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**MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Document

**Implementation of Surveillance Camera using Raspberry kit**

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| **Ext. Supervisor** | N/A |
| **Capstone Project code** | SCWR |

-Ho Chi Minh City, **21/05/2016**-

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Definitions, Acronyms, and Abbreviations

|  |  |
| --- | --- |
| Name | Definition |
| SCWR | Implementation of Surveillance Camera using  Raspberry kit |
| CCTV | Closed circuit television camera |
| SMS | Short message service |

A. Report No.2 Task Plan

1. Problem Definition

1.1. Name of this Capstone Project

- Implementation of Surveillance Camera using Raspberry kit.

1.2. Problem Abstract

The use of Raspberry with the support of the library OpenCV made recognition technology easily approach and quickly put into application life settlement is the requirement that the actual demand. Although recognition algorithm has yet to be absolutely accurate results, however, this technology still has a certain practical applications and high efficiency.

The system contains the software motion which enables the Pi’s camera to detect motion and save the image as well as view live streaming from the camera. You would never have to worry about looking back through recordings because this system would send directs SMS notifications, transmits intruder images to user, and make sound alarm every time motion is detected. Besides, combined with the convenience the Internet, takes the user to access the most amazing experience of modern technology with low cost and simple steps to configuration.

1.3. Project Overview

1.3.1 Current Situation and Disadvantages

New innovative technology revolves around how much a product is capable of implementing along with its price. Raspberry Pi crosses off both criteria because it is a cheap effective computer which is capable of much more.

1.3.1.1 Advantages

- Quick and simple setup, just plug in the power cord and download our application

- Intuitive Operation.

- Convenient, inexpensive technique of identification.

- Get alarms on your phone, so you know if something happens when you are away.

1.3.1.2 Disadvantages

- We must be familiar with the Unix operating system.

- Need to keep the power supplies and power outlets protected from the weather.

1.3.2 The Proposed System

SCWR is a high efficiency security measure and can protect you from burglary, theft and other crimes. Besides, SCWR also has an Android app and both of them must be connected to the internet.

Firstly, when something moves inside the monitored area, we must detect movement in the video stream. Next, the system has ability to detect that moving object is human or not, it helps to exclude the wrong thieves (such as mouses and cats).

In case moving object is human, we will switch over to still camera mode and take photos over the span of several seconds to capture the movement in high resolution snapshots. Finally, we make an alarm sound, sends an alarm message to users and transmits intruder images via WiFi to a static IP, which can be viewed using a web browser, even from your mobile. So that the user can easier monitor and call police.

1.3.3 Boundaries of the System

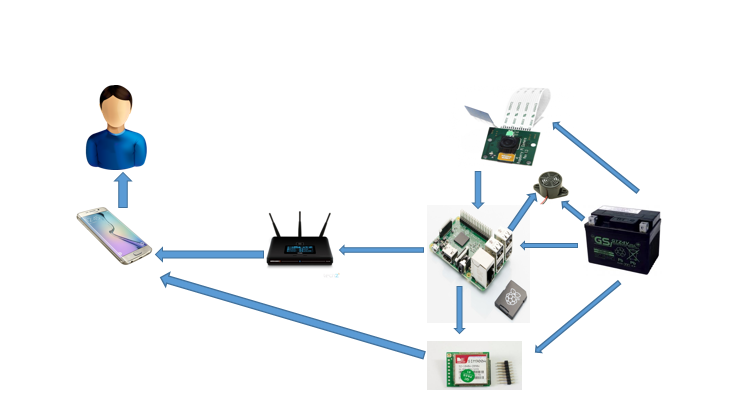
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Figure 1: Boundaries of the System

SCWR system has four blocks of subsystem. Firstly, Raspberry pi 3 will be Core Processer. Secondly, Camera Pi will be the Input Data of system. Thirdly, GSM Sim 900A and alarm circuit will be Alarm Block. And smart phone will be the display unit of Alarm Block, because smart phone will receive sms message with a link of intruder photo. Finally, SCWR also has a power supply circuit for Raspberry Pi 3, Camera, GSM and Alarm Circuit.

1.3.4 Development Environment

1.3.4.1 Hardware requirements

1. 2 Raspberry Pi 3

2. SMS GSM900

3. Camera module of raspberry kit

4. Adapter 12V

5. 4 Laptops with appropriate configuration for embedded development.

