Android and HoloLens based AR applications

Problem Statement

Information and communication technology (ICT) is one of the best way for fun and interactive learning. Flashcard is one of the learning methods to teach children the alphabet with science words. The substantial approach of flashcard leads the interaction of learning therefore it could create the fun learning. However, combining AR technology with the capability of flashcard could make the learning more interactive. In this way, presenting the utilization of AR could incorporate fun learning since AR offer rich media learning. Other than showing each alphabet upon presentation of its corresponding pattern marker, children have the choices to see 3D models of science objects that start with each alphabet character.

Problem Justification

It could be a challenging task to teach young children. Therefore, teachers need to wisely relate the factor which will present the connection with learning environment. Two features of associated works are discovered in this study which are learning aspects, particularly, fun learning and the use of AR to support learning.

For young children, few works had been done to examine the capability of AR in supporting learning. Ucelli et al., [1] built up the system to teach the children the theory of color. The book named "Little feet and big feet" was created utilizing AR book, children were able to relate with the system. [2] "Fun Learning with AR Alphabet Book for Preschool Children" created an alphabet flashcard to enhance existing alphabet learning by utilizing an AR technology. [3]

Continuous usage of the book may bore the learner as they can guess what things will show up. This report will describe three different application made for HoloLens & android device.

1. Android application: fixed objects were provided for each alphabet with 3D view.
2. HoloLens device: 3D view of forest
3. HoloLens device: 3D view of shapes with interactive gesture to move and drop the objects.

Project Description

This project has been developed mainly with the help of Microsoft HoloLens, Unity, Vuforia and Visual Studio Software. HoloLens enables user to build digital content and lets them interact with it in real world through gesture.

This project demonstrates an Android AR application which allows children to play a memory game, draw and to see the 3d view of objects.

Moreover, there is another HoloLens application which shows the animation of animals. User can look the 3d view of night forest which has the variety of assets like trees, plants, bridges, river, animals, bushes, and many more.

The third application which is also built for HoloLens device, enables the user to interact with the object. User can move or drop the object with the help of HoloLens gestures.

Project Scope

- The application can be made accessible from the App Store (iOS) and Play Store (Android) so that user can get the experience of Mixed-Reality without actually buying the HoloLens.
- Features like, sound with each letter, animation of each object, interaction with each object, random object popping up, etc. could be added for more enhancement of the application.
- Forest HoloLens Application can be made more realistic by mapping the surrounding into the forest.
- Random animals with animation can be added to the forest environment.

- Some searching element can be added (like find all the animals hidden under the bushes) to the forest view to make it fun and more interactive.
- Shape HoloLens application can be implemented with user defined shapes which can be positioned to any location user want.

Approach

Android 3D application: Flashcard of exact same object is required for the application to work. All the flashcards required are combined in pdf format. To see the 3D view, user have to hover their android phone over the flashcard then the 3D view of the respective object will pop up. User can tilt their phone to look around the object. Some object has animation like flying, walking, etc. User can play a memory game where children have to find the matching pair of cards to score points helping them to enhance their memory. When completed successfully, there will be congratulation scene with fireworks animation giving "Play Again" option. Children have the paint option too where they can practice the alphabet writing or drawing anything they like.

Forest HoloLens Application: User will look around their environment wearing HoloLens to see the forest night view in 3D. It is enhanced with the forest sound which will give more realistic view of the forest. Water flowing, tiger walking, butterfly flying, cat purring such animations have been added to the application.

Shape HoloLens Application: User can interact with the virtual object in the real world. Gaze HoloLens feature is used so that user can interact with the object they are looking. They can move the object via HoloLens gesture.

Tools and its usage in applications

- Unity 2017.4.f.1: Universal Window Platform(UWP), Android, Direct 3d (D3D) and Vuforia Augmented Reality has been used to create the 3D application.
- JDK 10 and Android SDK tools 27: To run the application on latest version of android.
- Vuforia: Vuforia with Unity will help automatically loading database and activation on scene.
- Visual Studio 2017: To create C# scripts for Unity application with settings like x86 architecture, Remote Machine, windows SDK, etc. to convert the app to HoloLens
- HoloLens Emulator: To deploy and test the application for HoloLens device.
- HoloLens Device: Features like Gaze, Sound, Voice Command, Spatial mapping, gesture, etc. used to create the HoloLens application.

Reference

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