AutiShapes: Learning Shapes Game for Autistic Children on Mobile Application

Najihah Mohd Sadry[1] and Nor Anita Fairos Ismail[2]

[1,2]Faculty of Computing, Universiti Teknologi Malaysia (UTM),
81310 Johor Bharu, Johor, Malaysia
{najihahmohdsadry@gmail.com[1],noranita@utm.my[2]}

Abstract. The aim of this project is to develop a learning shapes game for Autistic children on mobile application. The problems that have been identified in this project is the children who are diagnosed with Autism Spectrum Disorder. The common signs that exhibit by these children are social impairment, communication difficulties and repetitive and characteristic behaviours. ASD has no cure. However, there are therapies and behavioural intervention are designed to remedy specific symptoms and can substantially improve those symptoms. The interventions are educational/ behavioural interventions and medications. This project uses Waterfall methodology and Unity3D game engine in order to develop a 2D mobile game application. The result of this project is the AutiShapes 2D game have been integrated with mobile application and tested by the Autistic children at Louis Centre. The user testing is performed by using Usability Testing and User Acceptance Testing. The result obtained from the testing is most of the respondents are able to learn, understand and complete the tasks in AutiShapes 2D game.

Keywords: Autism, mobile game application, learn shapes, sort, match.

1   Introduction

Autism Spectrum Disorders (ASD) is defined as neurodevelopmental and behavioural disorders exhibit at the early stage of childhood [1]. Neurodevelopmental disorders (NDDs) are highly prevalent and severely debilitating brain illnesses caused by aberrant brain growth and development. Resulting in cognitive, social, motor, language and affective disabilities, common NDDs include ASD, intellectual disability, communication/speech disorders, motor/tic disorders and attention deficit hyperactivity disorder [2].

ASD may cause some problems in development areas such as verbal and nonverbal communication, social interaction, imaginative or creative play and sensory processing. Autism students may have trouble to communicate their needs to teachers and other students and also difficulty to understand some classroom direction and instruction, as well as subtle vocal and teachers' facial cues [4].

There are a number of challenges for the teachers in order to meet the needs of these students and these challenges usually turns out to be a stressful education for the children. The challenges can be for example inappropriate social interaction where it can lead to challenging behaviours, bullying and ostracizing. Besides, the teaching strategies will not be effective as the students have difficulties with imaginative or creative play hamper interactions with other students. Other than that, sensory issues also one of the

challenges because a student might not cope with noisy environments, being touched by others, or maintaining eye contact.

The method to implement 2D game is introduced in this project. The objectives of this project are : 1) to study and analyze the challenges in education that are faced by children with Autism; 2) to design and develop a mobile game for Autistic kids in identifying and learn basic shapes by using learning style such as matching and sorting. 3) to test and integrate the Two-Dimensional (2D) game on mobile application.

2   Review of Similar Applications

2.1   Autism/DTT Shapes

DTT Shape App uses Discrete Trial Training to help children with autism learn the basic shapes. DTT can be defined as the primary teaching method used in Applied Behaviour Analysis (ABA) to teach various pre-academic and social skills to autistic children. Although it is essential to teach the shapes to autistic children, it is also can be used to help children with attention deficit disorder (ADD), attention deficit hyperactive disorders (ADHD) or any child who has trouble staying on task. This app only available in English [3].
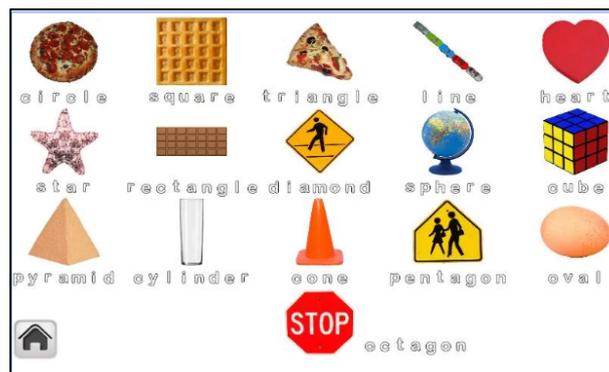

Figure 10: Autism/DTT Shapes app

2.2   Shape S – Autism Series

Shape S – Autism Series helps children with autism learn to differentiate shapes such as square, triangle, circle, rectangle and others. It also comprises the In-App version of Shapes which the activity would keep the child engages into this app. Besides, this app records score information for progress tracking and analysis purpose [6].

Figure 11: Shape S – Autism Series app

2.3   Drag N Match

Drag N Match app is an application that helps children match the object with the same picture given in option. The task to be accomplished in this game is the players need to drag the picture displayed as a question in order to expert their matching skills. The propose of this app is to help in boosting the matching skills of a child by seeing the similar picture [5].

