HOME MONITORING SYSTEM

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BORANG PENGESAHAN STATUS TESIS*

JUDUL: HOME MONITORING SYSTEM

SESI PENGAJIAN: 2015/16

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HOME MONITORING SYSTEM

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This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Software Development)

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FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
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2016

DECLARATION

I hereby declare that this project report entitled

HOME MONITORING SYSTEM

is written by me and is my own effort and that no part has been plagiarized without citations.

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STUDENT : _____ Date: 26/8/2016

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(DR SABRINA AHMAD)

DEDICATION

This project is dedicated to
my beloved family.

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Thank God for the consent, the Home Monitoring System development have proceed smoothly and successfully.

I would like to express my sincere gratitude to Dr. Sabrina Ahmad. I am very thankful to her for supporting me throughout my project and willing to accept me under her supervision. Thank you for providing me with helpful guidelines and knowledge to be share with.

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ABSTRACT

In present day, house break-in is one of the crime cases happen in residential area when the residents are not home especially during holiday season. Today technology enables us to create a system to monitor and detect house intruders. This project shall use a web application develop using php with mySQL database and is connected to a hardware called Arduino to monitor the house. The web application shall be use to monitor and automate the hardware based on user's selection command. The hardware is connected with the magnetic sensor and motion sensor will detect any movement/activity in the house and prompt notification to the user phone. This system is build especially for those who is in need of a low cost security system for secure and serene living.

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ABSTRAK

Pada masa kini, kes pecah rumah merupakan salah satu kes jenayah yang sering berlaku di kawasan perumahan apabila penduduk tidak berada rumah terutama pada musim cuti perayaan. Teknologi hari ini membolehkan kita untuk mewujudkan satu sistem untuk memantau dan mengesan penceroboh di dalam rumah. Projek ini akan menggunakan aplikasi web, dibangunkan menggunakan php dengan pangkalan data mySQL dan disambungkan kepada perkakasan yang dipanggil Arduino untuk memantau keadaan rumah. Aplikasi web boleh digunakan untuk memantau dan mengautomasikan perkakasan mengikut kehendak pengguna. Perkakasan ini adalah disambungkan dengan sensor magnet dan sensor pergerakan yang akan mengesan sebarang pergerakan / aktiviti di dalam rumah lalu menghantar pesanan ringkas (SMS) kepada telefon pengguna. Sistem ini dibangunkan terutamanya untuk mereka yang memerlukan sistem keselamatan berkos rendah untuk kehidupan yang selamat dan tenang.

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LIST OF ABBREVIATIONS

3G	3rd Generation
API	Application Program Interface
DFD	Data Flow Diagram
IDE	Integrated Development Environment
IP	Internet Protocol
PHP	PHP: Hypertext Preprocessor
PIR	Passive Infrared
RAM	Random-access memory
SDLC	Software Development Life Cycle
SMS	Short Message Service
SQL	Structured Query Language
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

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CHAPTER I

INTRODUCTION

1.1 Project Background

In present day, home break-in is one of the crime cases happen in residential area when the residents are not home especially during holiday season. One of the causes of home break-in is because the carelessness of the resident who overlook to lock their windows or door. Today technology enables us to create a system to monitor and secure the house from intruders.

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This project shall use a web application that connected to a hardware called Arduino to monitor the house. The web application shall be use to monitor and automate the hardware based on user's selection command. The hardware will detect any movement/activity in the house and prompt notification to the user phone.

1.2 Problem Statement(s)

The possibilities of home break-in has makes home security system as an important issue nowadays. Due to the lack of awareness by the house owner on home security and lack of security and safety features inside the house will make their house to be targeted by intruders. Besides that if the house owner is away from home, they cannot monitor their home and know the activity inside their house. Lastly if they are away from home, they need to ask someone else like close relatives or neighbors to watch their home.

1.3 Objective

1. To monitor home using web application.
2. To control the system using web application.
3. To provide prompt notification through instant messaging.

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1.4 Scope

This system is build especially for those who is in need of a low cost security system for their houses. Web platform has been chosen for the development of the project. Web platform is chosen as it can be access using a web browser from the computer or handy devices such as smart phone and tablet. Apart from that, the system will use an Arduino that connected with alarm, motion detection sensor and magnetic sensor for the door. Besides that, the Arduino will act as the hub for the monitoring system. Moreover, the system also provides a notification services if there is an activity inside the house. This notification will not only notify the user if there is intruder in the

house but also help user to take the next action immediately. The system can be controlled and monitored from any places with network coverage by accessing the web server. User can use any internet connection either via Wi-Fi network or internet data plan to communicate with the system.

1.5 Project Significance

This project is significant for any house owners that want a safer and better protection of their house. It will also reduce house break-in and create a safer environment for the user and their family to live.

1.6 Expected Output

This system can be tested and used to reduce and prevent the home break-in crime. Further research can be conducted to improve the system effectiveness.

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1.7 Conclusion

In a nutshell, this project is about to develop a web based Home Monitoring System that will create a safer surrounding for user home. The development of this project based on the objectives stated before is expected to be fulfilled. The project is believed to be able to contribute to community and technology innovation.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter describes about the literature review and project methodology of Home Monitoring System. Literature review is an important aspect to get the associated data for the system. The development of this project requires the developer to study on several ideas. Various resources such as journals, internet, articles, books and so on provide different kinds of concepts and methods used by others can be learned.

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2.2 Fact and Findings

House break-ins usually happen in residential area when the residents are not home especially during holiday season (Utusan, 2011). Malaysia's crime index recorded a 4.6 per cent increase between January and April 2016 due to an increase in property crimes. Early 2016 saw the numbers of 6,662 house break-ins cases were recorded (New Straits Times, 2016).

2.2.1 Domain

Security system can be defined as a system which alert user if an intrusion or disturbance are detected inside or outside the house. People cannot easily monitor their house every time. Thus, the development for a Home Security System is important topic in real life.

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The domain of Home Monitoring System is to monitor an activity inside of the house when the users are away from their home or during their sleep time. If there is a detection of activity inside the house, users will be alert with a text message notification on their mobile phone. Users can also activate and deactivate the system by using the web application. The system will store the record of the activity on the database. Hence the user will know the time of the activity occur.

2.2.1.1 Arduino

Arduino is a popular open-source single-board microcontroller. It is the descendant of the open source Wiring platform which used to make the process of using electronics in multidisciplinary projects more accessible. Arduino worked by using the Arduino IDE which is the open source software design for the Arduino board (Banzi, 2011). The software consists of a standard programming language compiler and the boot loader that runs on the board. Arduino is programmed using a wiring based language which is similar to C/C++ with some slight simplifications and modifications, and a Processing based integrated development environment. There are currently different type of Arduino such as UNO, Mega and YUN.

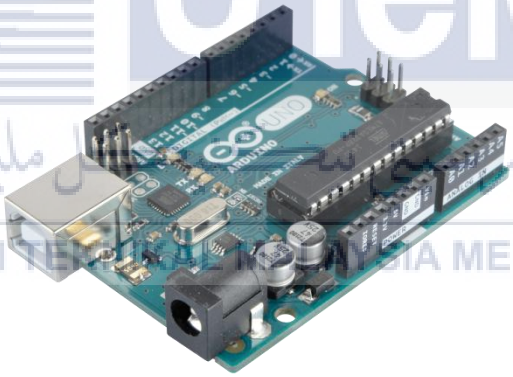

Figure 2.1: Arduino UNO

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2.2.1.2 Ethernet Shield

The Ethernet Shield is an additional board which allows an Arduino board to connect to the network. The board is based on the Wiznet W5100 ethernet chip providing a network (IP) stack capable of both TCP and UDP. The Arduino Ethernet Shield supports up to four simultaneous socket connections. Moreover, it is equipped with more features compare to the original Arduino Ethernet. One of the features added in Arduino Ethernet Shield is Micro-SD slot which serves to store any files on the serving network.

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Figure 2.2: W5100 Ethernet Shield

2.2.1.3 PIR Motion Sensor

According to Hans J. Keller (2000), the term "Passive Infrared", or "PIR", is commonly assigned to the technology of motion detectors used to detect people by sensing the thermal infrared radiation emitted through the human body. It is the most common detector used nowadays to detect motion. It works by use thermal sensors, detecting the small temperature increase when the sensor element is exposed to radiation and absorbs it.

One of the benefits using PIR detector is it is really cheap and reliable. It can be also found easily in any hardware an electronic shop. Apart from that, it is very small and can be hidden in a place where people cannot see.

Some of the limitation of PIR sensor is it cannot detect a slowly moving object. Besides that, the detector is temperature sensitive. If the surrounding temperature is higher than 30 degree Celsius, the detector is unable to sense effectively. Although it can sense up to 2000 square feet, the maximum sensing angle that it can cover is only 270 degree. This will give a blind spot for it. However, this will not be an issue if PIR detector is mounted to the wall as it only needs to cover around 180 degree.

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2.2.1.4. Magnetic Sensor

A magnetic sensor is device assigned for detecting a magnetic field. The working standard of magnetic sensor depends on the utilization of reed contacts, whose thin plates are hermetically fixed in a glass knob with inert gas. The presences of a magnetic field makes the slight plates flex and touch each other to make an electrical contact.

2.2.2 Existing System

From an internet research and publish journal, there are several existing system that provide a similar function as Home Monitoring system. They are Smart Surveillance Monitoring System Using Raspberry PI and PIR Sensor, Home Security System, and Ubiquitous Smart Home System Using Android Application.

