ALAMOSYS: HOME SECURITY SYSTEM

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ALAMOSYS: HOME SECURITY SYSTEM

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This report is submitted in partial fulfillment of the requirement for the Bachelor of
Computer Science (Computer Networking)

FACULTY OF INFORMATION AND COMMUNICATION TECHONOLOGY
UNIVRRSITY TEKNIKAL MALAYSIA MELAKA

DECLARATION

I hereby declare that this project report entitled

ALAMOSYS: HOME SECURITY SYSTEM

is written by me and is my own effort and that no part has been plagiarized

without citations.

STUDENT: _____ Date: 25/8/2016

(MOHAMAD ZAHID BIN MOHAMAD)

I hereby declare that I have read this project report and found

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Bachelor of Computer Science (Computer Networking) With Honors.

SUPERVISOR: _____ Date: 25/8/2016

(DR. ZURINA SAAYA)

DEDICATION

In the name of Allah, the Most Gracious, the Most Merciful. This project is dedicated to my precious parents, my brother, my sister and also my teacher that always been inspire me and taught me to think, understand and express. Without the I would not able to finish this project.

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ABSTRACT

AlaMoSys Home Security System is a system that secures all entry point in a house by integrating hardware and software which will protect home against intruder or unauthorized activities. In today market there are a lot of security system that been commercialized to fulfilled the need of securing our home, but most of this existing product did not provide any tool to monitor the security system. Beside, some of them only provide sound alert without notify its owner. This show that some of existing product is less efficient and effective. AlaMoSys is a product that powered by Arduino microcontroller. This system consists of Arduino with sensor and a web-based application that has ability to monitor, alarm and visualize security in real time. Moreover, it also includes sensor on all entry point into home that are particularly integrate to a security system. The goal of this product is to provide a home security system that allow user to monitor their house from remote location. In addition, the user also can arm and disarm the system in real time through website. Besides, this system also provide alert to user using SMS notification if any break-in or unauthorized activity happen.

ABSTRAK

Sistem keselamatan rumah AlaMoSys adalah satu sistem yang menjamin keselamatan rumah dengan memastikan semua titik masuk ke dalam rumah berada dalam keadaan selamat dengan menyatupadukan perkakasan dan perisian yang akan melindungi rumah daripada penceroboh atau aktiviti-aktiviti yang tidak dibenarkan. Dalam pasaran pada hari ini terdapat banyak sistem keselamatan yang di pasaran bagi memenuhi kehendak pengguna untuk melindungi rumah mereka tetapi ada diantara ini tidak menyediakan alat atau perkakasan untuk memantau sistem keselamatan. Malahan, ada di antara mereka hanya mengeluarkan bunyi sahaja tanpa memaklumkan kepada pemiliknya. Ini menunjukkan bahawa sebahagian daripada produk sistem keselamatan yang sedia ada kuang cepak dan berkesan bagi memastikan keselamatan rumah. AlaMoSys adalah produk yang digerakkan menggunakan mikro pengawal Arduino. Sistem ini terdiri daripada Adruino yang terdiri daripada pengesan dan aplikasi yang berasaskan laman sesawang yang mempunyai keupayaan untuk memantau, sebagai penggera dan memaparkan gambaran keadaan rumah secara masa sebenar. Selain itu, ia juga menggunakan pengesan di semua titik masuk ke dalam rumah yang di integrasikan pada sistem AlaMoSys. Matlamat produk ini adalah untuk menyediakan satu sistem keselamatan rumah yang membenarkan pengguna untuk memantau keadaan rumah mereka dari lokasi yang jauh. Di samping itu, pengguna juga boleh mengaktifkan atau mematikan sistem dalam masa sebenar menggunakan laman sesawang. Selain itu, sistem ini juga mampu memberi amaran kepada pengguna melalui pemberitahuan SMS jika berlaku pecah masuk ke dalam rumah.

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CHAPTER I

INTRODUCTION

1.1. Introduction

With increasing of thief and robbery in this modern life security system is important measure that will keep home safe when we not around at house. Security measure is an important thing that being implemented in our house, this is to make sure that thief can be detecting in moment they enter our house.

The first things they try to break are our house door. Most widely security implement is at door using electronic device which cannot be control. To implement security at home a lot of smart security system can be found in market, but some of them has no flexibility, cannot be control and expensive.

To overcome this problem there are many microcontrollers available in market for physical computing which can be used to control device and choose what sensor to use.

The aim of this project is to create a AlaMoSys: Home Security System that powered by Arduino microcontroller to manage sensor. This system consists of an Arduino alarm system and web-based application that has ability to monitor,

alarm and visualize home security in real time. This system include sensor on all entry doors and windows that are particularly integrated to the security system.

1.2. Problem Statement (PS)

A lot of alarm system can be found in today market but lot of them only can trigger sound alert if break-in happen, which we don't know when alarm is trigger.

Other than that some alarm system is built in system that cannot be control which we cannot choose our own sensor to use for sensor thief that enter our home when we are away. Also, some of alarm system does not provide a tool which can be used to monitor this system.

Table 1.1: Summary of Problem Statement

PS	Problem Statement
PS$_1$	The existing alarm system does not provide any tool to monitor the system
PS$_2$	If we observe some alarm system only trigger sound alerts without notify the owner

1.3. Project Question (PQ)

Project Question is the important part that use to identify each problem that being stated early. Below table show summary of project question based on problem statement.

Table 1.2: Summary of Project Question

PS	PQ	Project Question
PS_1	PQ_1	What kind of tool that can be used to monitor the alarm system?
PS_2	PQ_2	How to notify owner when alarm trigger?

1.4. Project Objective (PO)

Project objective defines the things that want to achieve. The objectives must be considered based on the problem statement and the project question of this project.

There are three project objectives that can be identifying from this project which are listed as below.

PO_1: To develop a system that can monitor, alarm and visualize a home security in real time

Based on this web page will be create that contain real time status of alarm system which data being send from Arduino to web page.

Provides visualization on web that allow owner to control (ON/OFF) the alarm system. This will make sure owner know well location of alarm, and if alarm trigger it will easy owner to detect the location

PO₂: To keep record and generate report from home security system

From the website, database will be created to store log which and when an alarm is trigger, which later can be used to analyse why that place often broke by intruder.

PO₃: To send SMS notification to owner's mobile phone if the security system detects a break-in or unauthorized activity

If we observe a lot of alarm system exist does not notify owner while trigger, in worse case some of this alarm trigger over a night without being turn off, this project will include a GSM module on Arduino that send notification to owner when system is activate. It also suggests to implement notify using WhatsApp application.

Below show summary of Project Objective:

Table 1.3: Summary of Project Objectives

PS	PQ	PO	Project Objectives
PS₁	PQ₁	PO₁	To develop a system that can monitor, alarm and visualize a home security in real time
		PO₂	To keep record and generate report from home security system
PS₂	PQ₂	PO₃	To send SMS notification to owner's mobile phone if the security system detects a break-in or unauthorized activity

1.5. Project Scope

Scope of project going to be handled as follows:

1) This project use Arduino microcontroller a device that interact to hardware

a. For this project it uses magnetic sensor that attach to door or window around the house.

b. A GSM module that use to send notification directly to owner.

c. C/C++ programming language use to upload written code to Arduino itself

2) This project implement Web based Real time monitoring the alarm system

a. A Software development tool Node.js- that use JavaScript, that suitable for cross-platform runtime environment which act as Server between hardware device and web page.

b. HTML use to display web pages, and PHP language use form sending data to database.

3) This project focus for little zone of observation – Home or Small Office

4) For this project less hardware will be obtaining to minimize cost.

1.6. Project Contribution (PC)

Project contribution defines the expected output from this project. This part can be referred to the objectives of this project.

Table 1.4: Summary of Project Contribution

PS	PQ	PO	PC	Project Contribution
PS_1	PQ_1	PO_1 PO_2	PC_1	Proposed an informative web page and real time monitor of home condition
PS_2	PQ_2	PO_3	PC_2	Proposed a home security system that provide notification directly to owner

In this project contribution, there have two contributions that have been considered of this project as shown on Table 1.4.

1.7. Thesis Organization

In this section, thesis organization that define summary of each chapter include in this report. There are total of seven chapter that need to be implement. All description of each chapter shown below:

Chapter 1: Introduction

In this chapter concentrate on introduction of project that involve brief introduction and background of project. It also contains specific problem that influence to create this project. Focus on introduction, problem statement, project question, objective, scope, contribution and conclusion of chapter.

Chapter 2: Literature Review

In this chapter concentrate in the idea of this project and explanation that referred to any reading material or publish thesis, research that related to project that guide the concept of this project.

Chapter 3: Project Methodology

In this chapter concentrate on project management, that use waterfall methodology development approach. This chapter will ease task for implementing and organize project. It also includes milestone of this project.

