** MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Document

The Roll System using Mobile Device

|  |  |
| --- | --- |
| **Group 1** | |
| **Group member** | Pham Huy Hoang – Team Leader – 60740  Nguyen Thanh Binh – Team Member - 60321  Nguyen Quoc Huy – Team Member - 60551  Do Minh Dat – Team Member - 60545 |
| **Supervisor** | Mr. Kieu Trong Khanh |
| **Ext. Supervisor** | N/A |
| **Capstone Project code** | RSM |

-Ho Chi Minh City, 09/2013-

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# Introduction

## Project Information

* Project name: **The roll system using mobile device**
* Project Code: **RSM**
* Product Type: **Website, Phone Application**
* Start Date: **September 9th, 2013**
* End Date:

## Introduction

Roll system was known with HPLite32, SimplePass of HP fingerpint system; roll system with ID card using by almost corporation or company around the world; the system face identify by Uniqul – Finland publish on 7/15/2013 or LogonSmart by Asus. Today, the trend machines replace humans in the hard work or the work does not require high intelligence became popular. So roll system face recognition becomes ever more necessary. The number of students in a university as well as the number of employees in large corporations in Vietnam is increasing dramatically, which means that the system should have professional roll with accuracy high.

## Current Roll Call System

Below are some current roll call systems:

* By manual: This system is widely used in school, university. The instructor will call the name of each student, check the absent, then submit the result to log system.
* Using ID card: This system is usually used in corporations. Each employee has a card. The card will be read by a card reader to check the attendance of the employee.
* Using fingerprint: This system is currently used in FPT University. 15 minutes before and after a studying session, the student must show his fingerprint to a machine to take attendance.
* Using camera + face recognition: This system is just in experimental stage. Each classroom has a camera. At the beginning of the studying session, the instructor uses the computer, connect to the camera and take picture of classroom. The system will recognize the student in the picture, write to roll call log system.

## Problem Definition

Below are the advantage and disadvantage of current roll call systems:

* By manual

+ Advantage: Simple to implement, cheap.

+ Disadvantage: The roll call take 3-5 minutes, take effort of instructor, wrong roll call.

* Using ID card

+ Advantage: High accuracy, not take much effort to check attendance.

+ Disadvantage: High cost (ID Card, Card Reader). Risk of ID card missing.

* Using fingerprint

+ Advantage: Quickly. No effort must be made from instructor.

+ Disadvantage: Cost of fingerprint reading machine. Risk of machine error. The student checks the attendance but not go to class.

* Using camera + face recognition

+ Advantage: Quickly. The entire class picture can be stored as log.

+ Disadvantage: High cost (Camera cost). Face recognition not too accuracy.

## Proposed Solution

The system is intended for used in only school or university, where the pupils/students sit in a classroom (A small classroom, from 20-30 students). The system must to manage the course, teacher, check attendance…. In detail, the system will enable following function:

### **Feature functions**

* The admin can manage information about course, class, instructor, students.
* The system will provide a method for admin to upload the student’s images, select the students in the images to make training data.
* The system will make a roll call list (Contains: Course, Class, Time, Instructor, Student List) for each class, based on the input information.
* The system will provide a method to assign instructor and student to course. The system must check the availability of the instructor before assigning.
* The system must support a method to change instructor of a course (When instructor is sick or busy).
* The system can output report about the absent rate of a course, or a student.
* The instructor/examiner (fix other place) can view info about: What course they are teaching. Roll Call and student lists of these classes.
* The instructor will use the mobile application. At the beginning of a studying session, a picture of entire class will be taken for checking attendance.
* Base on the student list, the system will recognize the students from the picture. The mobile app will notify attendance result to instructor.
* The instructor can, re-check attendance manually.
* The system will alert the instructor when it detects stranger in classroom.
* Based on the respond from instructor, the system will gather more data to become more accuracy.
* The student can view info about what course they’re studying.
* The student can view their own attendance of the course they participated in.

### Advantage and disadvantage

The advantage and disadvantage of the proposed solution:

* Advantage: Small cost or no cost (If the instructor has phone). Face Recognition accuracy is about 70~80%, will reach 100% with confirm from instructor. The attendance check is quickly (< 30 seconds). The taken picture can be stored as log.
* Disadvantage: Complex to implement. The accuracy can vary depend on: Noise, brightness, number of people, image solution… Need student’s picture to be used for recognition training.

## Functional Requirement

Function requirement of the system are listed as below:

### Create Account

* The account of instructors and students will be auto-created by the system, basing on the input from admin.
* The instructors and students can change their profile and password.