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2.2.2.1 Smart Surveillance Monitoring System Using Raspberry PI and PIR Sensor

Sanjana Prasad et al. (2014) proposed a monitoring system that captures information and transmits it via a 3G Dongle to a Smart phone using web application. The system use a Raspberry Pi as the hub with motion sensor and video camera module for remote sensing and surveillance, stream live video on the web and store it for future playback. The motion sensor is used to find the number of people located. If the motion sensor detects a movement, the camera automatically records the video. Then the Raspberry Pi will alert the house owner of possible break-in on their phone.

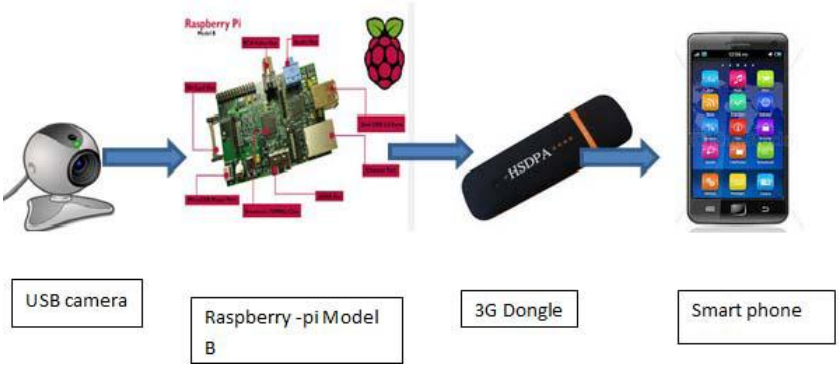

Figure 2.3: System design by Sanjana Prasad (2014)

Raspberry Pi has two main components interacting with each other. First is the web application that runs on the mobile device's browser. The other component is the server-side scripts that run in a cloud which will be operated by the Raspberry Pi.

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2.2.2.2 Home Security System

Another research study also been done by Dhadiwal Kalpesh Paraskumar et al. (2014) on a journal named Home Security System. They stated that with new arising technologies in this era, smart home security provides a comfortable and safe environment for users. The current home security systems use sensors that are installed to detect the intruders which will give out alarm when it is generated. The system uses a wireless technology for communication between the devices.

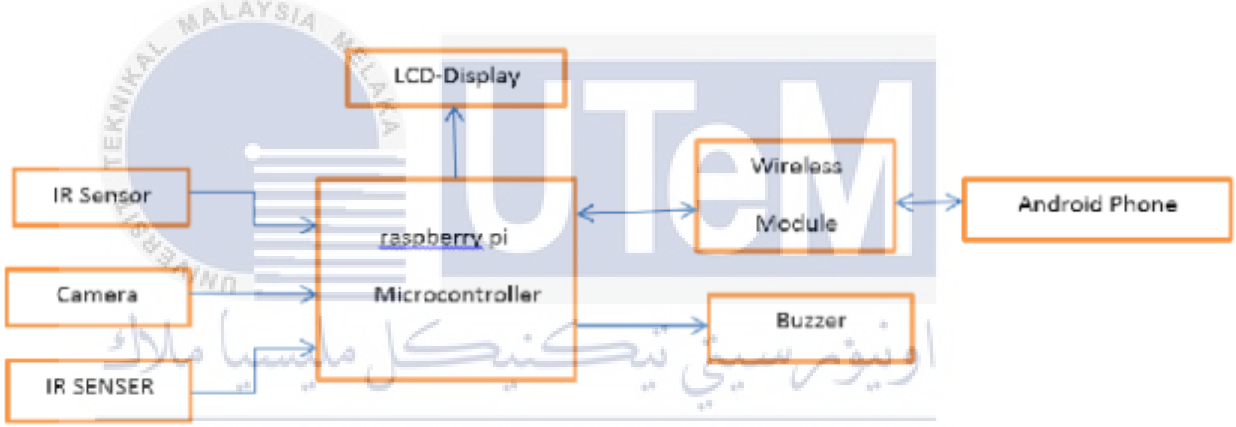

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Figure 2.4: Diagram of design architecture by Dhadiwal Kalpesh (2014)

The system provides monitoring of house if the house owner is not at home and will provide a good security to detect a break-in. Raspberry Pi is used as the microcontroller for this system. Other peripherals modules include are IR sensor, camera, buzzer and LCD display. A wireless module will become the medium for the connection between the Raspberry Pi and Android phone.

2.2.2.3 Ubiquitous Smart Home System Using Android Application

Ubiquitous Smart Home System Using Android Application is a low cost smart home system for remotely controlling and monitoring the smart home environment (Kumar, 2014). The system consists of an application developed using the Android platform and an Arduino with ethernet based micro web-server. The Arduino microcontroller is the main controller that hosts the micro web-server and performs the necessary actions that needs to be carried out. The Arduino microcontroller will control other peripherals such as motion detector, gas and smoke detector, door lock, alarm, temperature and humidity sensor, fan, light, air conditioner, electric gate, and other devices. If the motion sensor detects any intrusion, a notification will be send to the user via e-mail.

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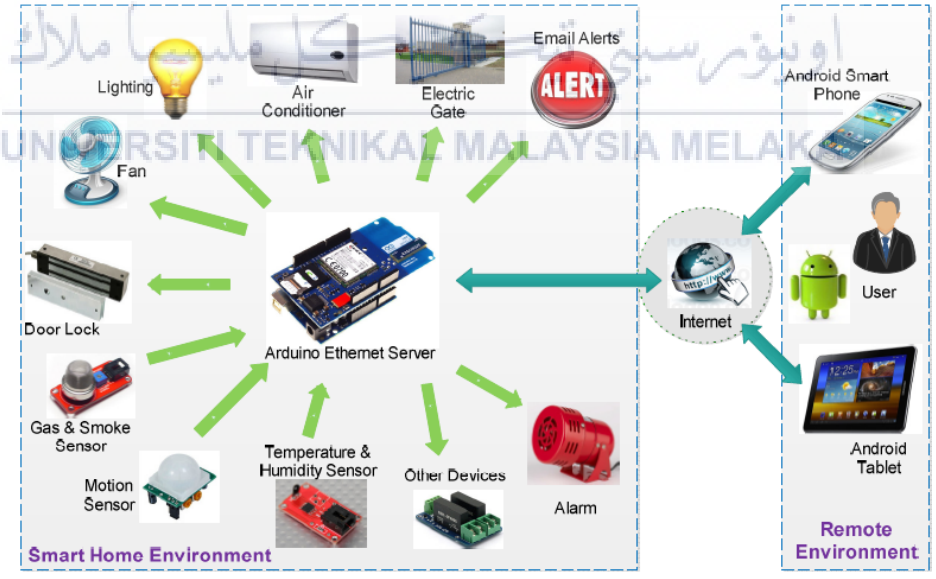

Figure 2.5: Diagram of design architecture by S. Kumar (2014)

2.2.3 Comparison between Existing Systems and System to be Develop

	Home Monitoring System	**Smart Surveillance Monitoring System Using Raspberry PI and PIR Sensor**	**Home Security System**	**Ubiquitous Smart Home System Using Android Application**
System Type	Web based	Web based	Android	Android
Microcontroller used	Arduino with Ethernet Shield	Raspberry Pi	Raspberry Pi	Arduino with Ethernet Shield
User interface	User friendly with bootstrap implementation	User friendly and straightforward	User friendly	User friendly and simple interface
Data Storage	Database	SD card	Cloud Storage	No database
Strength	Keep every record of possible intrusion	Streams live video and records for playback	Can capture image of intrusion	has various type of security which make the house environment more comfortable
Weakness	Only use motion detectors as its security measurement	Lack of notification services	Lack of notification services	No record for every event inside the house

Table 2.1: Comparison of Existing System and System to be developed

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2.3 Project Methodology

Methodology is a development process of technology that can be referred as a system management of projects. It contain procedures, definitions and explanations of the techniques used to collect, store, analyze and present the information as part of the investigation process. There are many types of methodologies that can be used as a guide such as waterfall, rapid application development, spiral, agile and more.

To develop this system, this project shall use the agile methodology of software development project methodology because of the methodologies simplicity and lightweight. Agile methodologies are an alternative to waterfall, or traditional sequential development. It promotes adaptive planning, evolutionary development, early delivery, continuous improvement, and encourages rapid and flexible response to change. In agile methodologies, there are four phases of software development cycle involves that combines the element of Standard System Development Life Cycle (SDLC). The agile methodology is also suitable if there is often change on business requirements, sometimes dramatically during the product development.

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While working on the project, there will always new things or improvement to be added. With agile methodology it is able to respond to the ever changing requirements throughout its development. The reason is in agile methodology every aspect of developments such as requirements, design, coding and so on is continually revisited. Therefore any change of requirement did mot poses any threat.

