

## Android Maze Game for Children as an Autism Therapy

Al Hamidy<sup>1</sup>, M. Israr Fathoni<sup>2\*</sup>, Muhammad Pu<sup>2</sup>, Muhammad Ilham<sup>2</sup>

1. Institute of Visual Informatic, National University of Malaysia, Bangi, 43600, Malaysia  
Email: al\_didy@yahoo.com

2. Faculty of Technology and Information Science, National University of Malaysia, Bangi, 43600, Malaysia  
Email: israrfathoni@gmail.com; muhammadpu@yahoo.com; aam10.87@gmail.com

### Abstract

Smartphone technology is increasingly used to help things in everyday life and becoming more sophisticated in mobile application. Nowadays it use to handling children with special needs, particularly children with autism. A game application could provide the therapist with game module and approach that is suitable for them to conduct the therapy. This study identify an alternative option of edutainment design that may be usable for ASD's children. The study in an autism therapy field can be improved in this research by using motion sensors on mobile devices tools to facilitate them. Therefore, we have develop an android application of a maze game that are suitable to use as a medium for play therapy specially for children with autism. The game is simple, easy to use and integrates interactivity and fun activities where user can learn more than just a common game.

Keywords: Motion Sensor, Maze Game, Play Therapy, Autism Therapy, Smart Phone  
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### 1. Introduction

Today, smart phones are used to do many thing that help people through its applications. The application in the smart phone is easy to use and making everyday life becomes easier and manageable. It also could enable the smart phone to be used in helping children with special needs, such as child with autism.

Autism Spectrum Disorders (ASDs) are a group of developmental disabilities characterized by a typical development in socialization, communication, and behavior(10). The children have to undergo some appropriate therapy, such as Applied Behavioral Analysis (ABA)(1), speech therapy(4), occupational therapy(3), social skills therapy (6), physical therapy(12), biomedical therapy(7), play therapy(17), behavior therapy(2), visual-based therapy(14), developmental therapy(13).

In this paper, we will discuss how the play therapy are used to help an autism children. There are several therapy that already used in the medical treatment, such as; using sensory integration, neuro-development treatment (Bobabth Therapy), behavior modification and play therapy (8). In this study, we developed a maze game as a media of occupational therapy that aims to help in developing the motoric aspects of the children by reducing stress, hyper response and hyperactivity, while improving body awareness and helping them to learn about the environment on the child

autism. We choose play therapy because the previous research conclude that the effective result using play therapy is between 74% and 85% in helping ASD by showing a positive change(17).

### 2. Game & Children

The most positive effect of video games are to have children progress on manual skill and they less feels that they are doing therapy. Evolving technology also provides players with better graphics that give a more "realistic" virtual playing experience (9). It means, more therapy will be feels like playing game.

According to (15) Playing video games change the brain's physical structure the same way as do learning to read, playing the piano or navigating using a map. Much like exercise can build muscle, the powerful combination of concentration and rewarding surges of neurotransmitters like dopamine strengthen neural circuits that can build the brain (5).

The aim of this study is to provide an explorative and fun environment for ASDs children in a form of maze game which could effectively help them recognize and express emotions through motoric, speech and emotion expressions . At the same time the game approach could stimulate their competition aspect and enhance their enthusiastic in the

player in a good way, while attempts to beat previous scores. The cooperation and competition game techniques allow the player to become more familiar in the game (18).

This paper is organized as follows. Section II discusses about objective of the study. Section III elaborates on the material and method used in developing our approach, including the software design and software's used. Section IV proposes the design and development of the game. that could be used as a module for the speech development of the autistic children. And section V concludes with ideas for future works and conclusions in .

### 3. Objective.

In this paper we design a maze game for an alternative option of ASDs therapy by using accelerometer sensor that provide by android device and hopefully could be used for children with this syndrome who have limitations in the interacting social, emotional, and focus. Children with ASDs could learn how to express their thoughts and feelings in a constructive way, learn how to accept responsibility, solve problems and develop resilience and self-esteem in the child (11).