Chapter 4: Analysis and Design

In this chapter concentrate in analysis requirement being use in this project including graphical user interface (GUI), Database use to develop this project and software design.

Chapter 5: Implementation

In this chapter concentrate on implementing of this project which involve configure software management, environment setup and implementation status

Chapter 6: Testing

In this chapter concentrate in testing project that being implement, by creating test plan, strategy, design and finding result of project.

Chapter 7: Project Conclusion

In this chapter concentrate on explaining project summarize by stating objective, contribution of project, limitation of project and future work that can be improve in system.

1.8. Conclusion

In conclusion, end of this chapter aiming that providing information above will help smooth the process of project and achieve objective. In The next chapter will concentrate in literature review, which will indicate idea of creating this project.

CHAPTER II

LITERATURE REVIEW

2.1. Introduction

In this chapter will discuss about literature review conduct to perform this project. To achieve the project objective, better understanding about concept and technique need to be clarified so it will smooth progress of this project.

It will involve collecting data from related publish information and material, and from result of finding we will cover objective of this project. Literature review focus on finding previous project, research or technique that related to its, it is important to prove that this project is relevant and could function well based on previous evidence

2.2. Literature Review

2.2.1. Domain

The domain of this project related on focusing of system development which will interact with Arduino, important to know what technique to using while interact with Arduino.

For this project Arduino only use in providing data from alarm sensor, that data provide will be extract by server then it will be send to client browser which will display the result.

2.3. Facts and Finding

Below shows structure of literature review that will be conduct in this project:
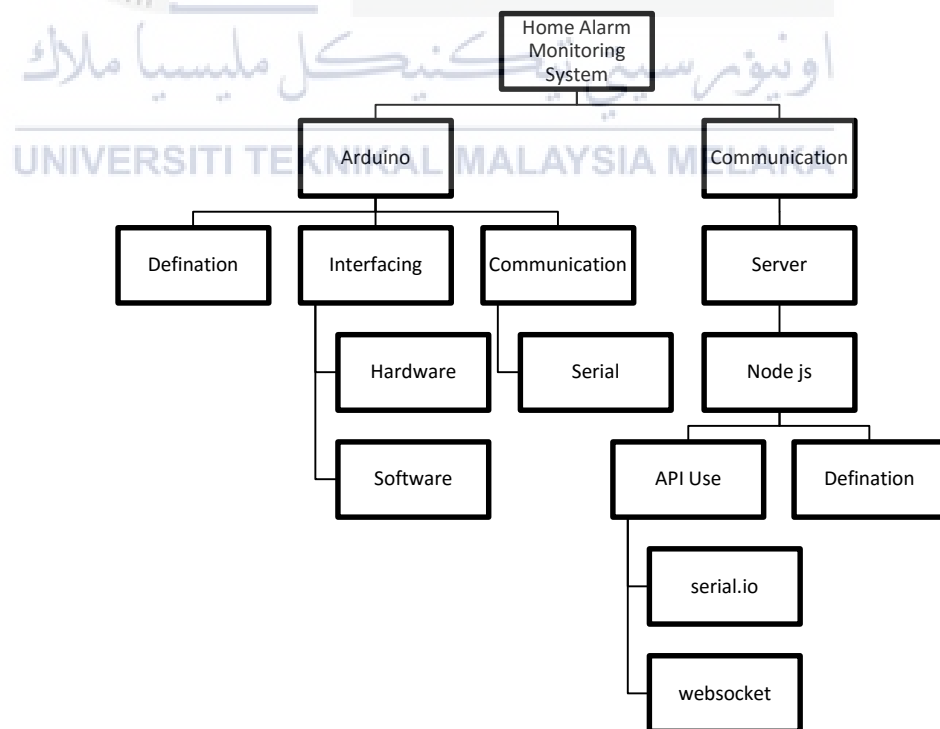
Figure 2.1 Structure of Literature Review

2.3.1. Arduino

Definition

Arduino introduce in 2005 is an open-source platform microcontroller based on easy-to-use hardware and software [6] that use to build a system that can interact with object that can sense and control physical device that connected to this electronic device. Based on Atmel microcontroller this device capable of reading input and display output which can be done by sending instruction using Arduino programming language.
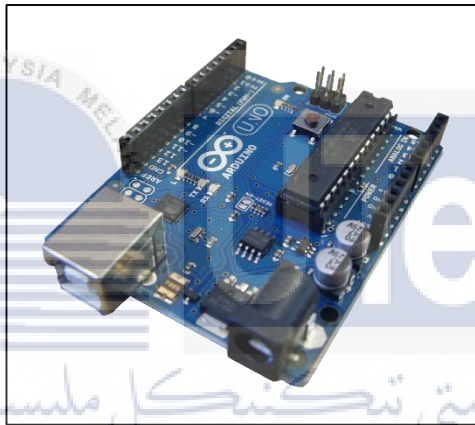
Figure2.2 Arduino Uno [6]

Interfacing

Arduino Board Main Component:
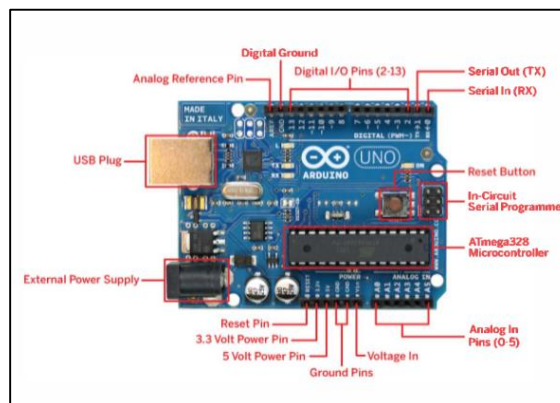
Figure 2.3 Arduino Board Component [6]

To make Arduino working properly it consist of component as show above picture that are [6]:

- USP Plug
- External Power Supply
- Reset Button
- Microcontroller - ATmega328 (send and receive information form circuit)
- Analog Pins (A0-A5)
- In-Circuit Serial Programmer
- Digital (2-13), Power and Ground Pin

There are two ways to interfacing with Arduino board it includes Hardware which will use Digital or Analog and Software.

Hardware

There is several hardware that interfacing with Arduino such as Output component, Input Component, User interface Component, Communication Component. As for this project hardware that related to it are:
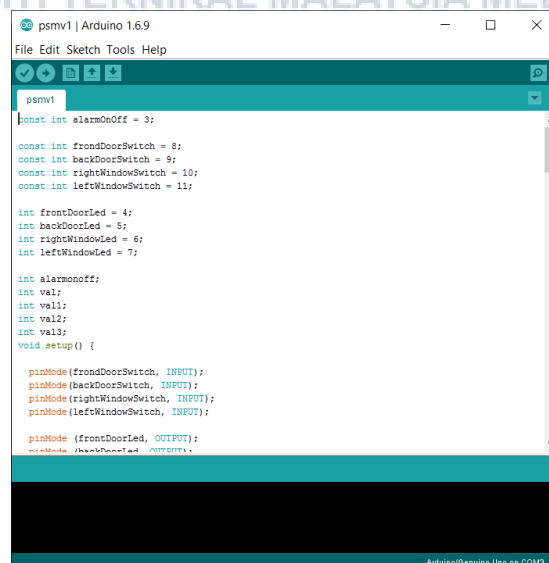
a. LED – Light-emitting diode is often use for some Arduino project, this semiconductor diode that emits light when activate. Because of its function is very simple it often uses for testing and many other type of project.

b. Magnetic switch - Often call as Reed switch, this switch offers low cost switch. This switch also can be use as alarm switch, it consists of two main part, a magnet and a switch with wire connecting to Arduino.

c. GSM Module – Global System for Mobile Communication (GSM) module a separated single-chip processor that use for voice, SMS and data transfer to mobile phone. It is a low-power consumption module that manufactured by SIMCom Wireless Solution. This device allows Arduino board to connect to internet, send and receive SMS and make voice call. This function can be used by configure GSM using GSM Library in Arduino IDE.

Software

Software help to send and receive set of instruction from or to hardware. Arduino using Arduino Integrated Development Environment(IDE). This software using sketches, in sketches all program will be written and load to hardware. All program that write to this sketch is using C++ programing language. To make program run, there are two part that should be understand first – setup () and loop ().

- Setup (): use to initialize pin modes or begin serial.
- Loop (): this function allows us to control, change and respond to Arduino board.

Figure 2.4 Arduino IDE

2.3.2. Communication in Arduino

In this topic will explain about how to communicate to Arduino, there are a lot method to made connection to Arduino, there are using Ethernet Shield, Wi-Fi module, GSM module and using Serial communication through USB cable. For this system it will focus on connecting Arduino using Serial communication.