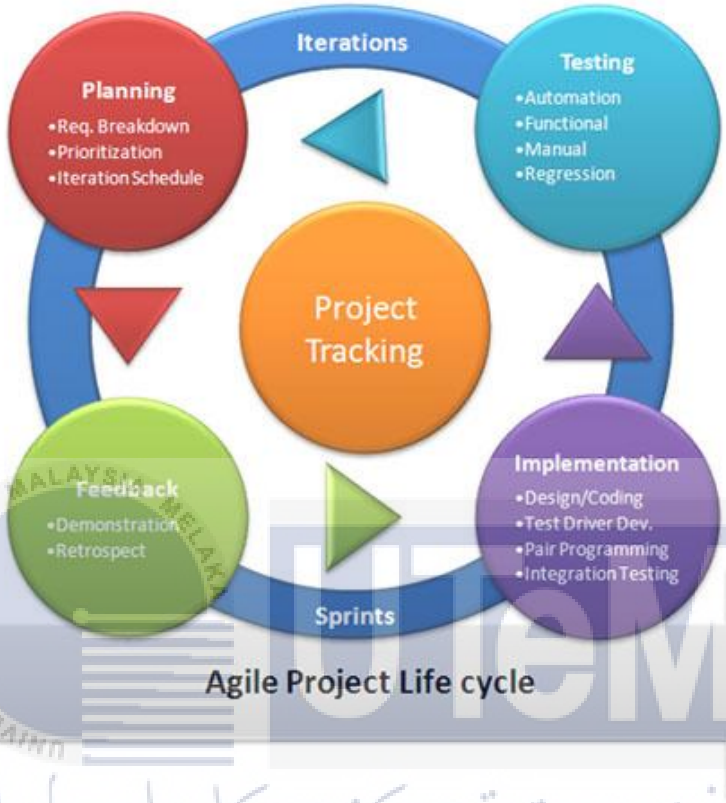

Figure 2.6: Agile Methodology

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In figure above are the phases that are going are to be followed in this methodology. In order to develop the system efficiently, all the phases must be done appropriately.

1. **Planning:** Planning is required before the start of any phase of development. It is important to understand more on the flow of the system throughout its development. In this phase requirements are collected from previous research. The design for the system is also created during this phase to ensure that the system will follow the guideline that had been produced.

2. **Feedback:** In this phase, a verification of the system will be carried out to find whether it meets the specification or need any changes to be made. Analysis of potential issues that may rise in future is also carried out in this phase.

3. **Implementation:** This is the phase where all planning and designs are realized. It is time consuming as coding and programming occurs in this phase. The system is actually built, tested, and installed in this phase.

4. **Testing:** This phase will close all the phases involved. The system is now prepared for release. This includes final documentation, integration, pre-release staged testing, and release.

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2.4 Project Requirements

2.4.1 Software Requirements

Table shows the software required to develop the Home Monitoring System.

Software	**System Requirement**
Operating System	Windows 2000 or higher
Web Server	XAMPP Server
Database	PhpMyAdmin (MySql)
Website Tool	Notepad++, Text Editor
Arduino Software (IDE)	Windows 2000 or higher

Table 2.2: Software Requirements

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2.4.2 Hardware Requirements

In order to develop this system the hardware that are required are as in table.

Hardware	**Requirement**
Computer/Laptop	Intel Pentium 4 or higher
RAM	512MB or higher
Hard Disk	Minimum 50 GB
Arduino Microcontroller	Arduino UNO or higher
Ethernet Shield	W5100 Module
Infrared Sensor	PIR Motion Sensor Module
Magnetic Sensor	Digital Magnetic Sensor Module

Table 2.3: Hardware Requirements

2.5 Project Schedule and Milestones

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16
Planning: Collecting Requirement																
Analysis																
Design: Interface Database																
Implementation																
Testing and Maintenance																

Table 2.4: Gantt Chart

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Week	Date	Activity
1	22-26 February	• Proposal submission and presentation
2	29 Feb – 4 March	• Proposal correction • Chapter 1
3	7-11 March	• Chapter 1
4	14-18 March	• Chapter 1 • Chapter 2
5	21-25 March	• Chapter 2
6	28 March – 1 April	• Chapter 2 • Chapter 3
7	4-8 April	• Demonstration • Chapter 3 • Chapter 4
8	Mid Semester Break	
9	18-22 April	• Demonstration • Chapter 4
10	25-29 April	• Demonstration • Chapter 4
11	2-6 May	• Demonstration • PSM Report
12	9-13 May	• Demonstration • PSM Report
13	16-20 May	• Demonstration • PSM Report
14	23-27 May	• Poject Demonstration and PSM Report
15	30 May – 3 June	• Final Presentation
16	6-10 June	• Draft report correction • Submission of final PSM Report

Table 2.5: Project Milestones

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2.6 Conclusion

In a nutshell, this chapter describe about the literature review and the methodology used for the project. Also mentioned in this chapter is the current existing system that has been developed by other researchers. Besides that, the project schedule and milestones are also included to show the timeline of the project development.

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CHAPTER III

ANALYSIS

3.1 Introduction

This chapter discusses the principal objective of system analysis phase which defines the specification of what the system needs to do in order to satisfy the requirements of end users. The matters are addressed in a manner so that problems can be identified and solved by the proposed system. Simply put, analysis is the process to identify and to study a procedure in order to identify goals and purposes and create systems that can achieve them effectively. Using Data Flow Diagram, the chapter will further show the scope and boundaries of the proposed system.

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3.2 Problem Analysis

The reason why this project is to be develops because house owner does not know the current situation of their house. When the house owner leaves their home, it exposed their house for intruders to break-in. This will cause a problem for them because most intruders today usually will target a house without their owner presence before stole valuable belongings such as jewelry, electronic gadget and cash. If break-in happens, they will not know when the intrusion happens and cannot take immediate action to prevent the intrusion.

Besides that, home without security are usually target by intruders. They can easily break-in inside the house without the need to worry their presence being recorded by the system. If the target house is equipped with the security system, intruders will leave the house area and try to search for another house. Usually security systems used for home include an alarm. The activate alarm will cause panic to the intruders and make them leave.

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3.3 Requirement Analysis

3.3.1 Data Requirement

For this project, the required data to develop the system have been identified. The data dictionaries are created as in table.

Column	Null	Type	Primary
id	No	int	Yes
first_name	No	varchar	No
last_name	No	varchar	No
username	No	varchar	No
password	No	varchar	No

Table 3.1: Table users

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Column	Null	Type	Primary
id	No	int	Yes
section	No	varchar	No

Table 3.2: Table house

Column	Null	Type	Primary
id	No	int	Yes
time	No	time	No
date	No	date	No
value	No	varchar	No

Table 3.3: Table motion_detection

Column	Null	Type	Primary
id	No	int	Yes
time	No	time	No
date	No	date	No
value	No	varchar	No

Table 3.4: Table door_detection

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3.3.2 Functional Requirement

Below is the context diagram of the system. It contains login process, activation of the system, notification, view detection history and manage house section.