### Instructor Management

* The staff can add/edit/active/inactive instructor.

### Class Management

* The staff can add/edit/active/inactive class.

### Student Management

* The admin can add/edit/active/inactive student.
* Each student must has a training set, contains 8-20 images for face recognizing. The staff can upload images, select the faces of the students to add. The staff can also remove images from training set.

### Course Management

* The staff can add/edit/active/inactive course.

### Roll Call Management

* The staff can add/edit/active/inactive roll call.
* The staff must input info of a roll call: The course, the instructor who teaches the course, the student list, the time of the course (Begin, End Date).
* The instructor can see what roll call they belong to.
* The instructor can change their roll call to another instructor, in case of sickness or busy.

### Attendance Checking

* At the beginning of each studying session, the instructor takes a picture of entire class for attendance checking.
* The instructor can re-check attendance manually.
* The mobile app will notify the result to the instructor.
* In case of wrong recognition, the student face will be added to training set for higher accuracy.
* The instructor can view the attendance log of the course they are teaching.
* The student can view the attendance log of the course they are studying.

### Stranger Alert

* If stranger is detected in the classroom, the system will alert to teacher. A log file will also be written.
* In case of wrong recognition, the student face will be added to training set for higher accuracy.

### Attendance Report

* The system will make attendance report, which shows the rate of absence in a course, or the rate of absence of a student.
* The report is only available to staff and instructor

## Role and Responsibility

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Full Name** | **Role** | **Position** | **Contact** |
| 1 | Kiều Trọng Khánh | Project Manager | Instructor | khanhkt@fpt.edu.vn |
| 2 | Phạm Huy Hoàng | Developer | Team Leader | hoangphse60740@fpt.edu.vn |
| 3 | Nguyễn Thanh Bình | Developer | Team Member | [binhnt60321@fpt.edu.vn](mailto:binhnt60321@fpt.edu.vn) |
| 4 | Nguyễn Quốc Huy | Developer | Team Member | [huynq60551@fpt.edu.vn](mailto:huynq60551@fpt.edu.vn) |
| 5 | Đỗ Minh Đạt | Developer | Team Member | datdm60545@fpt.edu.vn |

Table 1: Roles and Responsibility

# Software Project Management Plan

## Problem Definition

### Name of this Capstone Project

The roll system using mobile device (RSM)

### Problem Abstract

Roll system was known with HPLite32, SimplePass of HP fingerpint system; roll system with ID card using by almost corporation or company around the world; the system face identify by Uniqul – Finland publish on 7/15/2013 or LogonSmart by Asus. Today, the trend machines replace humans in the hard work or the work does not require high intelligence became popular. So roll system face recognition becomes ever more necessary. The number of students in a university as well as the number of employees in large corporations in Vietnam is increasing dramatically, which means that the system should have professional roll with accuracy high.

### Project Overview

#### The Current System

Below are some current roll call systems:

* By manual: This system is widely used in school, university. The instructor will call the name of each student, check the absent, then submit the result to log system.

+ Advantage: Simple to implement, cheap.

+ Disadvantage: The roll call take 3-5 minutes, take effort of instructor, wrong roll call.

* Using ID card: This system is usually used in corporations. Each employee has a card. The card will be read by a card reader to check the attendance of the employee.

+ Advantage: High accuracy, not take much effort to check attendance.

+ Disadvantage: High cost (ID Card, Card Reader). Risk of ID card lending, missing.

* Using fingerprint: This system is currently used in FPT University. 15 minutes before and after a studying session, the student must show his fingerprint to a machine to take attendance.

+ Advantage: Quickly. No effort must be made from instructor.

Disadvantage: Cost of fingerprint reading machine. Risk of machine error. The student checks the attendance but not go to class.

* Using camera + face recognition: This system is just in experimental stage. Each classroom has a camera. At the beginning of the studying session, the instructor uses the computer, connect to the camera and take picture of classroom. The system will recognize the student in the picture; write to roll call log system.

+ Advantage: Quickly. The entire class picture can be stored as log.

+ Disadvantage: High cost (Camera cost). Face recognition not to accuracy.

#### The Proposed System

The system is intended for used in only school or university, where the pupils/students sit in a classroom. The system must to manage the course, teacher, check attendance…. In detail, the system will enable following function:

##### Web

* The admin can manage information about course, class, instructor, students.
* The system will provide a method for staff to upload the student’s images, select the students in the images to make training data.
* The system will make a roll call list (Contains: Course, Class, Time, Instructor, Student List) for each class, based on the input information.
* The system will provide a method to assign instructor and student to course. The system must check the availability of the instructor before assigning.
* The system must support a method to change instructor of a course (When instructor is sick or busy).
* The system can output report about the absent rate of a course, or a student.
* Based on the respond from instructor, the system will gather more data to become more accuracy.
* The student can view info about what course they’re studying.
* The student can view their own attendance of the course they participated in.