By playing this maze game for children with Asperger's and Autistic children hopefully will open up opportunities for them to develop the social aspect, motoric aspects of perception, emotional aspects and intellectual aspects. This has become one of the aspects of interest in our research to help children with autism.

### 4. Material and Method

We started to realize that ASDs perceptive area created an enigma instead of an explicit list that every child diagnosed with autism will have a wide range of disabilities at many different abilities. Thus, it is impossible to clearly list all the disabilities for all children with autism because it different for each cases.

Figure 1 shows the principle of play therapy. The positive approach, empathy and low arousal have been choose implemented in this game.

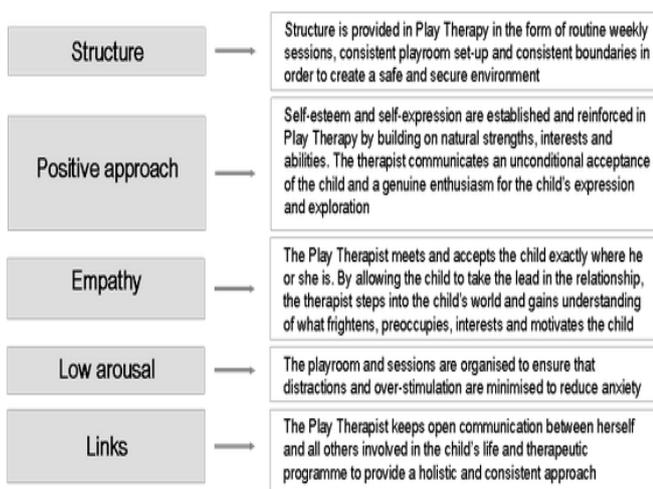


Figure 1. The principle of play therapy, Source : Cgame 2011

This study is using ADDIE (Analysis, Design, Development, Implementation, Evaluation) as it development model. The tools for developing the game/application are described below.

- a) Authoring software : Flash  
Using flash is efficient in terms of performance on Android devices, developing time, support and compatibility. the results are very good, we can build game faster and easier.
- b) Platform : Android  
The only mobile operating systems that have reached significant market share now are Android (Google) and iOS (Apple). We chose Android operative system to develop the Serious Games in this project.
- c) Programming Language : Action Script3.  
Action script programming can all be comingled to a certain extent. Flash animations are typically done in a more graphical environment but we can absolutely create our objects programmatically and make them do the same things through ActionScript.
- d) Interface design : Adobe Illustrator.  
Adobe Illustrator is a popular program for designing that primarily manipulates vector graphic. It is a vector graphics editor that allows to create and edit vector graphics images. And also can create designs with small file sizes which can be printed in high quality.

### 5. Design and Development

#### 5.1. Design Framework

We divide the mobile game development platform into three levels (figure 2). First level is device correlative, including device terminal and Real Time Operating System (RTOS), that provided by mobile phone companies and we did not make change on them. The second level is the game development kit, including general SDK, general engine and specialized game engine. The general game engine, based on the general SDK, as a kit designed for game developers. And the highest level is for the game developers, including the game logic level and the game physical device correlated level. The game logic level, which is important for game developers, has relation with the content of the game.

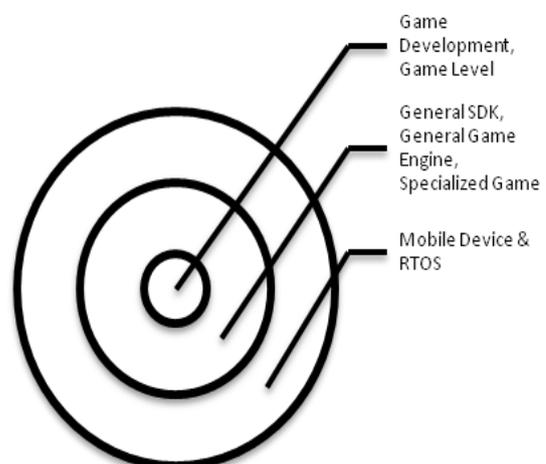


Figure 2. Framework of game design platform

## 5.2. Game Development

The game is designed and developed for regular androids phones users, where there are plenty of other applications has been developed based on various operating systems and platforms. From games, to daily live apps oriented for children with an autism spectrum.