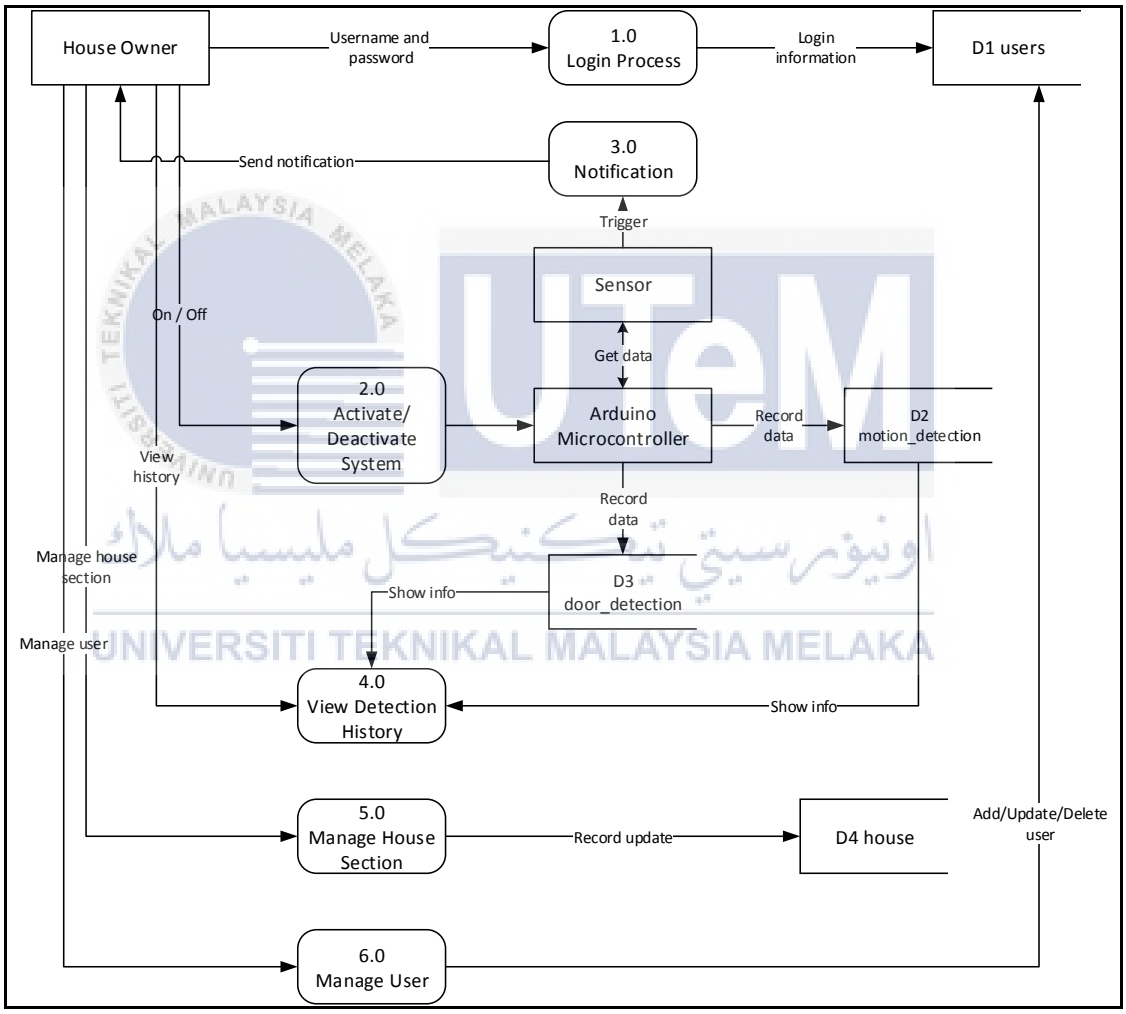

Figure 3.1: Home Monitoring System Data Flow Diagram Level 0

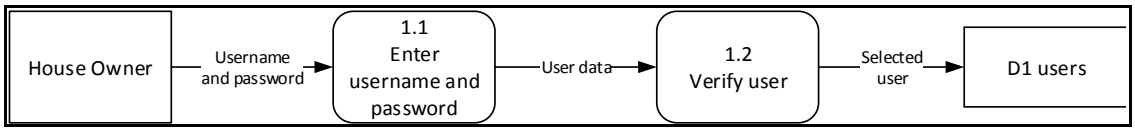

Figure 3.2: Login Process Level 1

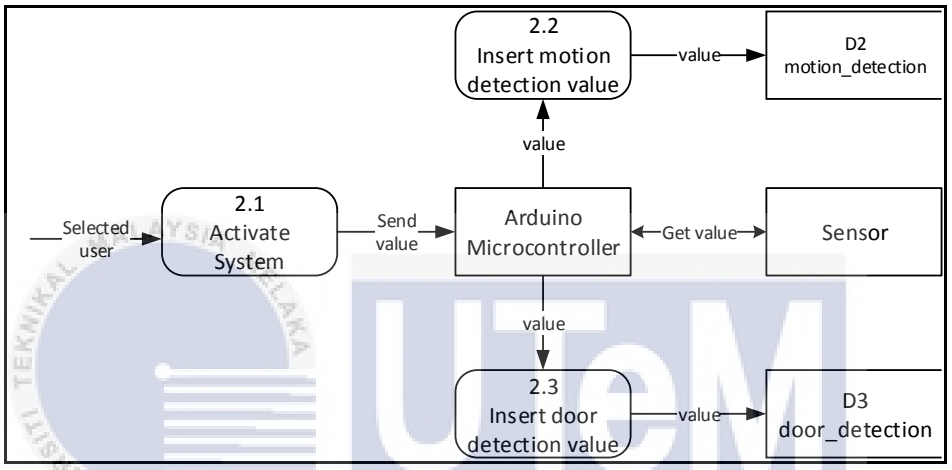

Figure 3.3: Activate system process Level 1

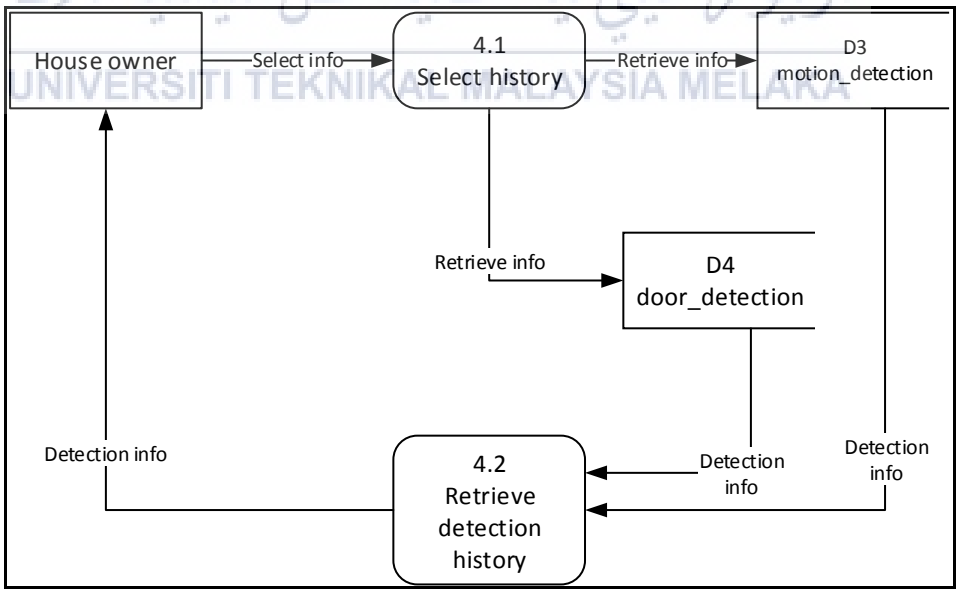

Figure 3.4: View detection history process Level 1

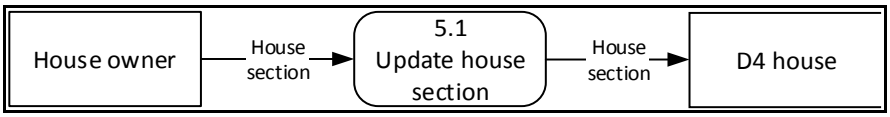

Figure 3.5: Manage house section process Level 1

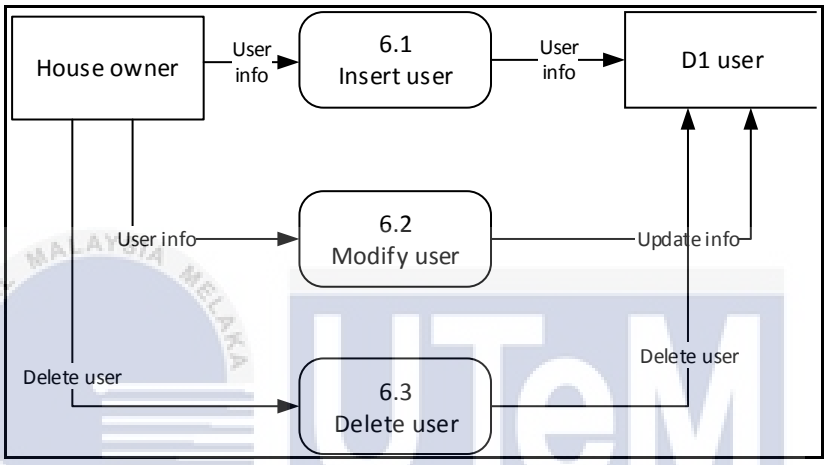

Figure 3.6: Manage user process Level 1

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3.3.3 Non-functional Requirement

The remaining requirements that are not covered by the functional requirements are known as non-functional requirements or sometimes quality attributes. The examples of non-functional requirements that are required but not include as the functional requirement of the system are performance, usability, security and reliability.

3.3.3.1 Performance

One of the non-functional requirements in the system is it must provide a quick response time. When motion detector senses motion, the response time for it to send a signal to microcontroller must be quick as possible so that microcontroller can trigger

the buzzer alarm to make noise. The system must be able to send notification to user when intrusion is detected.

3.3.3.2 Security

Authentication is important as it ensure the security of the system. With authentication the system can only be access by the right users. Unauthorized person who are not registered with the system is prohibited to access the system.

3.3.3.3 Validation

In the system, there is several numbers of processes that require validation. Examples include leaving a blank field on username or password and mismatch in filling the username or password.

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3.4 Conclusion

This chapter discusses and previews on the analysis phase and how it would be developed. Data requirement, regarding on what data the system should input and output as well as what data the system should store internally is also stated. This is illustrated by using data model or data dictionary.

CHAPTER IV

DESIGN

4.1 Introduction

This chapter shall focus on the design solution and discuss how it can solve the problem. System design is the process of defining the architecture, components, modules, interfaces, and data of a system to satisfy specified requirements. High level design focus on the system architecture which is the conceptual model that defines the structure, behavior of a system. The system architecture diagram and entity relationship diagram are also included as the output produced in this chapter of the report.

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4.2 High Level Design

4.2.1 System Architecture

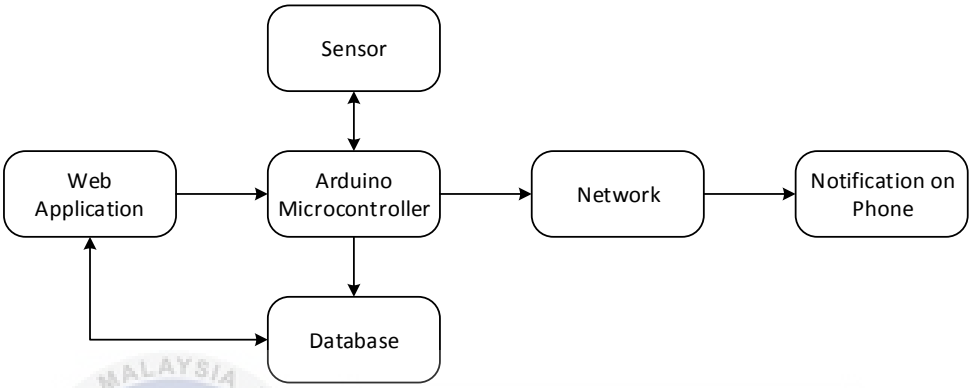

Figure 4.1: System Architecture

Based on figure 4.1, the web application for Home Monitoring System will act as the controller to activate the system. It can also retrieve the entire record store inside the database table. When the microcontroller is activated, it will retrieve every data trigger by the sensors. All the data which consist of time, date and sensor detection value will be stored inside motion_detection table and door_detection table. Besides that, when the sensor trigger any event the microcontroller will send a notification to the user phone via a connected network.