Serial

Serial communication, this is method that will be used in this project to made connection between Arduino microcontroller and PC or other devices. In this type of communication digital pulse are send and receive between this device. Before establishing connection between two devices this device must set same rate of communication and synch to rate that has been agreed [6].

For example: when sender(TX) send pulse which represent data, at certain rate, receiver(RX) will listen that pulse in same rate as sender.

From below figure we can see that serial port is communicating using COM3 of PC with data rate of 9600baud, data that being send is in form of bits 0 or 1.
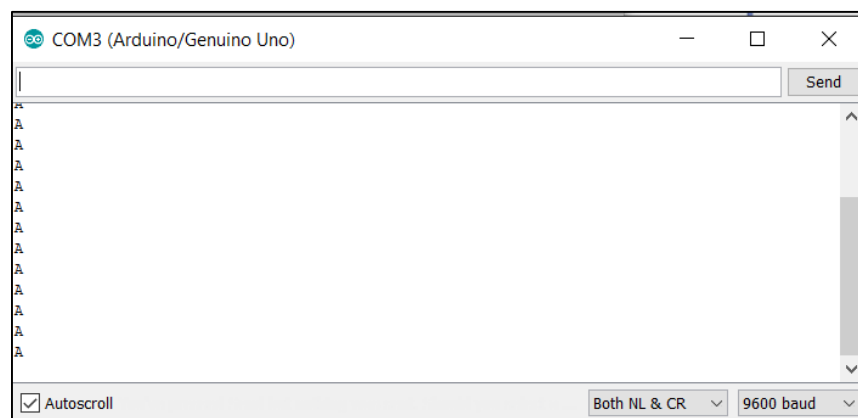
Figure 2.5 Serial Monitor in Arduino IDE

2.3.3. Communication to Arduino

Rather than using Serial Monitor in Arduino IDE there are lot of software that provide ways to communicate to this Serial Communication, for Arduino it uses protocol called "RS-232" to communicate to PC, this system we will use Node js that provide same protocol to provide communication directly to Arduino Board [6].

2.3.3.1. Node js

Definition

Node js an open-source and cross platform runtime environment that built on Chrome V8 JavaScript engine and the develop for server side web application. Node js written in JavaScript module, Node js is suitable for real time web because it is very lightweight and efficient. Node js not only capable in handling server-side application it being used to deploy network fast and scalable [5].

Node.js will be use serialport package to provide interfacing between Arduino and Node.js.

Below diagram show part of node js capable of:
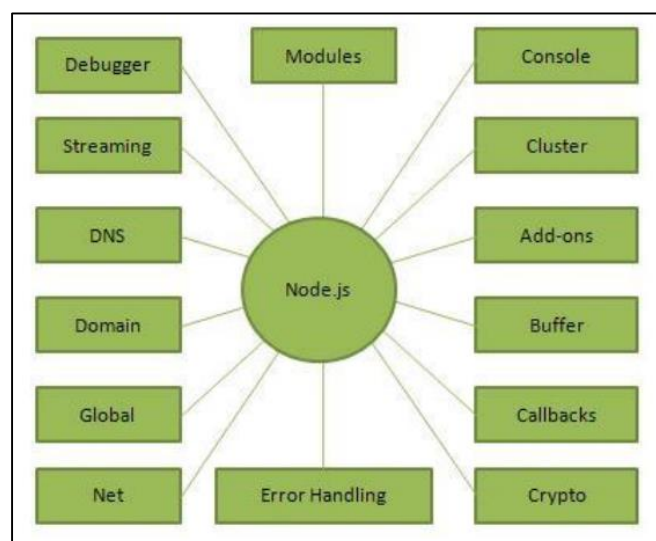
Figure 2.6 Part of Node.js [8]

Application Program Interface(API) Use in Node JS

- **WebSocket**

    WebSocket API define under World Wide Web Consortium(W3C). This technology written in JavaScript that provide two-way communication for data connection between server and a web browser, with this API it helps to create and manage connection to server, focusing on sending and receiving data on connection create from web to server.

    This API is being widely used for connection between Web and Node.js server side implementation.

    Below figure show how the link between server and web browser happen when using web socket.
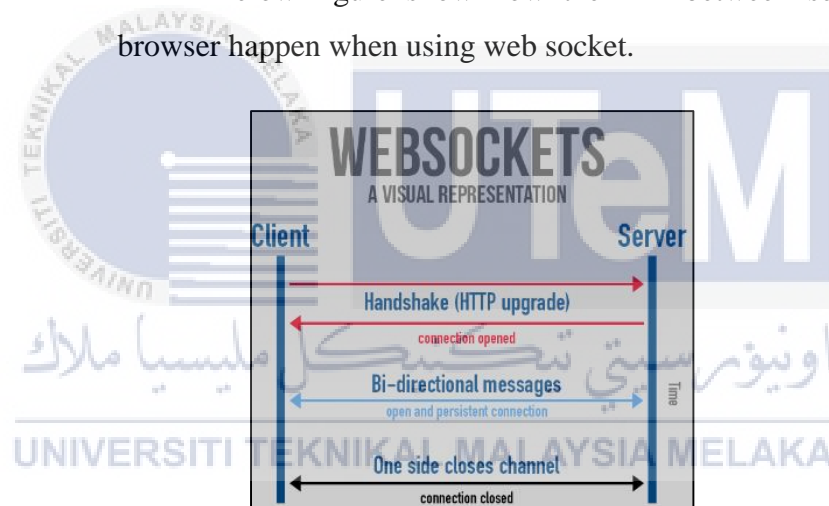
Figure 2.7 Connection Between Node.js and
Web Browser using WebSockets [7]

- **Serial.io**

    Socket.IO is a JavaScript library that being use for real-time web application. It often uses for server-side library especially for Node.js, this library provides real-time bidirectional communication.

To make it clear Socket.IO is WebSocket API that create to detect and decide connection establish between WebSocket and Node.js.

2.4. Related Work

Based on previous research and finding made in existing review, there are three previous project that related to this project. In this chapter will elaborate the research that being study.

2.4.1. Embedded System for Increasing Home Comfort and Security

Publish in Electrical and Power Engineering(EPE), wrote by Liviu Breniuc and Cristian Győző Haba,[1] this research mainly about home automation system with that implement new element to existing alarm system that exist now days. From this research related to element that continuously monitor of comfort level in house, temperature of house and whether condition around hose area. When any of this alarm trigger it will send a SMS to a prefer number. An SMS can also be issued in response to a received SMS from a known number. Issued SMS messages contain relevant data on situations that generated the messages. Being warned of the occurrence of these situations one can take the necessary preventive measures resulting in increasing the comfort, safety, reduced domestic consumption of energies and time savings.

In the research, proposed home automation (PHAS) is system that being proposed in the research that using SMS to display and issues problem if anything happen or sensor trigger around the house. Below shows block diagram of the system PHAS
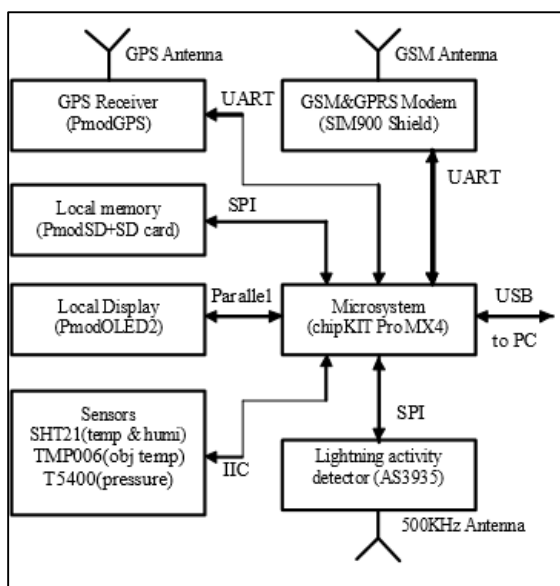
Figure 2.8 Block Diagram PHAS [1]

Based on chipKIT Pro MX4 and equip with Microchip PIC32MX460F512L microcontroller PHAS which act as coordinator. The sensor that attach to the microcontroller will pass and information to GSM.

2.4.2. Design of Small Smart Home System Based on Arduino

Based on the A. Adriansyah and A. W. Dani (2014) in their research on "Design of Small Smart Home System Based on Arduino" [2]. This paper mainly about Smart Home that use automated technology with several sensors include light, temperature, alarm and many other which being utilize using WLAN network based on Arduino microcontroller. The framework can screen and control lights, room temperature, alerts and other family machines. Results from testing the framework show legitimate control and control observing capacities can be performed from a gadget or device.

