A FRAMEWORK FOR IMPLEMENTING e-ATTENDANCE SYSTEM USING NEAR FIELD COMMUNICATION IN ANDROID OS

P. Elakiyaselvi
M.E, Dept. of Information and Technology
Periyar Maniyammai University
Thanjavur, Tamilnadu.
elakiya.cs@gmail.com

U.R.V.Nandhiny
M.E, Dept. of Information and Technology
Periyar Maniyammai University
Thanjavur, Tamilnadu.
mailnandhiny@gmail.com

Mr.M.B.Bose,M.Sc(S/W),M.E
Asst. Professor, Dept. of Information and Technology
Periyar Maniyammai University
Thanjavur, Tamilnadu
bosemb84@yahoo.com

ABSTRACT—Education system in India has been changing widely in last 10 years due to the development of the technology. Smart class, E-learning, Video conferencing are some of them. The core idea of this paper is to implement some of the emerging technologies like mobile computing and near field communications and advances in behavioral science studies to make a better educational system. This paper will be implemented in application as two parts. A secure framework for implementing different educational service mobile applications like, mobile attendance, mobile curriculum, mobile marks register etc. The second part will leverage Near Field Communication technologies and gamification behavior approach to incorporate game mechanics into activity oriented learning systems. Gamification works by making technology more engaging, and by encouraging desired behaviors, taking advantage of humans’ psychological predisposition to engage in gaming.

Keywords- Android; NFC; Mobile Computing; Android SDK; Education Tool.

I. INTRODUCTION

The rapid development of electronic devices and wireless communication provides a foundation for improving the learning and teaching environments through new technologies. A common phenomenon is that new game ideas grow up with distinctive technology or novel equipments used in learning, and it also brings a challenge to educational games, how we could integrate games in educational system, lectures, exercises, day life with recent technologies, such as 3G[1], PSP [2] or iphone [3], etc, to enrich the teaching or educational system and achieve better learning life.

However, when we live in and start to deliberate our educational system in technology rich learning environments, we are facing some challenges and opportunities that arise from introducing technology into educational system. Most of the theoretical literature on educational system has not yet incorporated a perspective on technology as to how perceive learning and teaching, especially on game-based educational system. As such, we would discuss it by present cases of how game technology to perceive the learning in this paper. This paper’s idea was inspired by the work on using NFC[4] successfully in building contactless universaity exam(CUE)[6]. Similarly we want to see if we could use other development frameworks than CUE for encouraging students to take part in specified activity and making automated updation for student details. Currently, most attractive choice is Google android [5] issued in 2007 and free to download from the official websites. After two years, these SDKs become more matured; the newest version of android 4.0 Ice Cream Sandwich[7]. This SDK have potential power to enrich the learning life through diverse ways based on the various educational purposes.

This paper is organized as follows: Section 2 describes the previous works and investigates the features of Google android and NFC. Section 3 introduces why and how to extend android platform as a game development tool for teaching purpose. Section 4 explains design issues and results. Section 5 Future enhancement for this framework 6 concludes the paper.

II. RELATED WORK

In schools, learners and teachers face a challenge, a problem, or a task that has been designed for a particular pedagogical purpose or they face situations that are likely to appear in work and public life. In both cases the purpose of exploiting tools is for learners to respond to such diverse challenges. Our focus is on the construct of the relationship between the educational tasks and the material artefact. This relationship is at the heart of Vygotsky’s notion of double stimulation [8], a method for studying cognitive processes and not just results. In a school setting, typically the first stimulus would be the problem, challenge, task, or assignment to which
learners are expected to respond. In a school setting, typically the first stimulus would be the problem, challenge, task, or assignment to which learners are expected to respond. The second stimulus would be the available mediating tools.

Based on this point, we have a theoretical design of teaching environment to describe how it works. Also the design of the first stimulation (tasks) and criteria to choose second stimulation (game development tools) are also given.