4.2.2 User Interface Design

4.2.2.1 Navigation Design

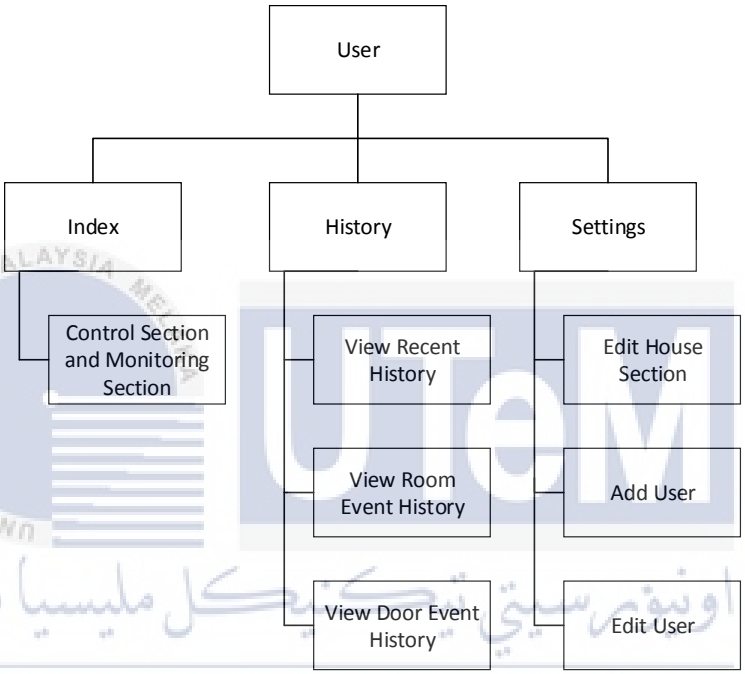

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Figure 4.2: Navigation Design

Figure 4.2 shows the navigation design and the flow of Home Monitoring System access by an authorized user.

4.2.2.2 Input and Output Design

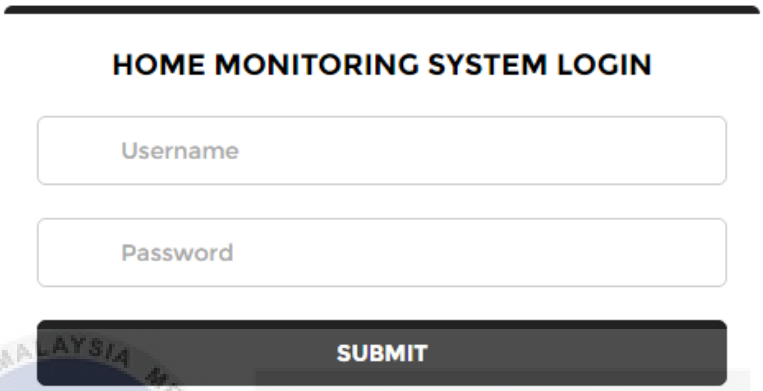

Figure 4.3: Login screen of Home Monitoring System

Figure 4.3 shows the login screen of Home Monitoring System. The user will use their own username and password to access the system. If the users enter a correct username and password they will be redirected to the index page. If they enter incorrect username or password, they will be alert with a message stating the error.

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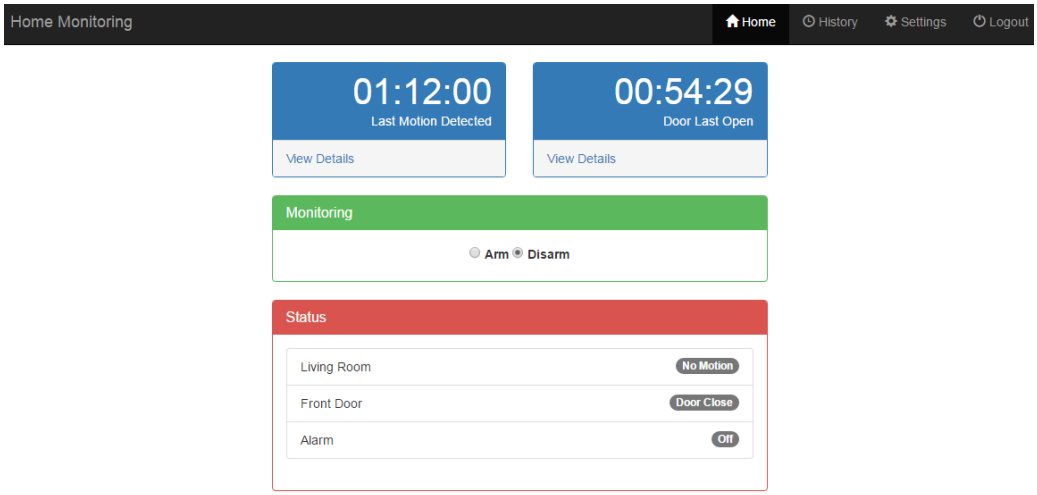

Figure 4.4: Interface of control section and monitoring section

Figure 4.4 shows the control section and monitoring section of the system. The history panel shows the summary of current event occur inside the house. The monitoring panel is used to activate the microcontroller and sensors. In the status panel, user can view the status of the room and door whether there is motion or door has been opened or closed.

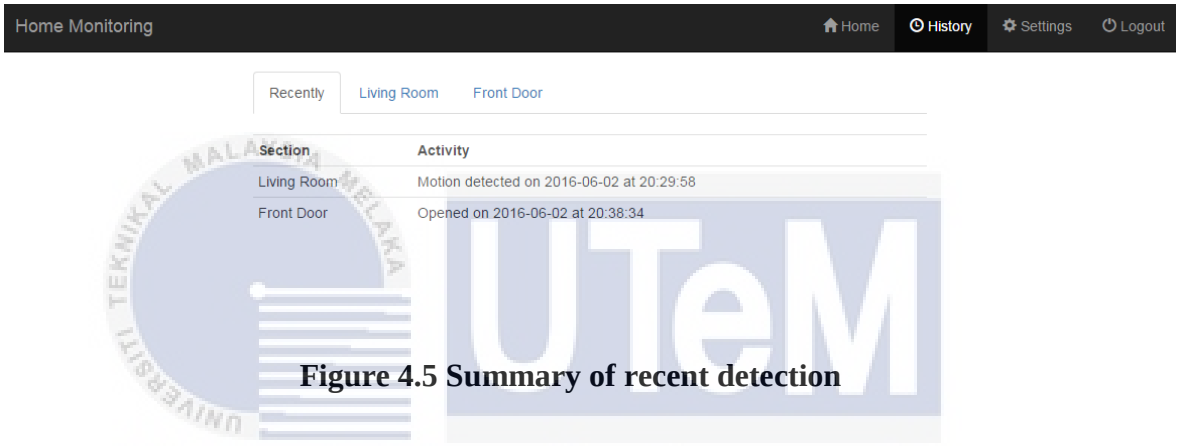

Figure 4.5 Summary of recent detection

The figure 4.5 is the recent history of activity recorded by the sensors. The record will be updated every time the sensors detect any event.

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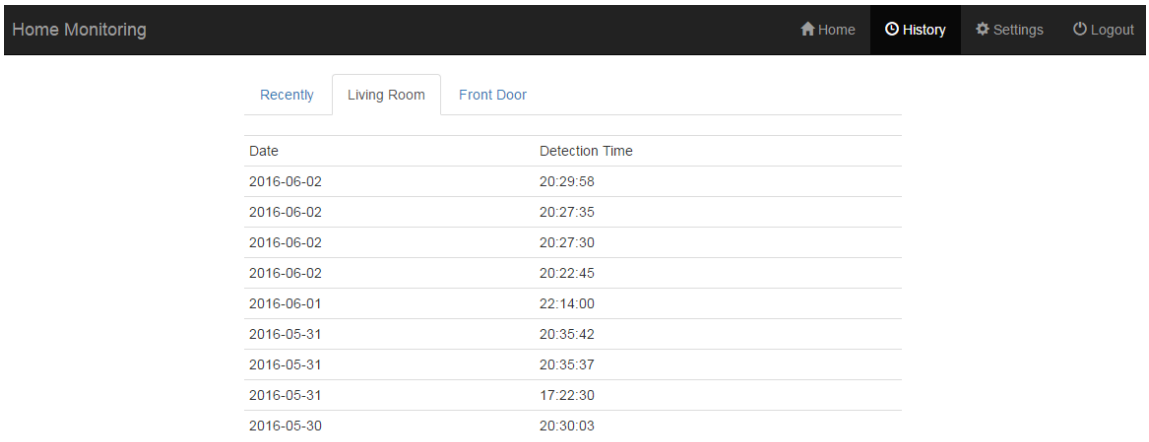

Figure 4.6: List of detected activity

When users click the Living Room tab or Front Door tab, the system will show all the details of recorded activity. The activity record is sync with the latest date and detection time.

