, Vena S, and Valenti A (2013)
10	Facial expression and emotion	Schuller B, Marchi E, Baron-Cohen S, O'Reilly H, Pigat D, Robinson P, Davies I, Golan O, Friedenson S, Tal S, Newman S, Meir N, Shillo R, Camurri A, Piana Stagliano AS, Bolte S, Lundqvist D, Berggren S, Baranger A, and Sullings N (2014)
11	Learning words	Al-Khafaji N, Al-Shaher M, and Al-Khafaji M (2013)
12	Emotion training in the context of financial decision-making	Jercic P, Astor PJ, Adam MT, Hilborn O, Schaaff K, Lindley C, Sennersten C, and Eriksson J (2012).
13	Imaginative play	Bai (2012)
14	Imaginative skills	Porayska PK, Anderson K, Bernardini S, Guldberg K, Smith T, Kossivaki L, Hodgins S and Lowe I (2013)
15	First Aid Learning	De Urturi ZS, Zorrilla AM, and Zapirain BG (2012)

Developmental Framework

The Developmental Framework was developed as depicts in Figure 1. This diagram shows the overall developmental framework model that served as a guideline to engage all the referred diagnosis method. This was adapted to the development of the prototype design and research question solutions based on the Vi-Per Games development phase.

Vi-Per Games is a name for Visual Perception Games. In terms of content, the prototype Vi-Per Games was developed based on the famous and well known multimedia development model namely ADDIE. ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation. It consists of five-phase systematic model used to guide through the process of creating multimedia products for a variety of settings. Each phase of the ADDIE model is an important element of the

design process. In each phase, decisions, iteration and testing are made for ensuring the effectiveness of the game experience.

Prototype Development

a. **Software**

The prototype was implemented on the Multimedia authoring tools which required to design the user interface of visual perception games. In other words, the combination of various tools made the system more powerful. The software involved in this study was (i) Adobe Illustrator CS5 (ii) Adobe Photoshop CS5, and (iii) Adobe Dreamweaver CS5. Adobe

illustrator was needed in order to create and edit the needed image in visual perception games. These elements were then imported to flash. Adobe Dreamweaver CS5 was used in Vi-Per Games to design the web based environment. It delivers powerful new tools that support Hypertext Preprocessor (PHP) based content management system. The PHP is free software released under the PHP License and can be set up on most web servers. It is also a standalone shell on almost every operating system and platform for free. Scripting based on PHP also been uses to serve as games engine and main component in this prototype.
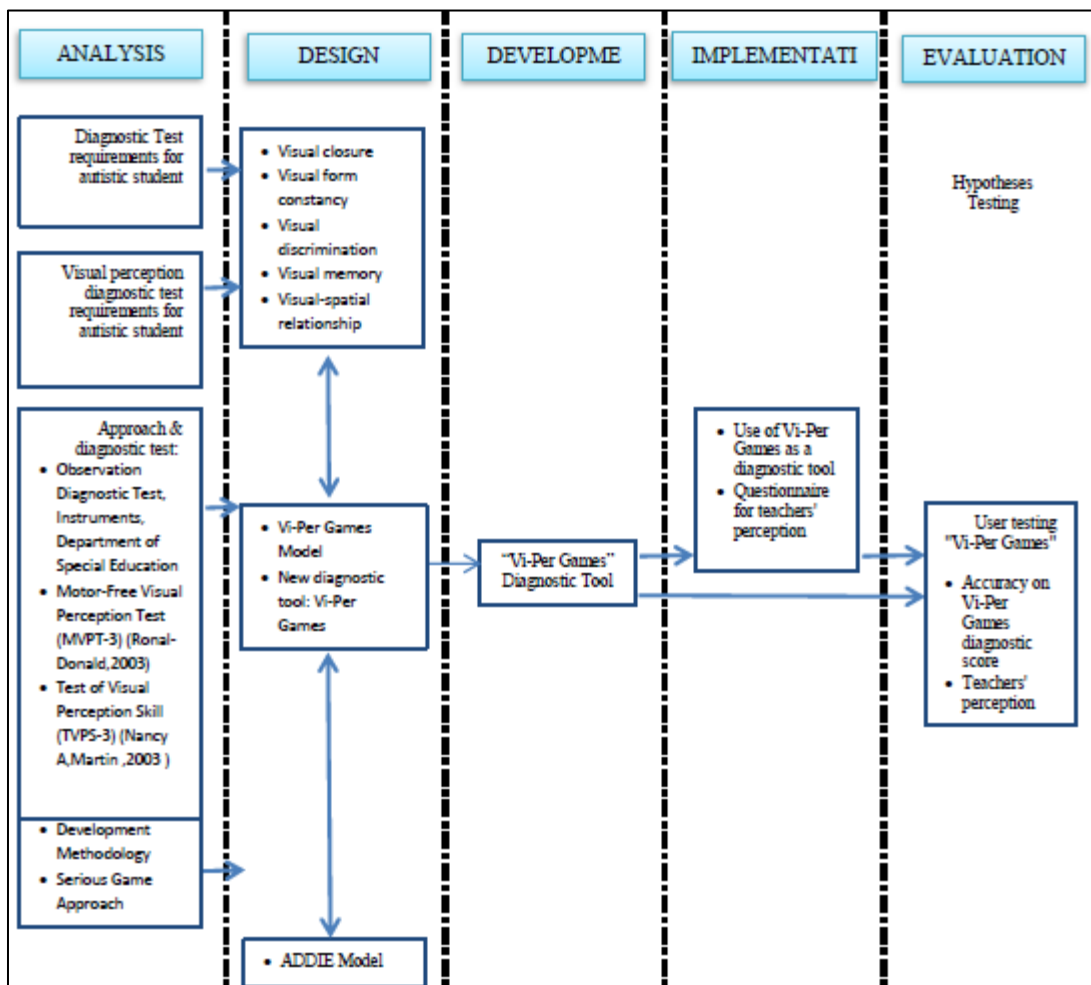

Figure 1- Developmental framework

b. **Game interface**

As the saying goes, a picture is worth a thousand words. Thus, it is essential to incorporate graphics in order to increase users'

understanding. In this project, two types of graphics were incorporated, vector and bitmap. Vector graphics or vector images define the curves and shapes in a picture and they are

stored as algorithms or a set of mathematics equations. Each game will start with

the introduction montage (Figure 2). Autism student can view their diagnostic report after he/she completed their games (Figure 3). There

are five parameters to diagnosing visual perception problems from proposed by Chalfant & Schefflin (1969), namely visual closure, visual discrimination, spatial relationship, visual memory, figure-ground and lastly visual form constancy.
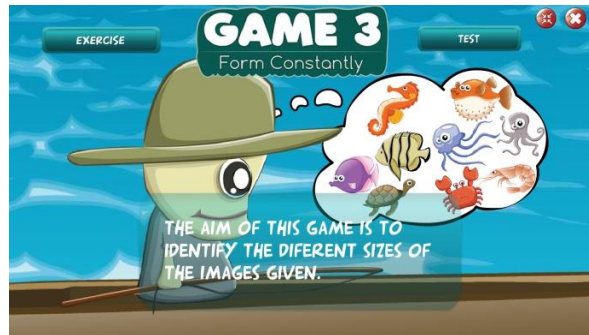

Figure 2- Let's go fishing game 1 exercise interface

Figure 3-Diagnostic Report Interface

CONCLUSION

Serious game is relevant to help several problems such as autism. In this paper, a related work of current serious games for autism; a developmental framework model to diagnose visual perception problem for autism children and the development of prototype were discussed.

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