In the research, the system was design which contain of several block, it includes input/output block, microcontroller and network block. Figure below show detail of the system.
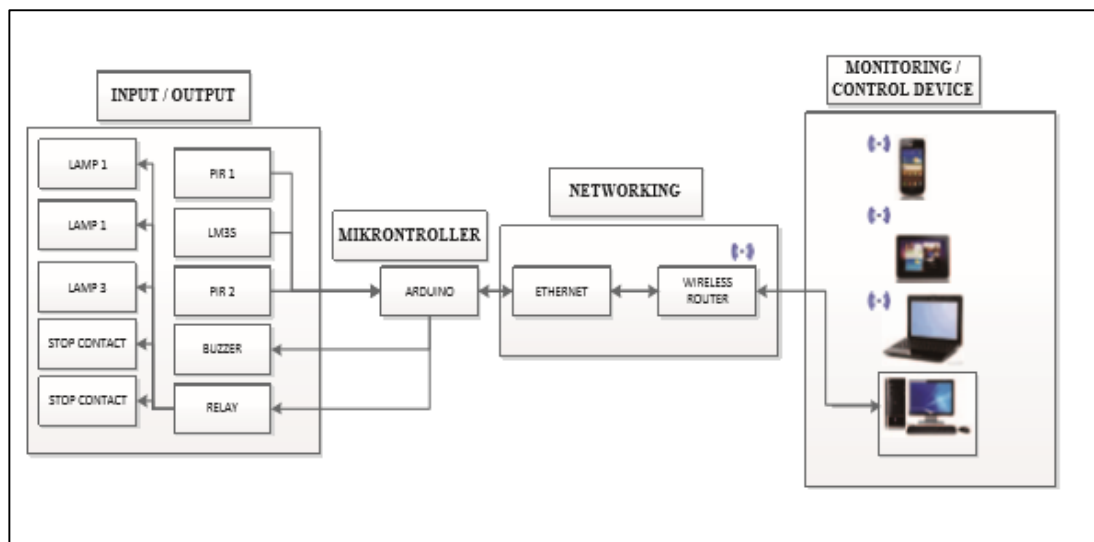
Figure 2.9 Block diagram in referred research [2]

For this system code are written in Arduino itself that devices connected to LAN or WLAN via network block using HTML with two-way communication. The situation and conditions of home based on the sensor readings sent to the monitoring device every two seconds. Status of the equipment that monitored and controlled will be seen in the monitoring device.

2.4.3. GSM based Home Security System

Diptanil Chaudhuri (February 2105) in his research "GSM based Home Security" [3]. This research is about merging all security parameter that can be found in house and create a system which will not only provide automation to the building but will also take into consideration of all the security features of the building. The Research focus on multiple type of sensor including gas sensors to detect any gas leakage that might occur in the building. It is also equipped with smoke and temperature sensors to look out if any fire breaks out in the building. It also features the function of intrusion detection by proper placement of passive infrared sensor (PIR sensor).

All of the sensor mention above will connected to a centralised microcontroller section which will generate a proper output in case of any

tragedy. Various security services number can be feed into the system so that a prior generated message can be transmitted to that number in case of any emergency. In depth study of the previous systems have been done so as to improve the performance of the system from its predecessors.
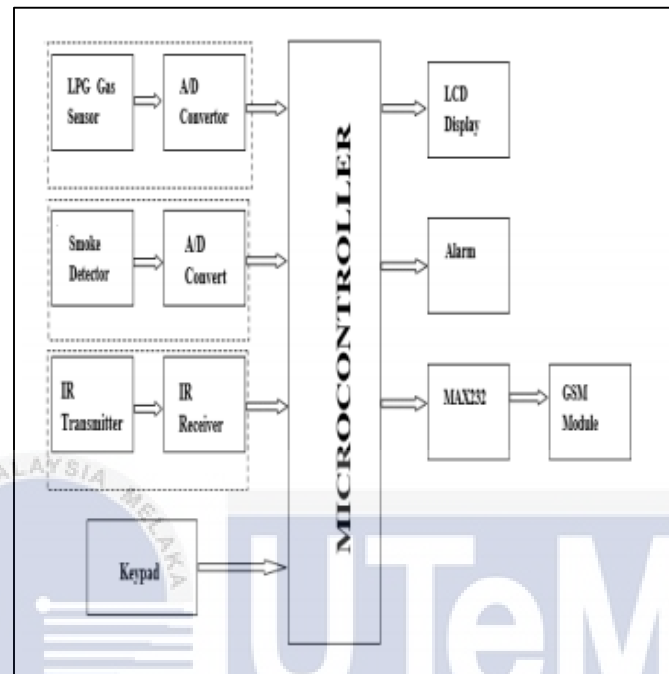
Figure 2.10 Block Diagram Used in Diptanil Chaudhuri Research [3]

From Figure Above it shows that all three sensors are connected to microcontroller 8051 which consists of three basic modules along with a GSM modem. The GSM modem is used to send the message to the respected authorities in case of emergency. The first module consists of lock keypad which can be used to lock the doors. If more than three attempts are made emergency signal will be sounded. The second module consist of intruder checkers which consists of an array of PIR sensors to detect the presence of a person in the house. Lastly the third module is the fire detection module which consists of LPG gas sensors and temperature sensors.

2.4.4. Access Control of Door and Home Security by Raspberry Pi through Internet

Md. Nasimuzzaman Chowdhury, Md. Shiblee Nooman, Srijon Sarker (November 2013) in their research "Access Control of Door and Home Security by Raspberry Pi through Internet" [4]. This concept can be utilized to deal with the security concerned issues in a cost effective way.

In this paper work a system is being created to join any entryway with the web, so that the entrance control system can be controlled from anyplace on the planet. For a situation that one is not at home and a guest is at his entryway steps then the approved individual will be informed about the guest by means of twitter and the individual can see the guest from the web through the camera from anyplace and the system will take a photo of the guest and keep a record by sending a connection through E-mail or tweet in twitter. On the off chance that the approved individual needs to give a message the guest it can be sent effortlessly through the web and it will show up in a screen on the front face of the entryway. The entryway lock can be controlled through the web. With the assistance of this system a confirmation of the guest can be kept as a record if any crisis case or situation happens.

2.5. Critical review of current problem and justification

From the related work that being study, it shows that many kind of development has been used to create Alarm system, Below Table show comparison of what kind of alarm system that being used to build Alarm System:

Table 2.1: Critical Review of Current Problem and Justification

Research	Security System Type	Central processing	Output parameter	Communication type/Alert platform	Monitoring type
Liviu Breniuc and Cristian Győző Haba (2014)	• Embedded System for Increasing Home Comfort and Security	• chipKIT Pro MX4 and equip with Microchip PIC32MX460F512L microcontroller	• Comfort level in house • Temperature of house • Whether condition	• Communication – GSM • Alert - SMS	• From this research it does not provide and type of monitoring tool to control sensor
A. Adriansyah and A. W. Dani (2014)	• Design of Small Smart Home System Based on Arduino	• Arduino	• Temperature • Motion • Turn ON/OFF Light	• Communication - Arduino Ethernet Shield • Alert - HTML	• In this research it provides a HTML monitoring, but all code of html written in Arduino IDE
Diptanil Chaudhuri (2105)	• GSM based Home Security System	• 8051 Microcontroller	• Detect present of LPG gas • Smoke Detector • Motion Sensor • Keypad for Door	• Communication – GSM • Alert - SMS	• From this research it does not provide and type of monitoring tool to control sensor
Md. Nasimuzzaman Chowdhury, Md. Shiblee Nooman, Srijon Sarker(2013)	• Access Control of Door and Home Security by Raspberry Pi through Internet	• Raspberry Pi	• Recorded motion • Tracking Object	• Communication - Wi-Fi • Alert - Mail/twitter application	• From this research it does not provide and type of monitoring tool to control sensor

2.6. Proposed Solution

The previous research that has been elaborate before shows that alarm system is more implement to provide status using SMS which less to provide monitoring tool except for research that conduct by A. Adriansyah and A. W. Dani (2014), which only provide monitoring tool using HTML.

For this project it will implement web real-time and monitoring tool to make sure that this alarm working as long as it does not being deactivate. It also will use SMS notification to inform owner directly if any alarm is trigger. In term of communication this project will implement Node j.s server that provide communication to Arduino microcontroller using serial port communication technology.

2.7. Conclusion

As conclusion, literature review is very important part to establish the project concept, it helps more to understand and to get clear picture of how this project will be implement. With all previous research and fact that being stated it clearly show that this project will be logically apply.

CHAPTER III

PROJECT METHODOLOGY

3.1. Introduction

In this chapter in mainly explain about project methodology and milestone use to complete this project. This part is a starting point where all plan will be structured and schedule according deadline of this project. By implementing this chapter, it will help to track back if we slip from the course that been schedule.

Methodology refer to method or procedure to collecting data, interpreting or solving problem within the scope of a certain field of study. By stating the methodology, it will help for this project to conduct procedure or method in right way, it also a systematic procedure that will handle method according it order or arrangement, which associate with Planning, Analysis, Design, Implementing and Testing of this project. But to be clear we have to understand that methodology is not set to provide solution, it helps in conducting this project to finding the result.