The maze part of the game play (figure 3) has been developed based on a comprehensive instructional design model, an ADDIE Model, which has a systematic flow to completely fulfills the task for which it has been designed. This ID model allows the system to maintain the child or young person concentration and keep him/her motivated. The stimulus leads into better results. The development of the game consist several levels so that the user could upgrade their skill from the easiest level up to harder level based on their capabilities.

There are many techniques used in the android platform games area for the development and performance of games [16]. These types of techniques allow the progress of more attractive and visual systems that goes from active animations to virtual or augmented reality. These techniques are directly related with the operation, idea and functionality of the system.

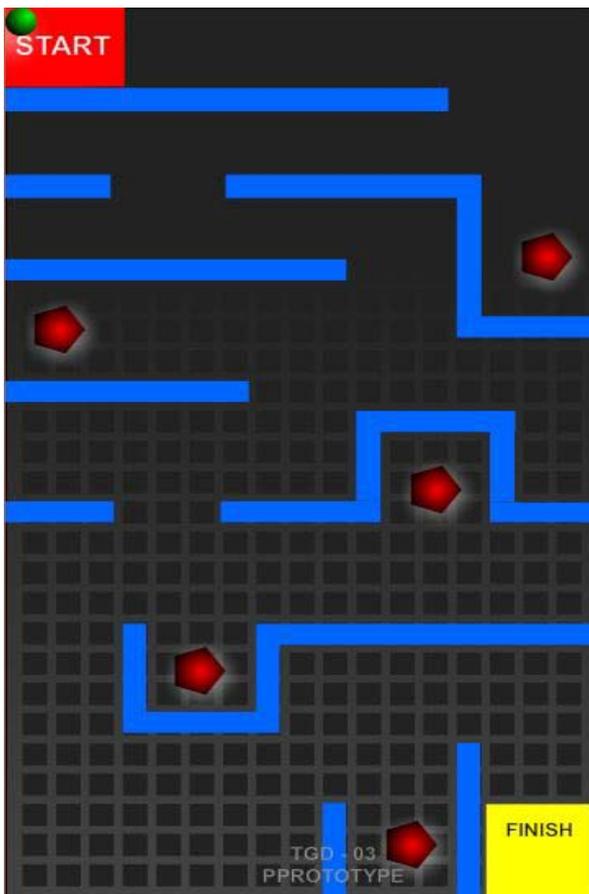


Figure 3. Game Play Interface level 4

In this study, a smart phone device that has been installed with the maze game apps intended to be used by children. By playing the game, a child will use their fingers (motoric aspect) to move the ball from the starting line to the finishing line. If the ball touch the boundary line, then the user have to start again at the beginning in this game along

the path there will be items and the user should try to control the ball so that it will touch theses when they play This item will disappear when the ball pass through it, and it will bring up an image and play the sound to mention the image shown. We expect that the child will pronounce the following the words that come out from this application.

## 6. Conclusion and Future Work

In this paper we describe how maze game could possibly help ASD subjects to learn social aspect, motoric aspects of perception, emotional aspects and intellectual aspects. The application of a customizable android platform could become an innovative approach which could help to aim a gradually increase social cognitive skills of autistic subjects.

Working with the smart phone media, will be very interesting to see how the smart phone could be used in a more 'free-form' scenario play, without the need for therapeutic intervention. Because worth to mentioned that at time, sometimes the therapist had to interpret and mediate directly to explain to the child especially when the child is uncontrolled and wants to destroy the hardware (device smart mobile) so the hardware should be durability.

In future, the game concept will be tested and evaluated by the targeted users, and results and finding will be discussed further which will be a subject for a another paper. To enhance the game and its facilities, we are looking for funding to develop a more complete version of this game with the aims of making the application; a) more powerful, b) more specifically tailored to the needs and the ability of autistic children, and c) have additional features such as voice detection.

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