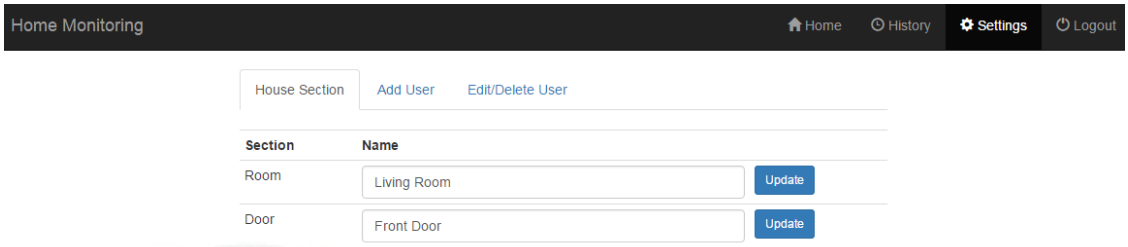

Figure 4.7: Editing house section

Figure 4.7 shows the editing page for house section. In this page, user can change the name of the house section as it is necessary if they want to change the monitoring section such as from living room to family room or front door to back door.

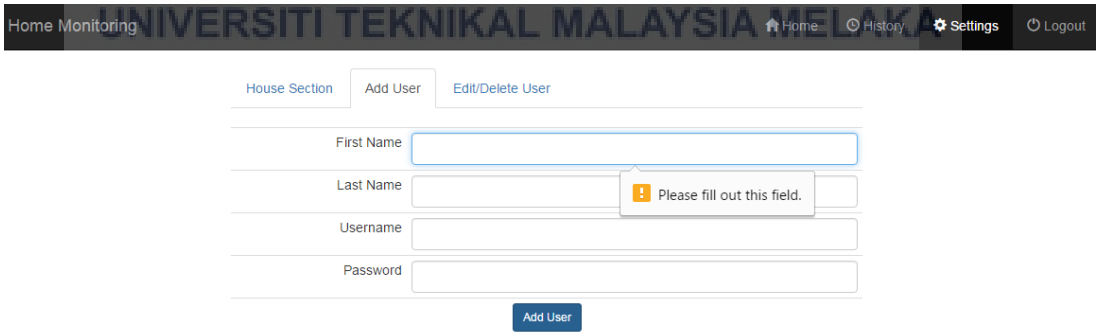

Figure 4.8: Add user

In add user tab, the current user can add another user who is a family members of the house. User need to fill their information and cannot leave any blank space inside the form. If there is a blank space, user will be notified to fill out the field before they can proceed to add another user.

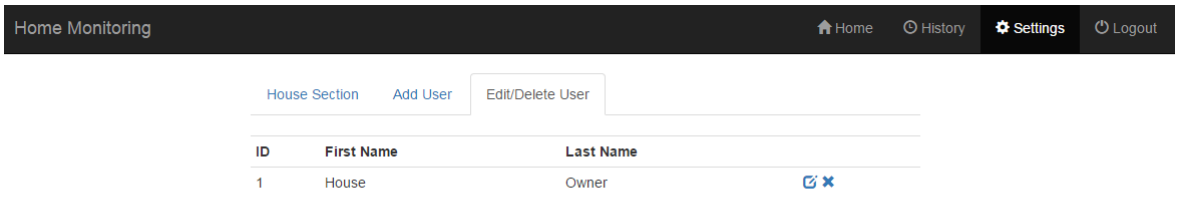

Figure 4.9: Edit/Delete user

In this section, user can edit their information or delete any users. When the users click the edit button, they will be redirected to another page to update their information. If they click the delete button, they will be alert for a confirmation to delete the user.

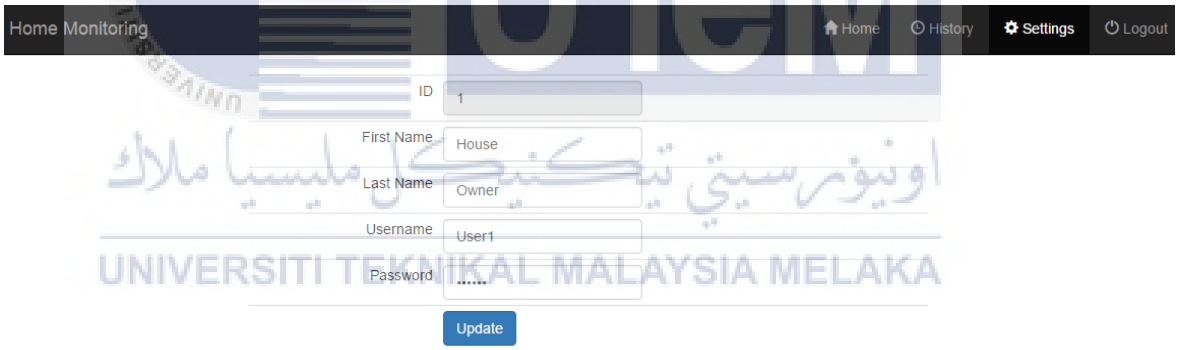

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Figure 4.10: Update user information

Figure 4.10 shows the update section for user information. User can change their first name, last name, username, or password.

4.2.3 Database Design

4.2.3.1 Conceptual and Logical Database Design

Entity Relationship Diagram is a specialized graphic that illustrates the relationships between entities in a database. In Home Monitoring System, there are four entities that illustrate the relationships between the entities in the database. The four entities are shown on the figure 4.11 below.

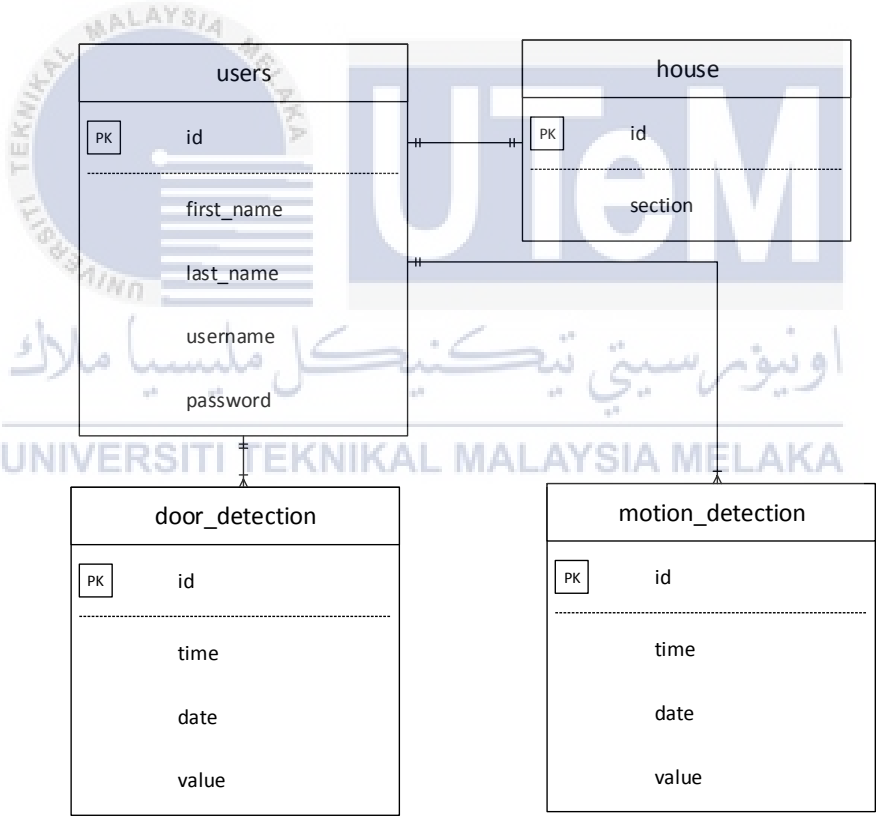

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Figure 4.11: Entity Relationship Diagram

4.3 Detailed Design

The system is developed according to the design from the DFD. This is important as all the function that had been set in the diagram meet the specification of the system.

4.3.1 Software Design

Software design is used to provide a low level description of the system. It also provides the structure and design component of the software. Software design also helps the reader to build an understanding about the system.

1. Login Process
    - Validate login data from the user by matching the details from database.
    - Input
        - User will enter their username and password.
    - Output
        - If success, user will be redirected to index page.
        - Else user will be prompted to enter a correct username and password.

2. Activate or Deactivate System
    - Arduino microcontroller will read the value from user selection on the radio button.
    - Input
        - User will select the input base on the radio button.
    - Output
        - If user selects Arm, the monitoring status in room section will change from No Motion to Motion Detected if an event detected by the sensor. It also will change the door section status from

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Door Close to Door Open depending on the sensor. Besides that, the brief summary of detection will be updated to the latest detection time.

- If user selects Disarm, nothing will be changes to the status panel.

3. View Detection History
   - List all the detection history.
   - Input
     - Select tab.
   - Output
     - List of detection history.

4. Edit House Section
   - User can change the current name of the house section.
   - Input
     - Enter a new input.
   - Output
     - The previous output will be change base on the new input.

5. User Management
   - Add, edit, and delete a new user.
   - Input
     - Add, edit, or delete function.
     - Insert user detail for add or edit function.
     - Click confirmation button for delete.
   - Output
     - New user will be add.
     - User will be prompted for delete confirmation.