In this chapter also will explain about milestone of this project, to ensure that project run well project milestone will be set to help in measure and monitor progress and performance of project until it reach this project objective.

3.2. Methodology

For this project we will implement Rapid Application Development(RAD) model which consider as incremental model, this methodology often uses when building application in short term or period. It also designs to give faster time in development and produce high quality result compare to traditional lifecycle software development.

The RAD methodology is used to respond to the need of delivering system very fast. RAD is a four phase software development cycle that combines the element of Standard System Development Life Cycle (traditional SDLC) in which the process inside standard SDLC are also used in RAD, but the phases are shortened and combined to produce more streamline development technique. In this methodology it involves four stages that include requirement planning, User Design, Construction, Testing and Cutover.
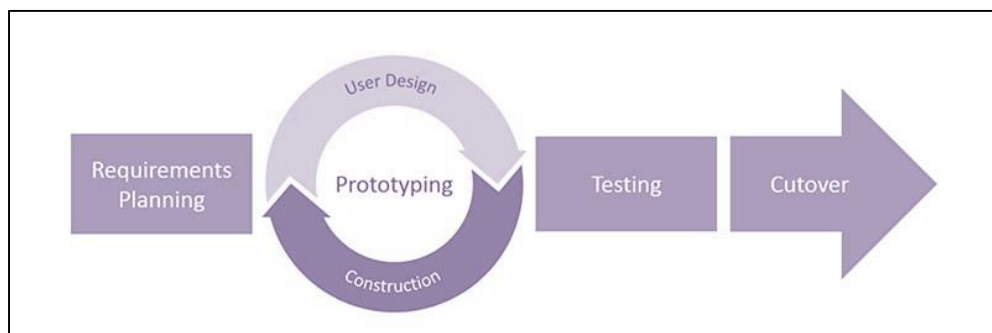
Figure 3.1 RAD methodology Phase

3.2.1. Phase I: Requirement Planning

For this phase, it related in specifying of this project problem and objective of the project, all issues regarding choosing right technique and module that will be solves and this phase also stated all information about hardware and software that will be used for Home Alarm Monitoring System project.

During this phase also all requirement need for Home Alarm Monitoring System will be stated including hardware and software that will be used to conduct this project.

i.   Software requirement

The software requirement for this system are Arduino IDE, Node js , HTML, PHP, and JavaScript.

ii.   Hardware requewment

The hardware requirement of this system are Arduino UNO, GSM module for Arduino, LED and Megnetic Sensor.

3.2.2. Phase II: User Design

In user design phase, Home Alarm Monitoring System models and prototype will be developing represent all system processes, inputs, and outputs. Arduino circuit will be design, it will attach all sensor and gsm

module with Arduino board. Not only Arduino, a client server architecture will be design which will be bridge between Arduino and web html.

3.2.3. Phase III: Construction

In Construction phase, the design that we create early will be assemble accordingly. This phase focuses on program and application development task, in this project construction will be divided into three part. The first part is configuring all hardware that attached to Arduino will be programme according to design so this device working properly. For the second part we will start do coding for server Side-Node js, this platform will interact between client and Arduino and the last part is configuring the Web pages.

In this phase any new changes or improvement can be made while in stages of prototyping, this will continue circulate between User Design and Construction until final prototype are produce.

3.2.4. Phase IV: Testing

For testing phase, prototype for this project will be tested it functionality it includes ensure that all alarm sensor that be setup function correctly, for the server side also will be test to make sure that all data from Arduino will be receive by server and web pages will be test to ensure that it display the alarm status that receive from server.

3.2.5. Phase V: Cutover

This is the last phase of RAD for this project, in this phase Home Alarm Monitoring System will be assemble software and hardware to create a complete system, this system can start operate.

3.3. Project Milestones

To make sure that this project flow and complete according to its dateline, project milestone will be creating to ensure that all activities planned will be completed according to project timeline. By using Gantt chart to visualize milestone it will enable ease on tracking time to ensure that all activities will be completed based on timeline that being set in Gantt chart.

Task Name	Start Date	End Date	Duration
Proposal PSM	02/22/16	02/26/16	5d
Chapter 1 : Introduction	02/29/16	03/18/16	15d
Chapter 2 : Literature Review	03/21/16	04/01/16	10d
Chapter 3 : Project Methodology	04/04/16	04/15/16	10d
Chapter 4 : Analysis and Design	04/18/16	05/06/16	15d
Project Demo	05/09/16	05/27/16	15d
PSM 1 : Final Presentation	05/30/16	06/07/16	7d
Chapter 5 : Implementation	06/27/16	07/22/16	20d
Chapter 6 : Testing	07/18/16	08/05/16	15d
Chapter 7 : Conclusion	08/01/16	08/12/16	10d
PSM 2 :Final Demonstration (Product & Report)	08/15/16	08/19/16	5d

Figure 3.2 Gantt chart date table
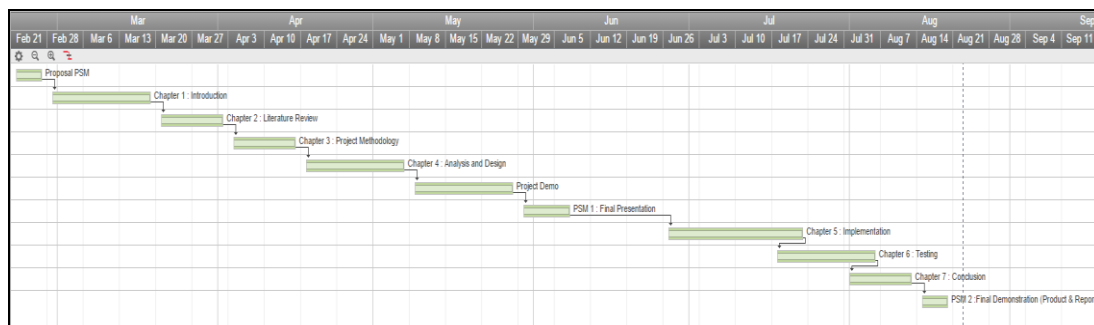
Figure 3.3 Gantt chart timeline

Table 3.1 Project Schedule and Milestone

Week	Activity
1: 22-26 Feb	Proposal PSM: Submission & Presentation
	Proposal assessment and verification
2: 29 Feb -4 Mar	Proposal Correction/Improvement Chapter 1
	List of supervisor/title
3: 7-11 Mar	Chapter 1 (System Development Begins)
4: 14-18 Mar	Chapter 1 & Chapter 2
5: 21-25 Mar	Chapter 2
6: 28 Mar -1 April	Chapter 2 Chapter 3
	Student Status
7: 4-8 April	Project Demo & Chapter 3 Chapter 4
8: 18-22 April	Project Demo & Chapter 4
9: 25 - 29 April	Project Demo & Chapter 4
	Student Status
10: 2 - 6 May	Project Demo
	Determination of student status(Continue/Withdraw)

11: 9 – 13 May	Project Demo & PSM Report
12: 16 - 20 May	Project Demo & PSM Report
	Presentation Schedule
13: 23 - 27 May	Project Demo & PSM Report
14: 30 May -7 June	**PSM 1: FINAL PRESENTATION (PA)**
15: 27 June – 1 July	Chapter 4 & Chapter 5
16: 11-15 July	Chapter 5
	Student Status
17: 18-22 July	Chapter 5 & Chapter 6
	Complete Implementation & Start Testing
18: 25 – 29 July	Chapter 6
19: 1-5 August	Chapter 6 & Chapter 7
	Testing Complete & Project Demo
20: 8-12 August	Chapter 7 – Draft Report
21: 15-19 August	**FINAL PRESENTATION OF PROJECT**

3.4. Conclusion

As conclusion, this chapter provide methodology that should be use to execute this project, this is important as a guideline. Based on all phase stated from Rapid Application Development methodology it will help to develop this system faster and efficient. Not only to follow the methodology to make this system a good quality project milestone should be follow to avoid any delay on develop this project.

CHAPTER IV

ANALYSIS AND DESIGN

4.1. Introduction

This chapter will describe more detail about this project, how this project will be carry out and it describes solution to problem that being stated in chapter I. In this chapter will concern more on detail design of this project. All requirement including hardware and software need on this project will be stated and the architecture of the system which includes block diagram and proper analysis in detail because it is important phase that need to be considered in doing a project.

4.2. Problem Analysis

For what we know on chapter I, some Alarm System that exist in current market does not provide tool to monitor the alarm system. The tool that will be use in this project is real time website that provide capability to monitor status of alarm system. This project will also create a web that visualize alarm condition

by providing picture of real house in that web page, with it will ease owner to track location of alarm that trigger.