6. Card SD 16GB

7. Cashing

8. Sensor HC-SR04

9. Smart phone

10. BuzzerAT 1

1.3.4.2 Software requirements

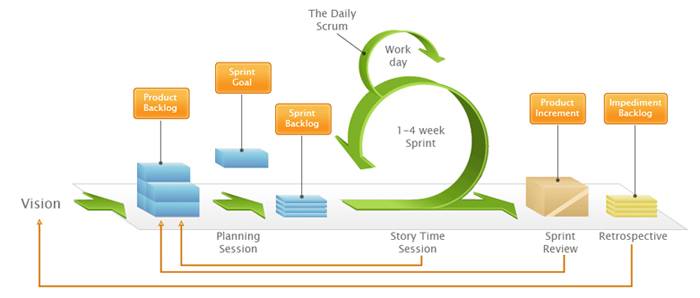
1. Visual Studio
2. OpenCV libraries
3. Linux environment
4. Github
5. Slack
6. Trello
7. StarUML
8. Putty

2. Project organization

2.1 Software Process Model

This project is developed under Scrum model. We choose this model because of following reasons:

* Scrum is easier to deliver a quality product in a scheduled time.
* Scrum allows us to change priorities and requirements quickly.
* Scrum has daily meeting that help us to measure individual productivity. Then we can improve the productivity of members.
* Issues can be defined and resolved rapidly because of daily meeting.

Figure 1: Scrum Model

Reference: <http://www.netspecglobal.com/approach.html>

For more information: <https://en.wikipedia.org/wiki/Scrum_(software_development)>

2.2 Roles and Responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Full name** | **Role in Group** | **Responsibilities** |
| **1** | Bùi Đại Trí | Supervisor, Project Manager | * Specify user requirements * Giving out technique and business analysis support * Control the development process |
| **2** | Đặng Ái Trinh | Team Leader, Business Analysis, Developer. | * Clarifying requirements * Creating plan * Managing process * Reviewing documents * Coding |
| **3** | Nguyễn Chí Nghĩa | Business Analysis, Developer, Tester | * Clarifying requirements * Configuring Hardware * Writing documents * Coding * Testing |
| **4** | Lê Long Hồ | Developer, Tester | * Writing documents * Coding * Testing |
| **5** | Nguyễn Hồng Lâm | Developer, Tester | * Writing documents * Coding * Testing |

2.3 Tools and Techniques

|  |  |
| --- | --- |
| Tool / Technique | Name / version |
|  |  |
| Circuit and PCB Design | Orcad Capture 16.6-p005 (v16-6-112D) |
| Programming | Python, Sublime/Notepad++, Visual Studio |
| Management | Slack, Github, SourceTree, Trello |
| Use cases Design | StarUml v2.7.0, Uml 2.0 |
| Environment | Raspbian Jessie, Ubuntu 15.0 |
| Monitor and remote | Putty, Remote Desktop Control |

3. Project Management Plan

3.1 Software development life cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sprint** | **Description** | **Deliverables** | **Resource** | **Dependencies** | **Risks** |
|  |  |  | **Needed** | **and** |  |
|  |  |  |  | **Constraints** |  |
| **Requirements** | Clarify requirements | Introduction of | 30 man- | Need to wait for | Missing |
| **Analysis** |  | proposed | days | supervisor ‘s | Requirement |
|  |  | system. |  | confirmation |  |
|  |  |  |  |  | Unclear |
|  | Identify and clarify | Software |  |  | scope of |
|  | project scope | requirement |  |  | project |
|  |  | specification. |  |  |  |
|  |  |  |  |  | Lack of |
|  | Choose and buy devices |  |  |  | member share |
|  |  |  |  |  | of understand |
|  |  |  |  |  |  |
| **Background** | Architecture design for | Software | 64 man- | Depend on | Lack of |
| **Preparing** | the system | design document | days | “Requirement | experience. |
|  |  |  |  | Analysis” |  |
|  | Detail design using |  |  |  | Not fulfil |
|  | top-down break down |  |  |  | requirement. |
|  | using top-down |  |  |  |  |
|  |  |  |  |  | Hardware |
|  | Choose architecture style |  |  |  | incompatible |
|  | Create project plan | Project plan |  |  |  |
|  |  | management |  |  | Lack of |
|  | Study documents | Component |  |  | Understanding |
|  |  | instructions |  |  |  |
|  | Configure hardware | Configure |  |  |  |
|  | devices | instructions |  |  |  |
|  |  |  |  |  |  |
| **SMS** | Configure and demo GSM | GSM instruction | 64 man- | Hardware | Hardware |
| **implementing** |  |  | days | Configuration | Incompatible |
| **and image** | Upload image to internet | Image upload |  |  |  |
| **uploading** |  | Instruction |  |  | Lack of |
|  |  |  |  |  | experience |
|  |  |  |  |  |  |
| **Detect** | Demo motion detection | Motion detection | 168 man- | Hardware | Lack of |
| **algorithm** |  | algorithm | days | Configuration | understanding |
| **and power** |  |  |  |  |  |
| **supply circuit** | Demo human detection | Human detection |  |  | Hardware |
| **implementing** |  | algorithm |  |  | Error |
|  |  |  |  |  |  |
|  | Integrate detect algorithm | Intruder detection |  |  |  |
|  |  | algorithm |  |  |  |
|  |  |  |  |  |  |
|  | Design and implement | Power Supply |  | Delay time for | Board broken |
|  | Power Supply Circuit | board |  | Making board |  |
|  |  |  |  |  |  |
|  | Test and fix bug | Test report |  |  | To many bugs |
|  |  |  |  |  |  |
| **Completing** | Update documents | Software | 64 man- |  |  |
|  |  | specification | days |  |  |
|  |  | requirement (full) |  |  |  |
|  | Update test reports | Test reports (full) |  | Finish testing |  |
|  | Prepare slide for presenting | Presentation slide |  |  |  |
|  | Upgrade needed documents |  |  |  |  |