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4.3.2 Physical Database Design (Schema Level –DDL/DCL)

```
CREATE TABLE IF NOT EXISTS `door_detection` (
  `id` int(11) NOT NULL,
  `time` time NOT NULL,
  `date` date NOT NULL,
  `value` varchar(10) NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=3 DEFAULT CHARSET=latin1;

CREATE TABLE IF NOT EXISTS `house` (
  `id` int(11) NOT NULL DEFAULT '0',
  `section` varchar(15) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

CREATE TABLE IF NOT EXISTS `motion_detection` (
  `id` int(11) NOT NULL,
  `time` time NOT NULL,
  `date` date NOT NULL,
  `value` varchar(10) NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=10 DEFAULT CHARSET=latin1;

CREATE TABLE IF NOT EXISTS `users` (
  `id` int(11) NOT NULL,
  `first_name` varchar(20) NOT NULL,
  `last_name` varchar(20) NOT NULL,
  `username` varchar(20) NOT NULL,
  `password` varchar(20) NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=2 DEFAULT CHARSET=latin1;
```

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4.4 Conclusion

In a nutshell, this chapter describes the design process of Home Monitoring System. This chapter also includes diagrams such as Entity Relationship Diagram and the system architecture to help people to understand the development of this application. The module integration and system design shows and explains every aspect of the system design. Developing a system without planning will lead to failure of the system and eventually, the discontinuation of the system.

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CHAPTER V

IMPLEMENTATION

5.1 Introduction

This chapter briefly describes the activity involved in the implementation phase during development of Home Monitoring System and the expected output after the phase is completed. Implementation phase is generally executed after all steps have been completed carefully and correctly. This is to ensure that this phase can be carried out smoothly. Basically programming and coding is performed in implementation phase.

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The topics covered in this chapter include Software Development Environment Setup, Software Configuration Management, Configuration Environment Setup, Version Control Protocol Procedure and lastly Implementation Status.

5.2 Software Development Environment Setup

Home Monitoring System adapted the client-server architecture. In this architecture the computer data storage, user interface as well as the functional process logic are developed and maintained as independent modules where the components consisting presentation tier, logic tier and data tier of services are established on separate platforms.

This approach delivers benefits which include reusability, maintainability, flexibility, scalability and manageability. Table below briefly describe each of component involve.

Component	Description
Presentation Tier	This tier is the top-most level of the application which runs on the computer. This layer is a layer which users can access directly.
Logic Tier	The logic tier is the functional modules that process commands. This is the module where mission-critical business problems are resolved. This tier works on a server and is also known as application server.
Data Tier	In this layer, information is stored and retrieved from database. From the database, information is delivered back to logic tier for handling.

Table 5.1: System Architecture

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For the hardware part, the system uses Arduino boards that communicate with the web using an internet protocol (IP) address. The address is uploaded into the Arduino which can be change anytime.

5.3 Software Configuration Management

5.3.1 Configuration Environment Setup

To develop Home Monitoring System, XAMPP is used as a platform for the web server of this project. XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes.

Besides that, phpMyAdmin is used to handle the administration of MySQL database. The phpMyAdmin is a free and open source tool written in PHP. It can perform various tasks such as adding, editing or deleting databases, tables, fields or rows, executing SQL statements, or managing users and permissions.

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In addition, Arduino software integrated development environment (IDE) serve as the programming platform for the Arduino microcontroller board. The Arduino IDE supports the languages C and C++ using special rules to organize code. The Arduino IDE supplies a software library called Wiring from the Wiring project, which provides many common input and output procedures.

5.3.2 Version Control Procedure

This section describes the procedure and control in managing the source code version. Source-code version control is a set of working rules for code sharing that lets developers modify files in an exclusive way. Managing and controlling the source code during development in this project is easy since there is only one developer working on the system. Despite that, version control procedure is still done to ensure the access of latest version of source code in future in case if any developer were to proceed or make improvements on the system or simply to make reference.

A version control table is made to keep track of the document changes. The table consists of version number, change records and last modified date. For version number, every change is numbered in order to keep track of the latest document. The last modified date of the file or document leaves by the developer to know when it was modified. Every previous file or document with major changes is kept and upload into the cloud storage. The table should be updated each time when the document is modified. The table below shows the version control table.

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Module	Version Number	Change	Last Modified Date
Web	1.0	Update code on line 50 index.php	3/4/2016
Web	1.1	Code deleted on line 5 get_data.php	16/5/2016
Arduino	1.0	Update code on line 61-107 Arduino sketch_apr8a	25/4/2016
Arduino	1.1	Update code on line 184-186 Arduino sketch_apr8a	15/7/2016

Table 5.2: Version Control Table

5.4 Implementation Status

This section describes the progress of the development status for each of the component or module. Table below will describe the status for each of the modules during development of Home Monitoring System.

Module	Description	Duration	Date Completed
Arduino	Detection of event and send data to the database.	3 weeks	8/4/2016
Web – Control and Monitoring	Allow user to control system and monitor event.	3 weeks	29/4/2016
Web – History	View event detection history.	3 days	25/3/2016
Web – Settings	Allow user to add, edit, or delete users.	3 days	7/5/2016
Notification – SMS	Send notification using SMS.	1 weeks	20/5/2016

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Table 5.3 Implementation Status

5.5 Conclusion

This chapter discusses on the activity involved in the implementation phase and the expected output after completing the phase. Among the topic covered in this chapter include Software Development Environment Setup, Software Configuration Management, Configuration Environment Setup, Version Control Protocol Procedure and lastly Implementation Status.

CHAPTER VI

TESTING

6.1 Introduction

This chapter will discuss on test plan, test strategy, test design, test data and test results and analysis. Testing is crucial stage in a project development. The reason is the quality of the product will be verified and measured in this stage. Besides that, testing is used in the overall process to determine whether objectives are being met and to ensure the product operates appropriately.

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From the results of testing, the developer can made an analysis in order to identify whether the product have fulfill the requirement and identify the strength and weakness of the product.

6.2 Test Plan

6.2.1 Test Organization

In this project, the test team is made up of the developer and the participants. The developer will manage the overall test plan. The participants involve for the testing is two residents house at Taman Kerjasama, Bukit Beruang, Melaka and residents of Kolej Kediaman Al Jazari UTeM. The participants are required to key in their information which is username, password, first name, and last name on add user section so they can login and use the system. Their given phone number is uploaded into the Arduino.

6.2.2 Test Environment

In order to do the system testing, the test is held inside the participant house with their permission. The platform and devices involve are laptop with chrome or firefox web browser that run Windows operating system and phone with chrome web browser that run on Android. Developer asked the tester if their phone is installed with a web browser and connected to the internet. If the tester does not have a web browser installed in their phone, they are provided with a laptop or a phone with internet connection.

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Hardware Environment

First, the Ethernet shield must be plugged together with the Arduino board. Next, the shield is connected to the router or laptop with internet connection using a wired Ethernet cable. The Arduino itself can be powered with 9-12 volt AC-DC adapter or 9 volt battery. The sensor involve are door magnetic sensor and motion sensor. The magnetic sensor is plug into pin 3 of Arduino while the motion sensor is plug into pin 7.

Both are powered with 5 volt output. The sensor are placed on the door and glued to the wall. Table below describe the hardware environment for the laptop use for the testing.

Operating System	Windows 7 Ultimate
Processor	Intel Core i5 2.60 GHz
Memory	4 GB
Hard Drive	500 GB
Network	Wireless or Ethernet Connection

Table 6.1: Laptop Hardware Environment

Network Environment

All laptop and devices for testing is connected to the network using a wireless hotspot except for the Arduino which required a wired connection. For the Arduino to communicate with the server, the address of the server must be known to the Arduino. Therefore, the server address which is *fyp-homemonitoring.esy.es* uploaded into the Arduino board using Arduino Software. The web is hosted on free hosting site. For the clients to communicate with the server, they need to open a web browser. After that they need to enter the URL *"http://fyp-homemonitoring.esy.es/home-monitoring/"* on the browser to access the web.

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6.2.3 Test Schedule

Test schedule is the time taken for the user in order to use the system for testing. The first testing is done at Taman Kerjasama. The second testing is done at Kolej Kediaman Al Jazari UTeM.

No	Testing Phases	Cycle	Duration (hours)
1	Black-box Testing	5	1
2	Performance Testing	5	1

Table 6.2: Testing Phases

6.3 Test Strategy

For test strategy, the selected approaches are the top-down approach and the black-box testing.

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Top-down Approach

Top-down approaches highlight planning and a thorough understanding of the system. It is inherent that no coding can begin until an adequate level of aspect has been extended in the design of at least some part of the system. In test strategy, top down is an approach to integrated testing where the top modules are tested and the branch of the module is tested step by step until the end of the related module.

Black-box Testing

Black-box testing is a method in software testing where the internal structure design and the implementation of the item being tested not familiar to the user. This type of approach of testing help the users for easier understanding on the system since the users do not have the knowledge on the internal structure of the system.

The black-box testing will be done from user's point of view. There is no need for the tester to have detailed knowledge on the functional features of the system. Therefore, the tester can be someone who does not have technical knowledge. Besides that, since the developers and tester are independent from each other, testing can be done without prejudice.

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6.3.1 Classes of Tests

Class	Type	Description
Functionality	Module	Each of the modules should run as stated in requirements.
Security	Authentication	Only registered user can access the system.
	Validation	Validation for registration or update fields. E.g.: Blank fields.
	Confirmation	Confirmation when deleting data.
Performance	Response Time	Time taken for sending notification to user.
		Response time of sensors.