Not only develop web site, in this project also will implement SMS notification status directly to owner phone if anything happen, from this quick respond can be made by owner if alarm trigger.

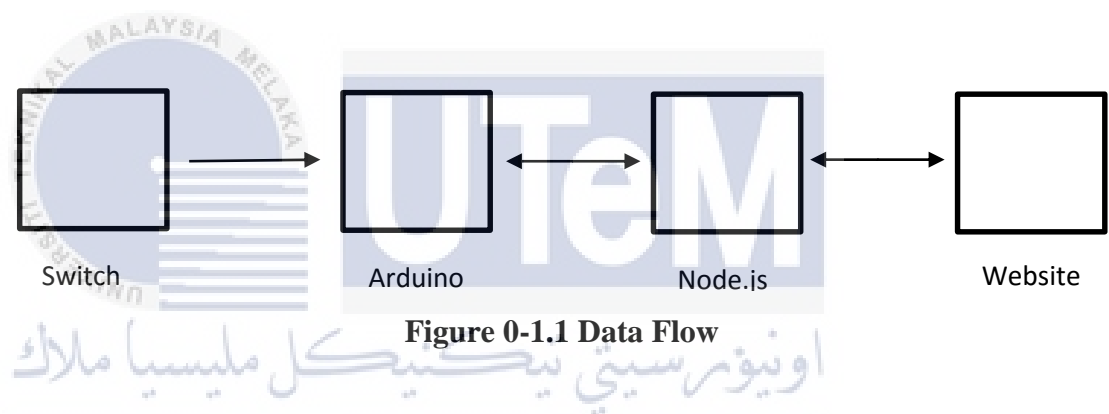## 4.3. Requirement Analysis

4.3.1. Data Requirement

Figure 0-1.1 Data Flow

From the above figure show that data flow from switch to website with two-way communication.

Monitoring - Switch will send input of current status to Arduino, then from Arduino node.js will ask if any status change, Arduino will forward input to node.js, in node.js input will be process and the result of input will be visualizing in website.

Controlling – Website will send instruction to node.js, node.js will process data that receive from website later will process the data and send it to Arduino, Arduino will receive status and process to execute instruction.
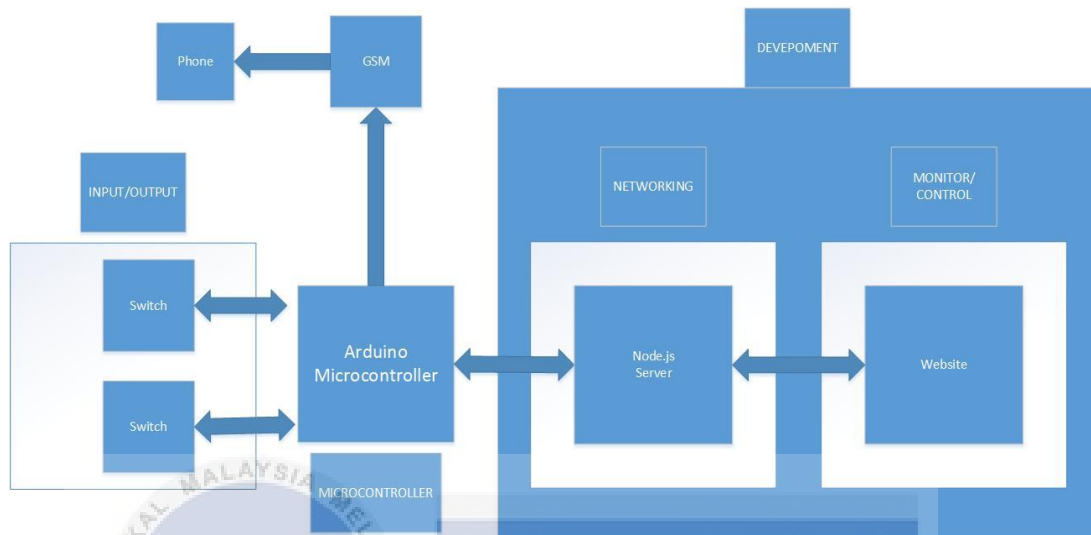
4.3.2. Functional Requirement

Figure 4.2 Block Diagram

This project will be design to have several block, namely: input/output block, microcontroller block, development block consists of networking block and monitor and control block. Above figure show detail of block diagram of this project.

1) Input/output

Consist of 4 magnetic switch, act as alarm that attach to door and window. Magnetic switch will send and changes on the switch to Arduino either switch is open or close. This switch is directly connected to Arduino microcontroller

2) Microcontroller

In this block, Arduino Uno Board will be center of switch that receive and send any activity from switch. All code related for manipulating switch will be coded in this microcontroller using IDE. It also connected to networking block and input/output block.

3) Development block

Consist of two other block networking and control/monitor block. This block where all development of this project will focus on including configuring node.js server and web site.

    a. Networking block

Directly connected to Arduino using USB cable that capable for serial communication, this block will be center system of this project. It receives and send any input/output to or from Arduino and web site.

    b. Monitor and Control Block

This is providing controlling and monitoring switch from Arduino using web site, it can be open using browser in any device which also provide two-way communication. Status of alarm system can be view using web site.

4.3.3. Other Requirement

4.3.3.1. Hardware Requirement

1) Arduino Uno Board

The Arduino UNO is a microcontroller board in light of the ATmega328. It has 14 computerized input/output pins, 6 simple inputs, a 16 MHz fired resonator, a USB association, a force jack, an ICSP header, and a reset catch. It contains everything expected to backing the microcontroller basically associate it to a PC with a USB link or forces it with an AC-to-DC connector or battery to begin.
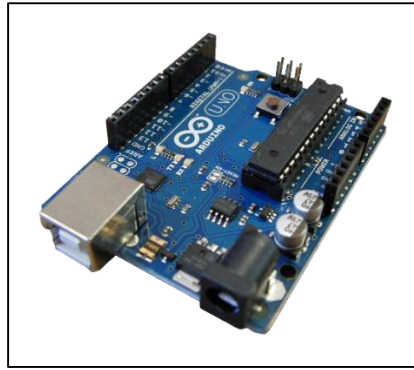
Figure 4.3 Arduino UNO

2) LED

LED is a light-transmitting diode item that is gathered into a light or light knob for use in lighting apparatuses. LED is a semiconductor gadget that discharges noticeable light when an electric current goes through it.
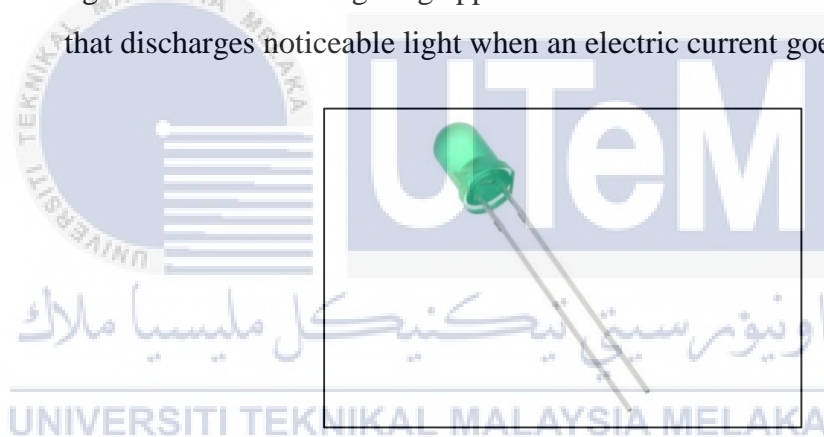

Figure 4.4 LED

3) Magnetic Switch

Often called reed switch, encapsulate with plastic shell with magnet attach to one side of this switch. Normally this switch will be used for door. This switch has two electrical contact. IT work using two type of connection, first is Normally open (switch off) and second is Normally closed (switch on).

Figure 4.5 Magnetic Switch

4) SIM900 GSM Module

This is GSM/GPRS-compatible Quad-band cell phone which works on frequency of 900MHz, this module not only used to send and receive message. It also capable to access internet and provide voice communication like normal phone. It configures and control via UART using AT commands.

Figure 4.6 SIM900 GSM

5) Cable

This is a standard issue USB 2.0 cable. This is the most common A to B Male/Male type peripheral cable, the kind that's usually used for printers. Compatible with most SFE designed USB boards as well as USB Arduino boards like the Uno.