Figure 12: Drag N Match app

3   Project Methodology

Figure 4 illustrates three main segments to guide this project on its design and development cycles. In order to develop a 2D mobile game application, there are involving several phases of project development which are:
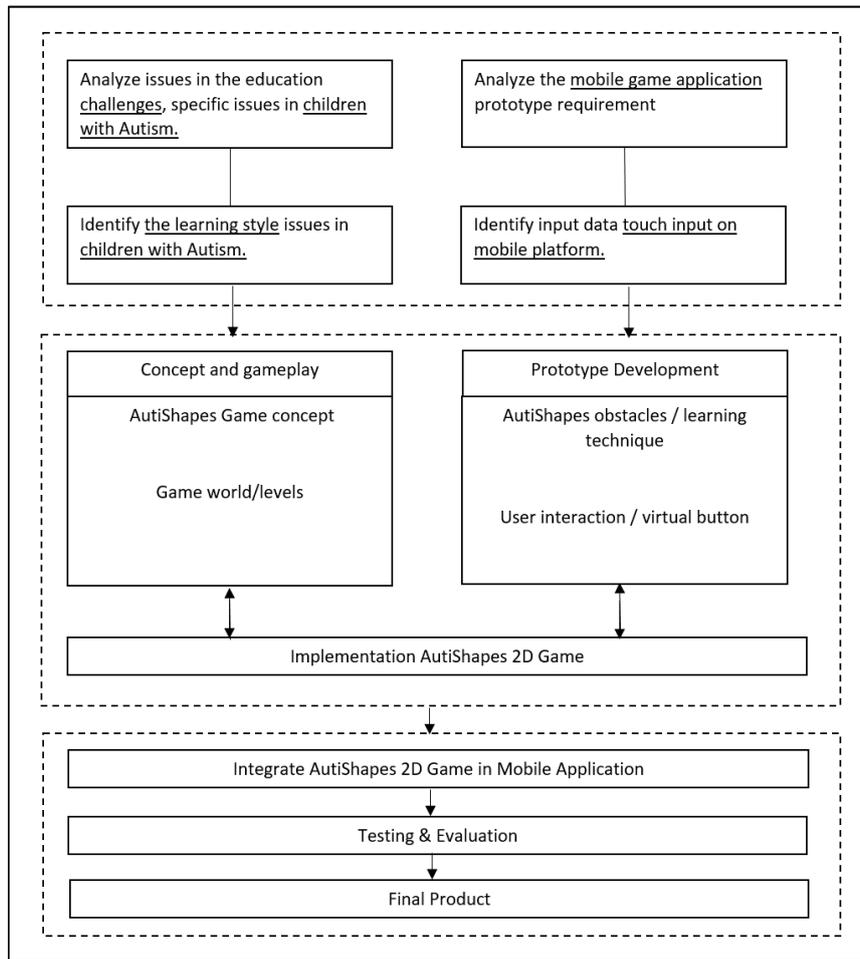
Figure 4: Project Methodology

Phase 1. Preliminary investigation and data collection of learning style for children with Autism.: In this phase, research will be focused on the challenges in education specifically for children with Autism. The learning style for these children have been identified as the guidance to develop a learning shapes mobile game application.

5. **Phase 2. Design The Gameplay of Obstacle/Learning Technique.:** Based on the information explored and gathered in the previous phase, a design phase of the 2 Dimension (2D) game is to visualize the learning process for the Autistic children. The challenges in education for these children are difficulties with imaginative or creative play hamper interactions with other students. By visualizing the material in learning process from conventional way into a game, it makes the learning process become more effective.

6. **Phase 3. Develop 2D Game.:** After the design phase is completed, the frameworks of AutiShapes 2D mobile game application is setting up. Also, the prototype of the game is being developed in this phase. In order to develop AutiShapes 2D game, Unity 3D is used since it is one of a game development platform.

7. **Phase 4. Integrate AutiShapes 2D Game in Mobile Application.:** After the development phase is completed, the game is integrated in mobile application. In this project, Android Software Development Kit (SDK) is used to integrate the game in mobile application since the platform used is Android. Android SDK enables developers to create application for the Android platform.

8. **Phase 5. Evaluation:** This phase will test and evaluate the game in mobile application. Novice user tester is required to test and evaluate the game using Usability Testing and User Acceptance Testing. Any weakness or strength of the game will be identified and any improvement will be made if needed.