##### Mobile

* The instructor can view info about: What course they are teaching. Roll Call and student lists of these classes.
* The instructor will use the mobile application to take a picture.
* The mobile shows the list of student present in class, notify the instructor if absent rate is high.
* The instructor can re-check attendance manually.
* The system will alert stranger.

#### Boundaries of the System

* The system is intended for using university, with small classroom, or for the examine room (The testing site will be FPT University).
* The maximum number of a classroom is 30 people. The classroom size is about: 6m x 8m
* The system is not intended for managing these aspect:

+ Managing the teaching calendar of instructor.

+ Managing instructor qualification, salary info.

+ Managing the testing, mark of student of each class.

* The language of the system is English.
* The complete product includes:

+ The website, for admin and students. Instructor can also use the website to change profile, view roll call info.

+ Mobile Application for instructor to check attendance.

+ All the process involved document.

#### Development Environment

##### Hardware requirements

**For server**

|  |  |  |
| --- | --- | --- |
| Windows | Minimum Requirements | Recommended |
| Internet Connection | Cable, Wifi (4 Mbps) | Cable, Wifi (8 Mbps) |
| Operating System | XP, Vista, 7, 8 | XP, Vista, 7, 8 |
| Computer Processor | Intel® Core 2 Duo | Intel® Core(TM) i5 CPU , M 460 @ 2.53GHz |
| Computer Memory | 1GB RAM | 3GB or more |

Table 2: Hardware Requirement for Server

**For Mobile Application**

|  |  |  |
| --- | --- | --- |
| Mobile | Minimum Requirements | Recommended |
| Internet Connection | Wifi (2Mbps) | Wifi (4Mbps) |
| Operating System | Android 4.0 or later version | Android 4.4 |
| Hardware | Touchscreen, Camera 2.0 MP or above | Touchscreen, Camera 4.0 MP or above |
| Memory | 512 MB or more | 1 GB or more |

Table 3: Hardware Requirement for Mobile App

##### Software requirements

* Microsoft Windows 7 Service Pack 1: operating system and platform for development.
* SQL Server 2008 Express: used to create and manage the database for system.
* StarUML: used to create models and diagrams
* Skype: used for communication and meeting
* Visual Studio 2010: used to implement website and web service.
* Eclipse Juno 4.4, Android SDK 22.0.5, ADT 22.0.5 & JDK 7u25: used to implement mobile application.
* Google Code & TortoiseSVN: used for source control.

## Project organization

### Software Process Model

Project is developed under agile model.



Figure 1: Agile Development Model

For more information: <http://www.indicthreads.com/1439/quick-introduction-to-agile-software-development/>

(Owner: IndicThreads.com. Online Software Developer Magazine and Conferences)

### Roles and responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Full name** | **Role in Group** | **Responsibilities** |
| **1** | Kiều Trọng Khánh | Project manager | * Specify user requirement * Control the development process * Give out technique and business analysis support |
| **2** | Phạm Huy Hoàng | Team Leader, BA, DEV, Tester | * Managing process * Designing database * Clarifying requirements * Prepare documents * GUI Design * Create test plan * Coding * Testing |
| **3** | Nguyễn Thanh Bình | Team Member, BA, DEV, Tester | * Designing database * Clarifying requirements * Prepare documents * GUI Design * Create test plan * Coding * Testing |
| **4** | Nguyễn Quốc Huy | Team Member, BA, DEV, Tester | * Designing database * Clarifying requirements * Prepare documents * GUI Design * Create test plan * Coding * Testing |
| **5** | Đỗ Minh Đạt | Team Member, BA, DEV, Tester | * Designing database * Clarifying requirements * Prepare documents * GUI Design * Create test plan * Coding * Testing |

Table 4: Roles and Responsibility Details

### Tools and Techniques

- Front-end technologies: HTML5, CSS3, JavaScript, jQuery, AJAX.

- Back-end: Website: ASP.NET MVC3 + Entity Framework.

Web Service: WCF. Mobile App: Android - Java.

- Web Server: Microsoft IIS.