Figure 4.7 USB 2.0

6) Breadboard

Breadboard is a plastic board that will hold the electronic segments when being connected to the board and are wired together. This board is intended to be utilized in creating models in view of the circuit format plan.
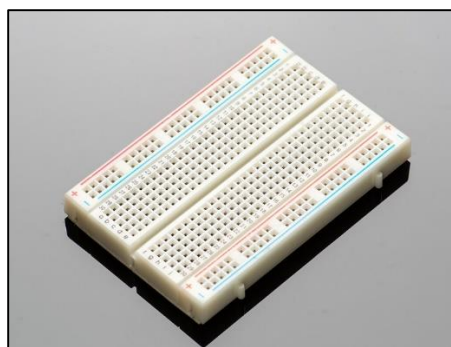

Figure 4.8 Breadboard

7) Jumper Wire

Jumper wires are utilized with the breadboard to exchange electrical signs from one section to another part rely on upon the circuit format that has been planned. Jumper wires can be different in size and shading on the grounds that every hop wire has a particular importance or capacity based on what object they are working with
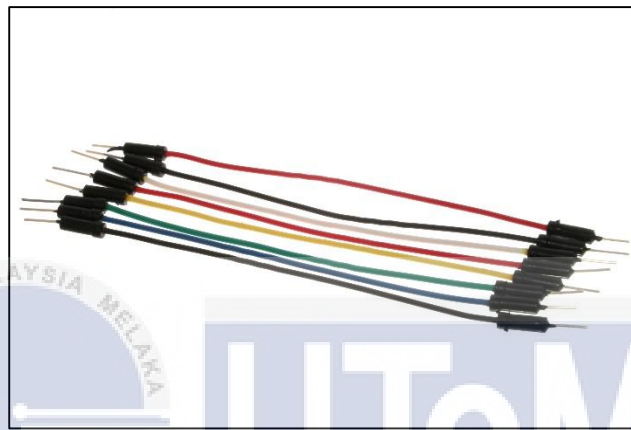

Figure 4.9 Jumper Wire

4.3.3.2.   Software Requirement

1) Arduino IDE

The Arduino IDE on the computer to create, open, and change sketches Arduino calls programs "sketches". IDE will use the two words interchangeably in this book.). Sketches define what the board will do. User can either use the buttons along the top of the IDE or the menu items [9].
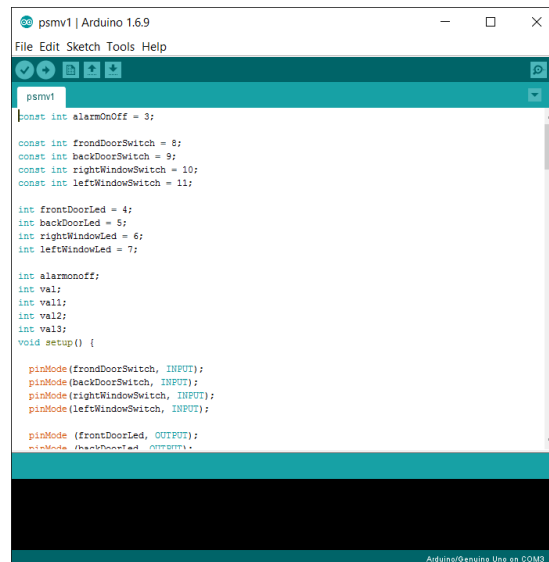
Figure 4.10 Arduino IDE

2) **JavaScript**

a. **Node.js**

Web development tool that written in dynamic language – JavaScript using V8 engine which is very fast and lightweight when running program that also capable in managing concurrent connection in single process. It also provides real time web application which widely used for InternOfThing(lot) tool.

Figure 4.11 Node.js Logo

b. **WebSocket (Socket.IO)**

Suitable to be implement in web browser and web server, this protocol provides full-duplex communication over single TCP connection which can support any protocol in it.

Socket.io is a WebSocket API that provide communication with WebSocket. It also provide an API in Node.js.

4.4. High Level Design
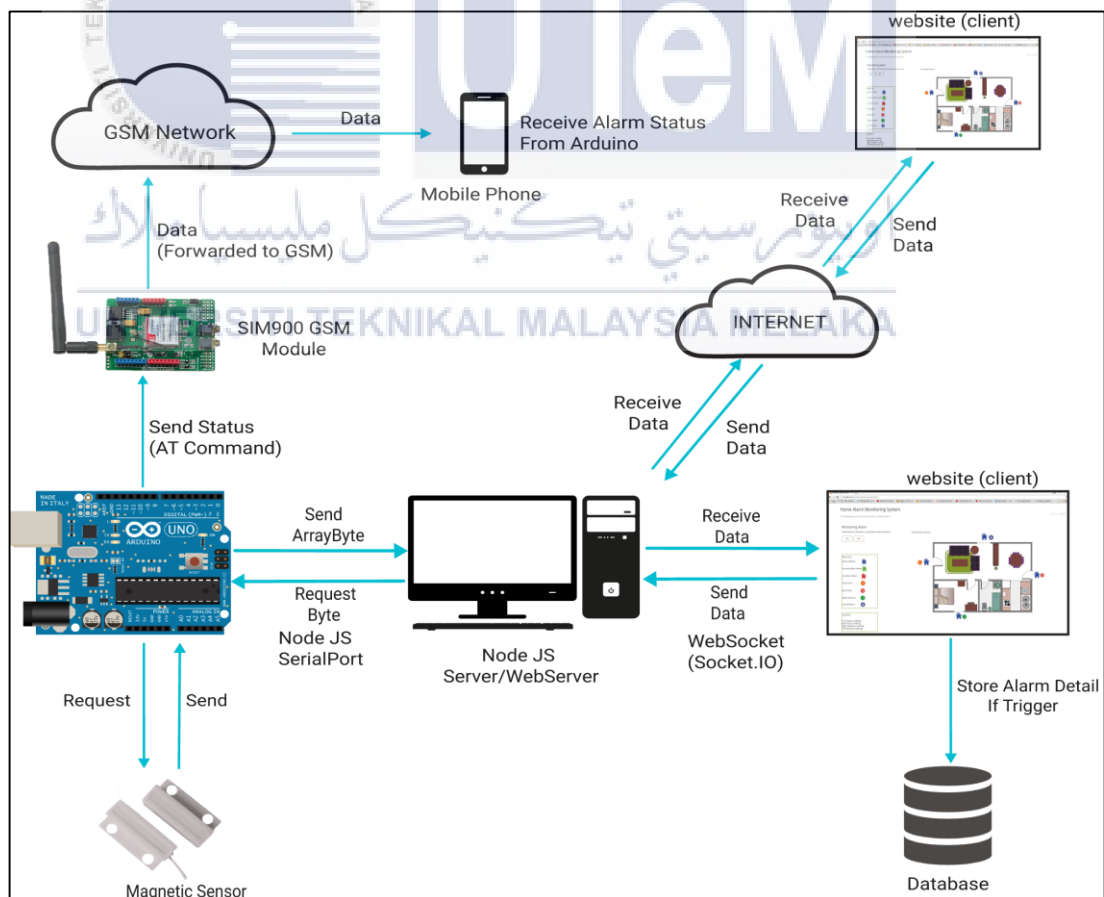
4.4.1. System Architecture

Figure 4.12 System Architecture Home Alarm System

From the above figure 4.12 show that system architecture of this project, this project will focus on develop the Node.js server and create a real-time web pages that able to control the and monitor all sensor that connected to Arduino.

4.4.2. Website Design

In this sub-chapter we will provide the proposed user interface for the new AlaMoSys webpage. The proposed design Figure 4.9 to Figure 4.18 will be as follows
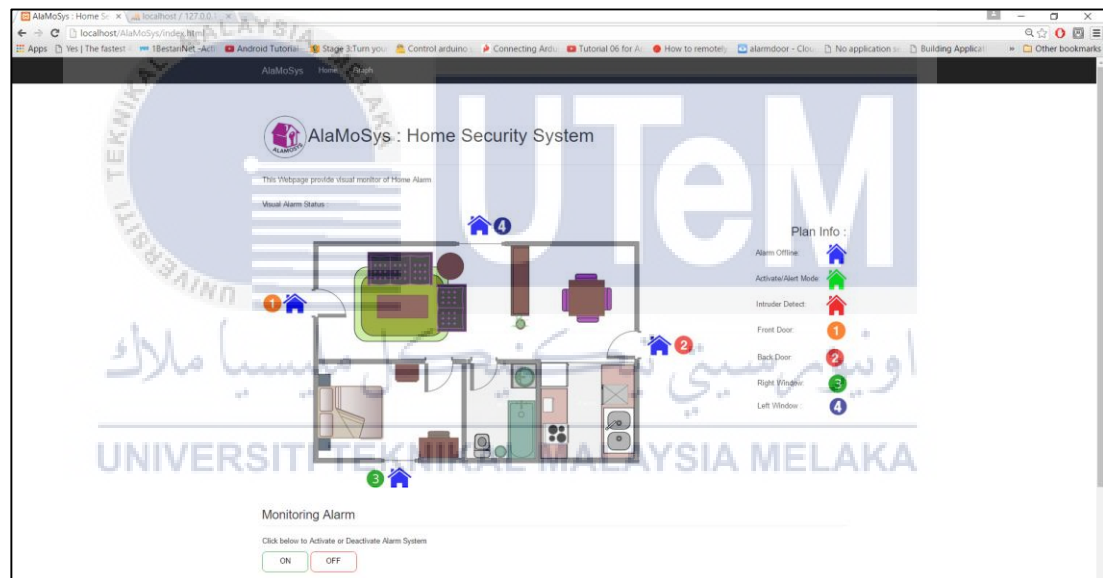