3.2 Sprint Detail

3.2.1 Sprint 1: Requirements Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Task** | | **Description** | **Author** |
|  | Collect requirement | Clarify requirement, identify scope | Trinh DA, NghiaNC |
|  | | and verify with supervisor | Ho LL, Lam NH |
| Write report | | Write week reports | Ho LL |
| Make slide | | Make slide for reporting | NghiaNC |

3.2.2 Sprint 2: Background Preparing

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| Prepare hardware | Choose and buy hardware devices  (2 Raspberry Pi 3, Camera Pi,  GSM 900) | NghiaNC |
| Install OS | Install Raspbian OS to 2 Raspberry | NghiaNC |
|  | And configure |  |
| Configure virtual | Install Ubuntu and Open CV on Linux | Ho LL |
| Environment (Linux) |  |  |
| Create project plan | Create project plan with detail task | Trinh DA |
|  | Choose development model |  |
| Study Open CV | Study Open CV documents to demo | Trinh DA, Lam NH |
|  | detection algorithm | Ho LL |
| Study Math lab | Study Math lab documents to demo | Lam NH |
|  | detection algorithm |  |
| Configure GSM | Configure GSM, interface with | NghiaNC, Lam NH |
| Sim 900A | Raspberry to send/receive SMS |  |
| Write report | Write week reports | NghiaNC, Ho LL |
| Make Slide | Make slide for reporting | NghiaNC |

3.2.3 Sprint 3: SMS implementing and Image uploading

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| Send SMS via GSM | Send/receive sms by using GSM 900 | NghiaNC, Lam NH |
| Sim 900A | And Raspberry Pi |  |
| Upload image | Study and demo how to upload an | Trinh DA |
|  | image from Raspberry Pi to a server |  |
|  | on the internet |  |
| Study distance sensor | Study and demo application of | Ho LL |
|  | distance sensor |  |
| Capture image | Demo capture image with time setting | Lam NH |
|  | by using camera pi |  |
| Write report | Write week reports | NghiaNC, Ho LL |
| Make Slide | Make slide for reporting | NghiaNC |

3.2.4 Sprint 4: Detect Algorithm and Power Supply Circuit implementing

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| Power Supply Circuit | Design and implement power supply | NghiaNC, Ho LL |
|  | for raspberry, gsm 900, alarm circuit and camera |  |
| Alarm Circuit | Design and implement alarm circuit | NghiaNC, Ho LL |
| Integration system | Integrate raspberry with gsm, camera | Trinh DA, NghiaNC |
|  | Power supply, alarm circuit | Ho LL, Lam NH |
| Test system | Implement test process to find out | Ho LL, NghiaNC |
|  | unexpected error |  |
| Fix bug | Correct unexpected bug | Trinh DA, Lam NH |
| Write report | Write week reports | NghiaNC, Ho LL |
| Make Slide | Make slide for reporting | NghiaNC |

3.2.5 Sprint 5: Completing

|  |  |  |
| --- | --- | --- |
| **Task** | **Description** | **Author** |
| Test system | Implement test process to find out | Ho LL, NghiaNC |
|  | unexpected error |  |
| Fix bug | Correct unexpected bug | Trinh DA, Lam NH |
| Write documents | Write Software Specification | Ho LL, NghiaNC |
|  | Requirement | Trinh DA |
| Write report | Write week reports | NghiaNC, Ho LL |
| Make Slide | Make slide for reporting | NghiaNC |

3.3. All Meeting Minutes

* All meeting reports is located at:

<https://github.com/cp-scwr/SCWR/tree/master/Meeting_Minutes>

4. Coding Convention

General view of JAVA Programming Style put into practice in the project:

* Naming Conventions:

-Variable name should be short yet meaningful. If the name is more than one word, it must be in mixed case, starting word with a lowercase.

-Constants name should be all uppercase with words separated by underscore.

-Methods name should be verbs, in mixed case with the first word lowercase, the first letter of each internal word capitalized.

-Class name should be nouns, in mixed case with the first letter of each internal word capitalized.

* Package and import statements:

-Package statement is the first non-comment line.

-Import statement is after package statement.

* Constants

-Numerical constants should not be coded directly.

* Variable Assignments:

-Advoid assigning serveral variables to the same value in a single statement.

* Comments:

-Using /\* \*/ for block comments

-Using // for line comments

* Return Statements:

-A return statement with a value should not use parentheses.

References:

**Code Conventions for the Java TMProgramming Language**

Revised April 20, 1999

<http://www.oracle.com/technetwork/java/codeconvtoc-136057.html>