- Database Management System: MS SQL Server 2008 Express

## Project Management Plan

### Iteration

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Phase**  **/Iteration** | **Description** | **Deliverables** | **Resource needed** | **Dependencies and Constrains** | **Risks** |
| **Preliminary Investigation or Analysis** | - Study similar existing systems.  -Identify and clarify requirements for the system in general. | -Introduction of proposed system.  -Main functions.  -Project Iteration Plan. | 30 man-days | N/A | Project may  not be feasible  for developing  because lack of technologies  and/or data |
| **Face Detect & Recognize** | -Studying face detect, face recognize algorithm & library.  -Find a solution, optimize for higher performance and accuracy. | -Face Detect and Recognize System (On Web Site and Web Service) | 25 man-days | N/A | Lack of experience.  The implemented algorithm is not the best.  Lack of test data |
| **Student management** | -Manage subject, student images/information. | -Student management function | 20 man-days | Depend on “**Face Detect & Recognize”** |  |
| **Roll call management** | -Create the roll call list, based on the information of student, instructor, class and course . | -Roll call management function | 30 man-days | N/A | Lack of experience.  Not have a clear understanding about business process. |
| **Web Service Implement** | -Create and deploy the web service on server. Provide RestFul service. | -Running WCF Web Service | 25 man-days | Depend on “**Roll call management”** | Lack of experience on making and deploying web service. |
| **Attendance checking** | -Instructor use mobile app to take picture, use picture for attendance checking. | -Android App with attendance checking function | 20 man-days | Depend on “**Web Service Implement”** | Lack of experience on Android development, transfer file between Android and WCF.  No Android device available for testing. |
| **Attendance report** | -Students can view their own attendance rate.  -Instructor and admin can view reports. | -Attendance report function. | 15 man-days | N/A | Lack of experience of making report. |

Table 5: Iteration

### Iteration Detail

#### Phase 1: Preliminary Investigation or Analysis

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Identifying and studying existing systems** | Find which systems currently provide similar service, their strengths and weakness. | HuyNQ, HoangPH, BinhNT |
| **2. Identifying and clarifying main functions.** | Define which main functions system should provide. | HuyNQ, HoangPH, BinhNT |
| **3. Introduction.** | Complete Introduction Report. | HoangPH |
| **4. Project Management**  **Plan.** | Prepare Project  Management Plan. | HoangPH |
| **5. Website Prototype.** | Build a prototype of proposed system (Website). | HuyNQ, HoangPH |
| **6. Mobile Prototype.** | Build a prototype of proposed system (Mobile App). | BinhNT, HoangPH |
| **7. Design ER diagram.** | Design ER diagram. | HoangPH, HuyNQ, BinhNT |

Table 6: Phase 1: Preliminary Investigation or Analysis

#### Phase 2: Face Detect & Recognize

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Identifying Requirement and Planning** | Which feature this function  should have and how to  implement. | HoangPH |
| **2. Studying Face Detection & Recognition Algorithm** | Studying algorithm, implement by using library EmguCV. | HoangPH |
| **3. Extract Face from Image** | Find the faces in images, extract them for later use | HoangPH |
| **4. Recognize Face** | From the input face, find out who the face belong to | HoangPH |
| **5. Optimize** | Optimize the implement for more performance and accuracy | HoangPH |
| **6. Implement GUI** | Create the interface for extracting and storing face | HoangPH |
| **7. Testing** | Test system behavior and  performance  Test user behavior and  performance | HoangPH, HuyNQ, BinhNT, DatDM |
| **8. Document** | Adding SRS, SDD,  Installation Guide, Manual  Guide | HoangPH, HuyNQ, BinhNT, DatDM |

Table 7: Phase 2: Face Detect & Recognize

#### Phase 3: Student Management

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Identifying Requirement and Planning** | Which feature this function  should have and how to  implement. | HoangPH, HuyNQ, BinhNT, DatDM |
| **2. Design ER Diagram** | Design ER Diagram | HoangPH, HuyNQ, BinhNT, DatDM |
| **3. Manage Student** | Allow admin to add/edit/active/inactive student | HuyNQ |
| **4. Manage Student Face** | Each student has a training set, which contains 8-20 faces. Allow admin to add, edit images in this training set | HuyNQ, HoangPH |
| **5. Implement GUI** | Create the interface for managing student info | HuyNQ, HoangNQ |
| **6. Testing** | Test system behavior and  performance  Test user behavior and  performance | HoangPH, HuyNQ, BinhNT, DatDM |
| **7. Document** | Adding SRS, SDD,  Installation Guide, Manual  Guide | HoangPH, HuyNQ, BinhNT, DatDM |