**Previous Works**

Building a contactless university examination system using NFC

For aiding the examination process the CUE system covers the following processes:

- Managing and publishing the date and place of the examination
- Student identification before the examination using NFC technology
- Examination completion procedure

The mobile component of the system is implemented inside the DIAD NFC framework[9][10][11]. The detailed description of the CUE systems working is given by introducing the different roles arising during the education at a university and the processes belonging for these actors. The main actors of the system are the student, the teacher and the administrator. The teacher’s main task is to hold a subject (or more) during the study period then test and estimate the knowledge of the students after the semester has ended. Inside the CUE system the above responsibility of the teacher is aided by a number of services. First the teacher has to announce a subject for the students. After the student registers to the subject the teacher holds the lecture in the study period. Approaching the end of the study period the teacher should announce examination dates and places using the CUE system. After a student has been registered to an exam date and place and presents himself at the examination the teacher should check the student's identity to determine whether the student can be permitted to take the exam or not. The identification process is also aided by the CUE system by providing a service for securely check the available information about a student (photo, name, exam registration). After the exam the teacher can publish the results inside the CUE system.

As the teacher is responsible for measuring the gained knowledge of the students at the end of the study period, correct exam tasks should be prepared by the teacher. A complex university examination system should support this process by providing services for automatic exam test generation. The CUE system provides the possibility for the teacher to write test questions and generates the test automatically.

**III. FEATURES OF THE GOOGLE ANDROID AND NFC**

**A. Android Features**

Android consists of a kernel based on the Linux kernel, with middleware, libraries and APIs written in C and application software running on an application framework which includes Java-compatible libraries based on Apache Harmony. Android uses the Dalvik virtual machine with just-in-time compilation to run Dalvik bytecode, which is usually translated from Java bytecode.

- Application framework enabling reuse and replacement of components
- Dalvik virtual machine optimized for mobile devices
- Integrated browser based on the open source WebKit engine
- Optimized graphics powered by a custom 2D graphics library; 3D graphics based on the OpenGL ES 1.0 specification SQLite for structured data storage
- Media support for common audio, video, and still image formats (MPEG4, H.264, MP3, AAC, AMR, JPG, PNG, GIF)
- Rich development environment including a device emulator, tools for debugging, memory and performance profiling, and a plugin for the Eclipse IDE

Following Table 1 shows the comparison of iPhone and Android SDK.

**Libraries**

Android includes a set of C/C++ libraries used by various components of the Android system. These capabilities are exposed to developers through the Android application framework. Some of the core libraries are listed below:

**System C library** - a BSD-derived implementation of the standard C system library (libc), tuned for embedded Linux-based devices

**Surface Manager** - manages access to the display subsystem and seamlessly composites 2D and 3D graphic layers from multiple applications

**LibWebCore** - a modern web browser engine which powers both the Android browser and an embeddable web view.
### Table 1: Comparison of iPhone and Android SDK.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Google Android SDK</th>
<th>iPhone SDK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Environment</td>
<td>Eclipse recommended by Google</td>
<td>Xcode provided by Apple</td>
</tr>
<tr>
<td>Operating System for Development</td>
<td>Windows, Mac OS X, Linux</td>
<td>Mac OS X</td>
</tr>
<tr>
<td>Emulator</td>
<td>Provided</td>
<td>Provided</td>
</tr>
<tr>
<td>Programming Language</td>
<td>Java</td>
<td>Objective-C</td>
</tr>
<tr>
<td>Mobile device</td>
<td>Google phone is available in most countries</td>
<td>iPhone is available in most countries</td>
</tr>
<tr>
<td>Programming Interface</td>
<td>API contains key high-level abstraction which short development time.</td>
<td>Mainly rely on the low level standards like OpenGL ES and OpenAL</td>
</tr>
<tr>
<td>Share of Application</td>
<td>Publish/sell the application on Google android market</td>
<td>Publish/sell the applications on iTunes Apple store</td>
</tr>
</tbody>
</table>

SGL - the underlying 2D graphics engine

3D libraries - an implementation based on OpenGL ES 1.0 APIs; the libraries use either hardware 3D acceleration (where available) or the included, highly optimized 3D software rasterizer

FreeType - bitmap and vector font rendering

### B. NFC Features

Near field communication, or NFC, allows for simplified transactions, data exchange, and wireless connections between two devices in proximity to each other, usually by no more than a few centimeters. NFC allows you to share small payloads of data between an NFC tag and an Android-powered device, or between two Android-powered devices.

Tags can range in complexity. Simple tags offer just read and write semantics, sometimes with one-time-programmable areas to make the card read-only. More complex Tags offer math operation and have cryptographic hardware to authenticate access to a sector.