4   Implementation

Figure 5 illustrates a gameplay flow and framework. The framework illustrates the overall game flow of this game. It consists of three gameplay which are Determining Shapes, Match Game and Sort Game.
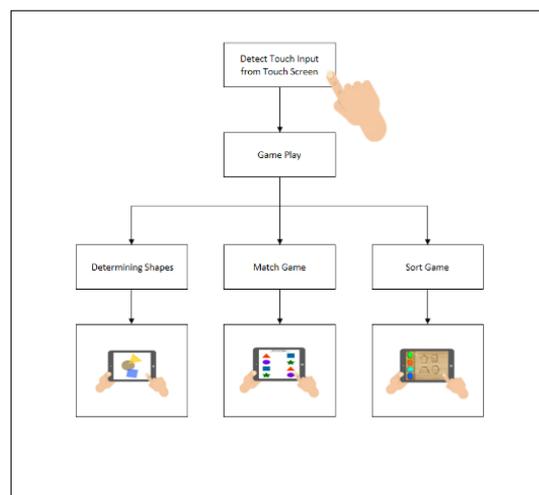

Figure 5: Game Framework

4.1   Implementing the gameplay and the obstacles

The concept of this game is about learning shapes. There are three basic shapes that are chosen for this game which are circle, triangle and square as shown in Figure 6. Figure 6 shows the three basic shapes with varied design; outlined and solid with different colours that are used in this game.
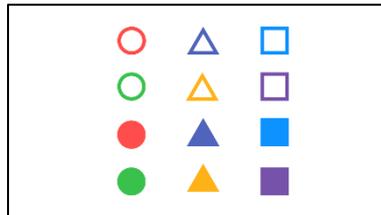

Figure 6: List of shapes

This game has three game world which are Determining Shapes, Match Game and Sort Game. The development of this 2D game is done by using Unity 3D. Figure 7-9 show a gameplay for each game world respectively.
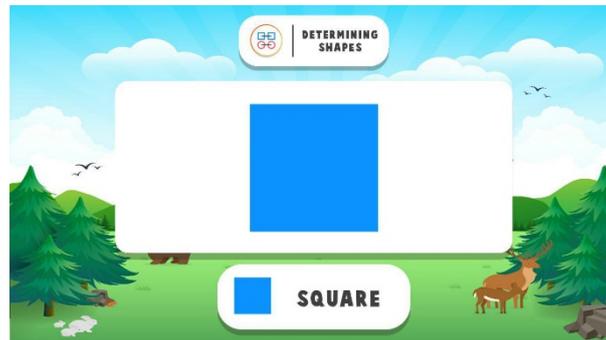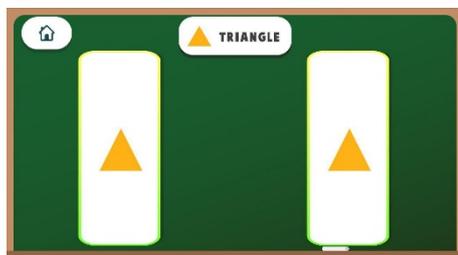

Figure 7: A gameplay in Determining Shapes

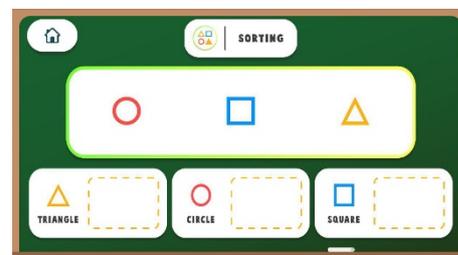**Figure 8**: A gameplay in Match Game

Figure 9: A gameplay in Sort Game

In Determining Shapes, the game displays the three basic as an introduction to shapes. While in Match Game and Sort Game, these gameplay require the player to complete the tasks for each level. Match Game has three levels for each type of shape whil in Sort Game, it has four level with the different level of difficulties.

5   Result

The result of this project is a 2D game that is integrated with mobile application. The process of user testing is done for Usability Testing to determine the extent to which the game is understood, easy to learn, easy to operate and attractive to the users under specified conditions and also User Acceptance Testing to analyza certain functionalities of this game.

The game has been tested with the Autistic children at Louis Center and the result has been discussed in this project.There are six subjects in total for user testing. The subjects are required to play the game with the guidance of their teacher to help at the beginning. From the observation, all subjects managed to complete all tasks within a certain time. Besides, the subjects also do show some expression while they were learning to play the game.

6   Conclusion

As to conclude the entire project, this project represents the way children with Autism learn and the way they are taught in their early developmental stage. The objectives for this is completely achieved and the suggestions in order to enhance this project are discussing for further project improvement since there are a few limitations of this project.

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