Table 8: Phase 3: Student Management

#### Phase 4: Roll Call Management

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Identifying Requirement and Planning** | Which feature this function  should have and how to  implement. | HoangPH, HuyNQ, BinhNT, DatDM |
| **2. Manage Instructor** | Allow admin to add/edit/active/inactive instructor | DatDM |
| **3. Manage Course** | Allow admin to add/edit/active/inactive course | DatDM |
| **4. Manage Class** | Allow admin to add/edit/active/inactive course.  Assign student to class | HuyNQ |
| **5. Manage Roll Call** | Allow admin to create/edit/delete roll call.  Each roll call contain info: The instructor, the student list, the course, time, begin – end date | HuyNQ, HoangPH |
| **6. User Profile** | Instructor or student accounts will be created by system.  Instructor or student can log in to change their profile, password | HuyNQ |
| **7. Implement GUI** | Create the interface for managing roll call | HuyNQ, BinhNT, HoangPH |
| **8. Testing** | Test system behavior and  performance  Test user behavior and  performance | HoangPH, HuyNQ, BinhNT, DatDM |
| **9. Document** | Adding SRS, SDD,  Installation Guide, Manual  Guide | HoangPH, HuyNQ, BinhNT, DatDM |

Table 9: Phase 4: Roll Call Management

#### Phase 5: Web Service Implement

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Identifying Requirement and Planning** | Which feature this function  should have and how to  implement. | HoangPH, HuyNQ, BinhNT, DatDM |
| **2. Studying WCF** | Studying the create and using of WCF | HuyNQ |
| **3. Instructor Login** | Check the input id and password from mobile to login instructor | HuyNQ |
| **4. Get Instructor Info, Roll Call List** | Based on the instructor’s id, show to current roll call list | HuyNQ |
| **5. Face Recognize From Android Camera** | Studying about transferring image files between Android and WCF  Transfer the result back to Mobile for showing | HuyNQ, BinhNT |
| **6. Testing** | Test system behavior and  performance  Test user behavior and  performance | HoangPH, HuyNQ, BinhNT, DatDM |
| **7. Document** | Adding SRS, SDD,  Installation Guide, Manual  Guide | HoangPH, HuyNQ, BinhNT, DatDM |

Table 10: Phase 5: Web Service Implement

#### Phase 6: Attendance Checking

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Identifying Requirement and Planning** | Which feature this function  should have and how to  implement. | HoangPH, HuyNQ, BinhNT, DatDM |
| **2. Getting Image From Mobile, sending to Web Service** | Allow instructor to take picture of class, use picture for checking attendance | BinhNT |
| **3. Confirm result, re-check attendance manually** | Allow instructor to confirm and re-check attendance | BinhNT |
| **4. Stranger Alert** | Alert when detect stranger | BinhNT |
| **5. Implement Mobile App** | Create the Android App for instructor to User | BinhNT, HuyNQ, HoangNQ |
| **6. Testing** | Test system behavior and  performance  Test user behavior and  performance | HoangPH, HuyNQ, BinhNT, DatDM |
| **7. Document** | Adding SRS, SDD,  Installation Guide, Manual  Guide | HoangPH, HuyNQ, BinhNT, DatDM |

Table 11: Phase 6: Attendance Checking

#### Phase 7: Attendance Report

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| **1. Identifying Requirement and Planning.** | Which feature this function  should have and how to  implement. | HoangPH, HuyNQ, BinhNT, DatDM |
| **2. Report about absent rate of a course** | System will make report about the absent rate of a course by month/year | HoangPH |
| **3. Report about absent rate of a student** | Allow instructor to confirm and re-check attendance | HoangPH |
| **4. Export Report** | Admin can export report | HuyNQ |
| **6. Testing** | Test system behavior and  performance  Test user behavior and  performance | HoangPH, HuyNQ, BinhNT, DatDM |
| **7. Document** | Adding SRS, SDD,  Installation Guide, Manual  Guide | HoangPH, HuyNQ, BinhNT, DatDM |

Table 12: Phase 7: Attendance Report

### All Meeting Minutes

Refer to Meeting Minutes folder.

## Coding Convention

Java: Using to develop Android App.

Summary:

* Naming Convention.
* Indentation.
* Declaration.
* Code Examples

Follow “Code Conventions for the Java TM Programming Language, by Sun Microsystems, rev April 20, 1999”.

C#: Using to develop website and web service.

Summary:

* Naming Convention.
* Layout Convention.
* Commenting Convention.
* Language Guidelines

Using C# Code Convention From:

http://msdn.microsoft.com/en-us/library/vstudio/ff926074.aspx