Table 2 shows the comparison between NFC (Near Field Communication) and Bluetooth. Fastest connection can be established with the help of NFC. It takes only <0.2 sec for setting up a connection.

### Table 2: Comparison NFC and Bluetooth

<table>
<thead>
<tr>
<th></th>
<th>NFC</th>
<th>Bluetooth</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID compatible</td>
<td>ISO 18000-3</td>
<td>Active</td>
</tr>
<tr>
<td>Standardization body</td>
<td>ISO/IEC</td>
<td>Bluetooth SIG</td>
</tr>
<tr>
<td>Network Standard</td>
<td>ISO 13157 etc</td>
<td>IEEE 802.15.1</td>
</tr>
<tr>
<td>Network Type</td>
<td>Point-to-Point</td>
<td>WPAN</td>
</tr>
<tr>
<td>Cryptography</td>
<td>Not with RFID</td>
<td>Available</td>
</tr>
<tr>
<td>Range</td>
<td>&lt;0.2m</td>
<td>~10m(class 2)</td>
</tr>
<tr>
<td>Frequency</td>
<td>13.56MHz</td>
<td>2.4-2.5GHz</td>
</tr>
<tr>
<td>Set-up time</td>
<td>&lt;0.1s</td>
<td>&lt;6s</td>
</tr>
<tr>
<td>Power consumption</td>
<td>&lt;15mA(read)</td>
<td>Varies with class</td>
</tr>
</tbody>
</table>

### IV. EXTENSION OF ANDROID FOR AN EDUCATIONAL PURPOSE

This section gives motivation of improving the android for teaching purpose and direction of how to extend it. Due to the different educational environments and teaching aims, there could be various extending methods and directions. From our knowledge, there is no paper that describes extending android or iPhone SDK’s application as a game development tool for educational purposes, so not much previous experiences are available.

#### A. Gamified Activity Learning System Description

For aiding teaching systems and encouraging the students to take part in specified activities by this learning system covers the following processes and it is described as two parts:

**Academic Module**

- A secure framework for implementing different educational service mobile applications like, mobile attendance, mobile curriculum, mobile marks register etc.
- This data’s can be transferred from staff device to student device.
- It is automated system save’s every date to server after confirmation.

**Gamified Activity Module**

- Leverage Near Field Communication technologies and gamification behavior approach to incorporate game mechanics into activity oriented learning systems.
Points are given for their regular presence in particular place. Eg: Taking part in seminar, attending lectures, etc and last leader will be awarded.

B. Components of the Gamified Activity Learning System:

Mobile Equipment:
Inside the Learning system mobile equipment can be used either by the student or the teacher. The Mobile Equipment should have the DIAD NFC framework installed on it along with the student or teacher application. The teacher uses the mobile equipment for taking attendance, editing mark and maintaining curriculum. The students’ mobile equipment to register their presence in particular place.

NFC Reader or Smart Poster:
Student details and lecture details published on smart posters equipped by RFID tags [12]. Student can easily register their presence. Server contains the following entries:
- student information,
- teacher information,
- student points information
- student attendance and mark information

V. DESIGN AND RESULTS

Design procedure for this framework is done as a two modules. This module’s are explained as follows with architecture.

A. Academic Module
This module consist three separate functions are developed as for now; they are mobile attendance, mobile mark editor and mobile curriculum. This three let to ease the work of teachers. From mobile attendance they can take attendance and can be update to sever at the moment. It avoids the malfunction in attendance system.

Mobile Mark Editor also has the same function as mobile attendance. It saves the mark details of the student and saved in server. Mobile curriculum which is developed to maintain course plan and teaching plan in mobile.

Fig 1 shows data transmission of the mobile device and NFC data transmission. Architecture remains same for three modules. Architecture for mobile curriculum bit varies from this.
Fig 2: Gamified Activity Module

Fig 2 shows the architecture of the part two implementation. This part is to encourage students take part particular activity and it is achieved NFC.

VI. CONCLUSION

From our previous experiences in the Educational tool, we would like to offer new choice for teachers and to ease their work. And we found that Google android is a suitable tool for the educational use. In this way, we extended the android platform mainly based on the requirements from previous works. Further, we have included gamified activity to increase the usage of the application. This educational tool can be further extended by adding feature to upload and save power point presentation, docs. NFC can also used as an attendance.

REFERENCE