

CSIS0801 Final Year Project 2013 – 2014

FYP13002 Educational Software with Interactive Robot Platform

Project Plan

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Executive Summary

Technologies on gadgets are becoming more and more useful in nowadays life. It does not only provide us a platform of entertainment and communication, but also a platform to learn. Nowadays, the most commonly use high-tech gadgets include smartphone and tablet. In this project, we will integrate tablets with robot to assist children in learning.

Our project aims to provide children, especially children with special needs, an interactive robot platform for educational purposes. With the aid of robot, we hope that children's interests in learning can be aroused. Besides, the tablet is expected to provide a communication and monitoring platform for parents. We expect this system can help children to learn efficiently.

Section 1: Introduction

1.1 Overview

In this century, children can gain knowledge from school as well as self-learning at home with the assistance of their parents or some tools. Traditional tools include story books, word cards, puzzles, and so on. Children are now learning with traditional tools together with modern high-tech tools such as tablet to improve the effectiveness.

Parents now prefer to earn more money and give a better living environment to their children, therefore, focusing on their work more. They are too busy and tired to read story books with children after a whole day of work. Besides, they usually hire a maid to take care of the children and send them to some classes like play group or abacus class. Most parents would like to teach their children to read and write outside classes or even before their kindergarten start.

Therefore, a platform will be provided in this project for children to learn and for parents to monitor and communicate with their children. To arouse children's interests in learning, robot is a good option. Children can be attracted by the robot and interacted with robot during their learning. There are quite a lot of choices in the market now; however, we aim to provide parents a platform that can monitor the learning progress of their children in order to have a better understanding of them.

Everything from watching television to talking to friends can be quite difficult for the hearing impaired, not to mention learning. Thus, we hope to build a system which can be used by them as well.

With the aid of robot and tablet, we hope children can improve their reading and writing skills as well as gain knowledge in mathematics. We also hope parents can have close connection with their children through our monitoring and communication features.



Recently, there are existing smartphone applications which help children to learn and help the Deaf and Blind to use a smartphone or tablet. For applications with learning purpose, it is usually games such as crossword puzzle or music games. For applications designed for the Deaf and Blind, it is usually a converter of speech and text or media player specially designed for them. Therefore, we would like to develop our software with new ideas that do not exist in current market.

1.2 Special Educational Needs

We aim to provide a platform which can be used by the hearing impaired. Hearing impaired implies partial inability to hear, it can be divided into several levels – mild, moderate, moderately severe, severe and profound. Hearing impaired is found to be more sensitive to high pitch as well.



For hearing impaired children, their progress in learning are generally slower than hearing children. Usually, in classroom, teachers will pair hearing impaired students with hearing students which allow them to ask hearing students questions about the concept they do not understand. Teacher will also maintain visual focus on them in classroom.

Furthermore, hearing impaired children are found to be weaker in reading and mathematics. They will have difficulties in learning these. Thus, they need to pay more efforts and times to learn and improve in these two areas.

1.3 Role of Robot

Robot plays an important role in this project. It can not only arouse children's interests, but also keep their attention, especially for younger children.

Besides, results of games or exercise can be indicated by robot. It can present the result in a fun and interactive way. Robot can also assist in different functions such as indicating direction.

With the sound and visual effects, together with robot, learning can be more interesting.

Robotic car will be used in this project and we believe our system can be extended to other robot with more features in the future, such as robot with movable hands to enhance the learning experiences.



Section 2: Objective

2.1 Develop educational software

To develop multi-platform educational software, which support iOS and android devices, with interactive robot platform to aid children in learning

2.2 Design for the hearing impaired

To provide hearing impaired children an interactive platform to learn at home

2.3 Enhance children-parents bond

To enhance the connection between children and parents, especially working parents, with the aid of communication and monitoring features

Section 3: Problem Setting

3.1 Project Description

To achieve objective 1 – develop educational software, our team will integrate tablet into robot to develop interactive educational software. Besides, augmented reality (AR) technology will be used to enhance the visual experience. Multi-platform software will be developed for iOS and android tablets.



Four major learning areas

There will be four learning areas, including English vocabulary learning in story, reading & speaking, writing, and mathematics.

English vocabulary learning in story will provide story recordings with vocabulary pronunciation and AR image. To make it more interesting and dynamic, story cards will be needed and there will be buttons on the card to allow children to control actions of images or recordings via AR and camera.

Reading & speaking area will provide passages for children to read and speak. Technology of voice recognition will be used to determine the correctness of the pronunciation. Children can tap on the word to listen the correct pronunciation of unknown words. The light on the robotic car will turn on if the children read the passage correctly as an encouragement.