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Table 6.3: Classes of Tests

6.4 Test Design

6.4.1. Test Description

Test description discusses about the procedure to make the testing work. In order to do the test, test cases and expected result for each module are designed. The testing is divide into three classes which is functionality, security and performance.

No	Test Step	Expected Result	Class
1	Select the Arm button.	Monitoring activated.	Functionality
2	Select the disarm button.	Monitoring deactivate.	Functionality
3	Click on links.	Redirect to another page.	Functionality
4	Key in house section name.	When update button pressed, house section name is update.	Functionality
5	Key in first name, last name, username and password.	When button add user is click, new user will be added.	Functionality

Table 6.4: Functionality Test

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No	Test Step	Expected Result	Class
1	Login with valid username and password.	Redirect to main page.	Authentication
2	Login with incorrect username and password.	Redirect to login page with prompting user for correct username or password.	Authentication
3	Login without entering username and password.	Display error prompting user to fill the fields.	Validation
4	Leaving blank fields when update button is click.	Display error prompting user to fill the fields.	Validation
5	Leaving blank fields when add user button is click.	Display error prompting user to fill the fields	Validation
6	Leaving blank fields when add update button is click.	Display error prompting user to fill the fields	Validation
7	Click on delete button	Confirmation box pop-out.	Confirmation

Table 6.5: Security Test

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No	Test Step	Expected Result	Class
1	Select arm button. Trigger the motion sensor with movement.	Detection record into the database. Send notification to user's phone. Changes of status in monitoring section.	Response Time
2	Select arm button. Trigger the magnetic sensor by opening and closing the door.	Detection record into the database. Changes of status in monitoring section.	Response Time

Table 6.6: Performance Test

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6.4.2 Test Data

All the results from the test case are collected and become the test data for the system. Below are the tests data used for the test case.

Username	TK_763N	TK_762N	AJ1_UTeM	AJ2_UTeM	AJ3_UTeM
First Name	Mr	Mrs	Aiman	Syazwan	Aniq
Last Name	Gabriel	Wendy	Zakwan	Amin	Aiman
Password	123456	123456	abc123	qweasd	qwerty123

Table 6.7: Test Data

6.5 Test Results and Analysis

The tester involved is two residents of Taman Kerjama, Bukit Beruang and three residents of Kolej Kediaman Al Jazari UTeM. Below are the test results from the test cases that were done in testing phase.

No	Test Step	Expected Result	Actual Result	Result	Class
1	Select the Arm button.	Monitoring activated.	Monitoring activated.	Pass	Functionality
2	Select the disarm button.	Monitoring deactivate.	Monitoring deactivate.	Pass	Functionality
3	Click on links.	Redirect to another page.	Redirect to another page.	Pass	Functionality
4	Key in house section name.	When update button pressed, house section name is update.	House section name updated.	Pass	Functionality
5	Key in first name, last name, username and password.	When button add user is click, new user will be added.	New user is added.	Pass	Functionality

Table 6.8: Functionality Test Result

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No	Test Step	Expected Result	Actual Result	Result	Class
1	Login with valid username and password.	Redirect to main page.	Redirect to main page.	Pass	Authentication
2	Login with incorrect username and password.	Redirect to login page with prompting user for correct username or password.	Redirect to login page with prompting for user correct username or password.	Pass	Authentication
3	Login without entering username and password.	Display error prompting user to fill the fields.	Display error prompting user to fill the fields.	Pass	Validation
4	Leaving blank fields when update button is click.	Display error prompting user to fill the fields.	Display error prompting user to fill the fields.	Pass	Validation
5	Leaving blank fields when add user button is click.	Display error prompting user to fill the fields	Display error prompting user to fill the fields	Pass	Validation
6	Leaving blank fields when add update button is click.	Display error prompting user to fill the fields	Display error prompting user to fill the fields	Pass	Validation
7	Click on delete button	Confirmation box pop-out.	Confirmation box pop-out.	Pass	Confirmation

Table 6.9: Security Test Result

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No	Test Step	Expected Result	Actual Result	Result	Class
1	Select arm button. Trigger the motion sensor with movement.	Detection record into the database. Send notification to user's phone. Changes of status in monitoring section.	Detection record into the database. Send notification to user's phone. Changes of status in monitoring section.	Pass	Response Time
2	Select arm button. Trigger the magnetic sensor by opening and closing the door.	Detection record into the database. Changes of status in monitoring section.	Detection record into the database. Changes of status in monitoring section.	Pass	Response Time

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Table 6.10: Performance Test Result

After the testing, the participants are required to answer and give feedback on their level of satisfaction when using the system. The scale for satisfaction is 1 (lowest) to 5 (highest).

Tester/ Modules	Mrs Wendy	Mr Gabriel	Aiman Zakwan	Syazwan Amin	Aniq Aiman
Functionality	4	3	4	3	4
Security	4	4	4	4	4
Performance	3	3	3	4	4

Table 6.11: Satisfaction Result

6.6 Conclusion

In a nutshell, the chapter discussed the activity involved in the testing phase. The topics such as test plan, test environment, test schedule, test strategy are covered in this chapter. Testing and evaluation is one of the most important phases during the development of project. When the product has been test, the respondent may give feedback on the system so developer can make improvement and increase the quality of the system.

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CHAPTER VII

CONCLUSION

7.1 Observation on Weaknesses and Strengths

Based on the testing and evaluation done, there are several strength and weakness from this project. The strength and weakness of the project must be highlight for future improvement.

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7.1.2 Project Strength

The strength of Home Monitoring System lies in its simple user interface. The interface helps users to easily understand how to use the system and flow of the system. Besides that, since the system is built as responsive web it has the capability to be accessed from devices such as mobile phone, desktop, laptop or tablet with internet browser installed. Therefore user can access the system from their phone or tablet.

7.1.3 Project Weakness

There are three weaknesses identify during the project testing. The first weakness is it required a wired connection for both of the sensor and Arduino connection to the internet. The second weakness is if the server is down, there will be detection by the sensor but it will not be record on the database.

Besides that no SMS notification will be sent to the user if the Arduino is not connected to the internet. Other than that, there is delay for about 5-10 seconds when sending SMS notification.

7.2 Propositions for Improvement

Although the project has been successfully developed according to the objectives, it still has some flaws that needed to be overcome. Developer needs to find solutions on how to improve the system to make it much better than the previous one. There are several solutions that can be applied for improvement of the system.

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Wireless Connection

Currently the sensor and Arduino are connected with each other using wired connection. For the Arduino to connect to internet and web, it required a network cable. Instead using a wired connection, it is better to use a wireless connection so that the sensor and Arduino can be place and move anywhere inside the house.

Notification

During testing phase, there is a delay between 5-10 seconds when sending the SMS notification to the user phone. The delay is identified as the problem from the SMS API provider side. For future improvement, developers can use other SMS API provider such as Nexmo or bulkSMS to reduce the time delay.

Develop Android Application for the System

At the moment, there is no android application available for the system as the developers focus on developing the web version of the system. If there is an android version, it will help the users by just running the apps instead of opening the web browser and typing the address of the site.

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7.3 Project Contribution

The developed product is believed to be able to contribute in technology fields. The system is build especially for those who are in need of a low cost security system. The benefits of the system is house owner is instantly notify that an invasion has occurred. This can keep family members from going in on a potentially dangerous situation. Additionally, any activity detected by the motion sensor is stored inside of the database.

7.4 Conclusion

Home Monitoring System has been successfully developed according to the objectives that were given. The website is able to control the system. Secondly it able shows the status of the detection. Besides that the system able to provide prompt notification to user through instant messaging.

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APPENDICES

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Appendix A: Sample of test case for Functionality Testing

Functionality Test Case

Test ID	**Test Step**	**Expected Result**	**Actual Result**	**Result Pass/Fail**
1	Select the Arm button.	Monitoring activated.		
2	Select the disarm button.	Monitoring deactivate.		
3	Click on links.	Redirect to another page.		
4	Key in house section name.	When update button pressed, house section name is update.		
5	Key in first name, last name, username and password.	When button add user is click, new user will be added.		

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Security Test Case

Test ID	Test Step	Expected Result	Actual Result	Result Pass/Fail
6	Login with valid username and password.	Redirect to main page.		
7	Login with incorrect username and password.	Redirect to login page with prompting user for correct username or password.		
8	Login without entering username and password.	Display error prompting user to fill the fields.		
9	Leaving blank fields when update button is click.	Display error prompting user to fill the fields.		
10	Leaving blank fields when add user button is click.	Display error prompting user to fill the fields		
11	Leaving blank fields when add update button is click.	Display error prompting user to fill the fields		
12	Click on delete button	Confirmation box pop-out.		

Appendix C: Sample of test case for Performance Testing

Performance Test Case

Test ID	Test Step	Expected Result	Actual Result	Result Pass/Fail
13	Select arm button. Trigger the motion sensor with movement.	Detection record into the database. Send notification to user's phone. Changes of status in monitoring section.		
14	Select arm button. Trigger the magnetic sensor by opening and closing the door.	Detection record into the database. Changes of status in monitoring section.		

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Appendix D: Sample of user satisfaction level

Tester Name/ Modules							
Functionality	Lowest	1	2	3	4	5	Highest
Security		1	2	3	4	5	
Performance		1	2	3	4	5	

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