Writing area will provide watermark of Chinese words or English letters in the format of copybook on the screen of tablet, which let children to trace the word or letter easily. Children will be required to write the word on the screen following the stroke order for characters or word. The light on the robotic car will be used to indicate the correctness of the writing.

Mathematics area will include fundamental arithmetic operations (e.g. addition, subtraction, and even multiplication). In order to make the numbers figuratively, AR

is involved so children can perhaps understand the algorithm more easily. Children can know whether they answer correctly from the color of the robotic car's light.

Special design for the hearing impaired

In order to allow hearing impaired children to use the software, a special mode will be implemented in the software. The special mode features changing the pitch of sound that is suitable for the hearing impaired. Besides, level of difficulties can be chosen in each learning area to allow them to progress slowly and effectively.

English vocabulary learning in story and Mathematics area are very useful for the hearing impaired as they are usually weak in these areas. Their skills can be well-trained and objective 2 can be reached with the interactive reading and learning platform specially designed for them.

Communication and monitoring features

Besides the four learning area, there are two special features – chat-room and monitoring platform, which lead us to success in objective 3 – enhance children-parents bond.

Children can form chat-room among themselves. They can learn how to express themselves via words. This can enhance their writing skills, organization skills, interpersonal skills and communication skills. Also, their parents can know what the talk about to understand more about their children. Besides, children can communicate with their parents as well, so their parents can follow their learning progress even parents are not with their children through monitoring platform.

3.2 Technical Process

Model-View-View Model structure

To build an application for tablet, we need to have a clear structure. Therefore we are going to build it in Model-View-View Model (MVVM) structure. View controls the user interface, such as animations and visual effects. View Model is the value converter, while Model includes back end logic.

Multi-platform software

To build multi-platform software, we will use Unity for development which allows us to export the software supporting iOS and android devices.

Augmented reality

Processor, display, sensors and input devices are needed for augmented reality (AR). In our project, the tablet contains all of the elements. Using AR, virtual world is integrated with the real world. When the AR application recognizes the object and receives the digital information, it will begin to execute the code for the AR program and 3D images are produced on the tablet. 3D development software will be needed to support AR program writing, and we are going to develop on Unity, which allows us to tie animation or digital information in the computer program to an object in the real world.

Voice recognition

Speech analysis is the key in voice recognition. The program will take the digital recording and parse it into small, recognizable speech bits. It will then begin a complex process of identification and contextual analysis – comparing and pairing up each string of recorded speech bits with the record in our database. In our project, we will use voice recognition to analysis the children speech in order to get the correctness.

Communication network

Network connection will be required for the system in order to access the chat-room and record the children's progress. Children will be required to log in to their own account at the beginning. Their progress will be recorded in our database and can be retrieved from the parents account. In our project, which uses tablets, network connection hardware is already provided in the tablet and only WIFI network will be needed.

Wireless control of robotic car

Wireless control of robotic car will be allowed to let children take the tablet out from the robotic car and use it at a distance. Network connection will be needed to control the movement and action of the robotic car.

3.3 Possible Difficulties

1. Augmented reality

It will be difficult to ensure high successful rate of the object. Especially, our target user is children, where they may not be able to place the object in front of the camera in a correct position.

2. Voice recognition

Different people have their unique voice and it is difficult to do analysis. Speed, intonation and pitch of speech will affect the analysis and may lead to low recognition rate. Besides, quality of microphone and level of background noise may affect the recognition.

3. Data encryption

As there will be network communication, data encryption is important to protect the information. We will need to ensure the data transmission is secured.

4. Control of robotic car

We will need to ensure that the control of robotic car remains stable within a certain distance to provide a better user experience. Wireless technology will be needed to enable this function.

3.4 Possible Solutions

1. Augmented realities

We may prepare learning materials with embedded “marker” instead to increase the recognition rate.

2. Cryptography

Cryptography will be applied to enhance the security of data transmission.

3. Use of wireless connection

To control of robotic car, we may either use one of the wireless technologies: infra-red, Bluetooth and WIFI. Bluetooth will be used between robotic car and tablet, which is supported by our hardware, to provide easy and stable connection within a certain distance.

Section 4: Project Schedule

Sept 2013	Preparation of Project plan & Project web page
Oct 2013 – Jan 2014	Preliminary implementation
Dec 2013 – Jan 2014	Writing interim report
Jan 2014	First Presentation
Jan 2014 – Mar 2014	Finalized tested implementation
Mar 2014 – Apr 2014	Writing final report
Apr 2014	Final Presentation
Apr 2014 – May 2014	Preparation of project exhibition
May 2014	Project exhibition

Section 5: Budget

<u>Item</u>	<u>Amount (HK\$)</u>
Printed Material for AR	1500
Printing Quota	200
Stationary	200
	<u>1900</u>

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