Figure 4.13: Main Page of AlaMoSys
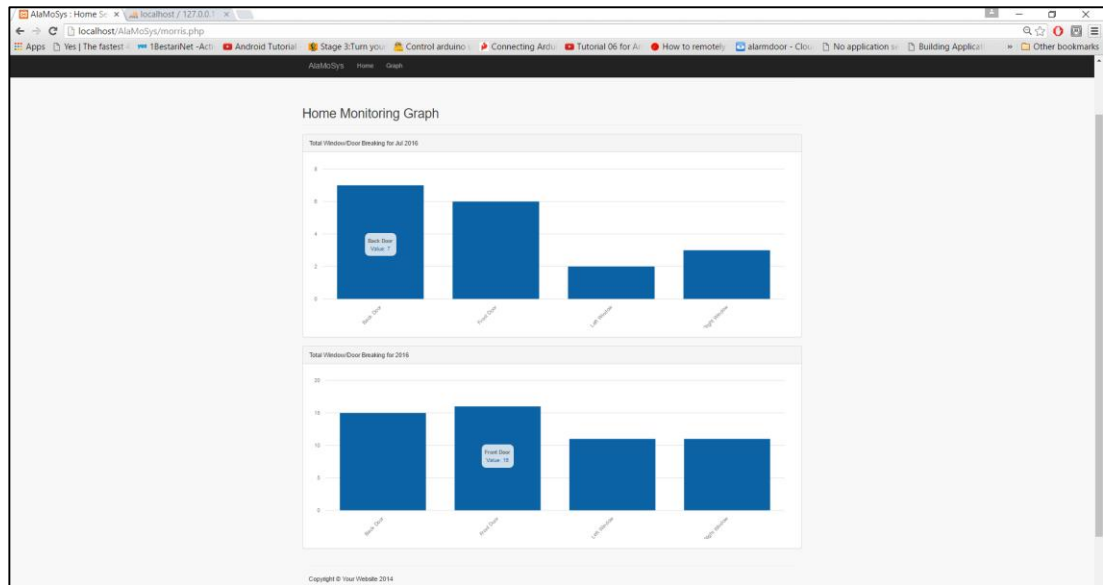
Figure 4.14: Reporting Page of AlaMoSys

4.5. Conclusion

Analysis and Design, a chapter that is very important before going for implementation phase. In order to implement all requirement software and hardware must be verifying. Other than that, this chapter provide an information for determine it flow, by specifically explain data and functional requirement of this alarm system that will be created in implementation stages. The next chapter will explain implementation and input/output expected for this project.

CHAPTER V

IMPLEMENTATION

5.1. Introduction

In this chapter, mainly will describe how implementation of AlaMoSys a Home security system. The activity involve in this chapter will focus on setup this project including hardware and software and what is the expected output after completing this phase will be stated.

5.2. Development Environment Setup

In this section will determine project setup for AlaMoSys system involve hardware and software requirement that will be documented. The hardware development setup it will cover all step-by-step procedure of install and assembling. The software development setup will cover operating the software, including uploading source code to Arduino ide, configuring Node JS server, setup the web server and creating a database to store information.

5.2.1. Hardware Development Setup

In this project, it involves use of hardware that stated from chapter 4. All this hardware will be assembling to Arduino. Arduino will use to control all hardware that attach to it.

Below Arduino board show detail pin that will be inserted by hardware that stated in chapter 4:
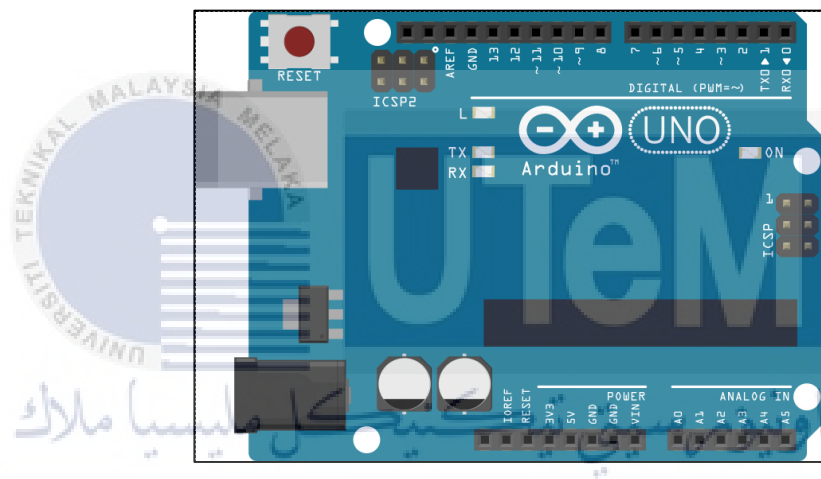

Figure 5.1 Detail of Arduino Pin

From figure 5.1 show the detail of Arduino overall Arduino pin, based on that table 5.1 below show pin that will be use in this project.

Table 5.1 Hardware that will be attach in Arduino pin

Hardware	Pin
LED (Alarm Indicator)	3
Magnetic Sensor (Front Door)	8
Magnetic Sensor (Back Door)	9
Magnetic Sensor (Right Window)	10
Magnetic Sensor (Left Window)	11
LED (Front Door Indicator)	4
LED (Back Door Indicator)	5
LED (Right Window Indicator)	6
LED (Left Door Indicator)	7
Buzzer	2
GSM Module	12,13
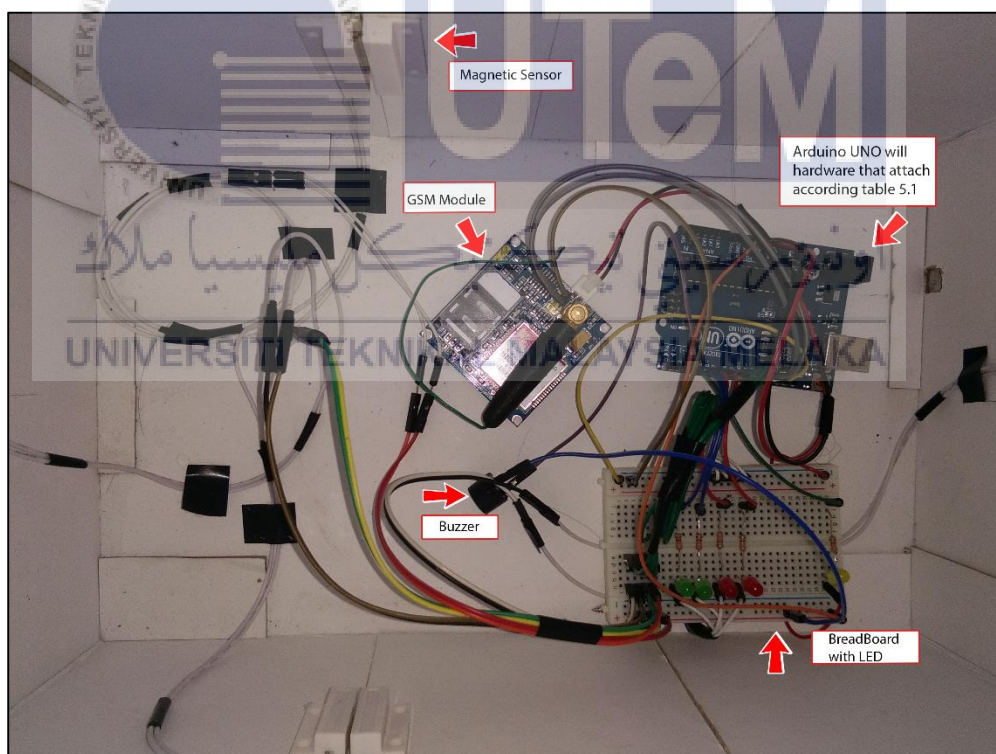
Figure 5.2 Entire project hardware after assamble (top view)

From figure 5.2 show AlaMoSys system complete hardware setup which include Arduino UNO with basic wiring that attach all other device according to table 5.1, item listed are buzzer and LED which being use as Alarm indicator if system trigger, GSM module that use to send SMS notification and magnetic sensor that use to sense if any break-in happens.

Figure 5.3 A prototype of Home that match real home environment

From figure 5.3 above show the project prototype from that being built to match real home environment. This prototype includes of 4 magnetic sensors that attach to all entrance of the prototype home. This setup will help to understand real situation of AlaMoSys system that being implement.
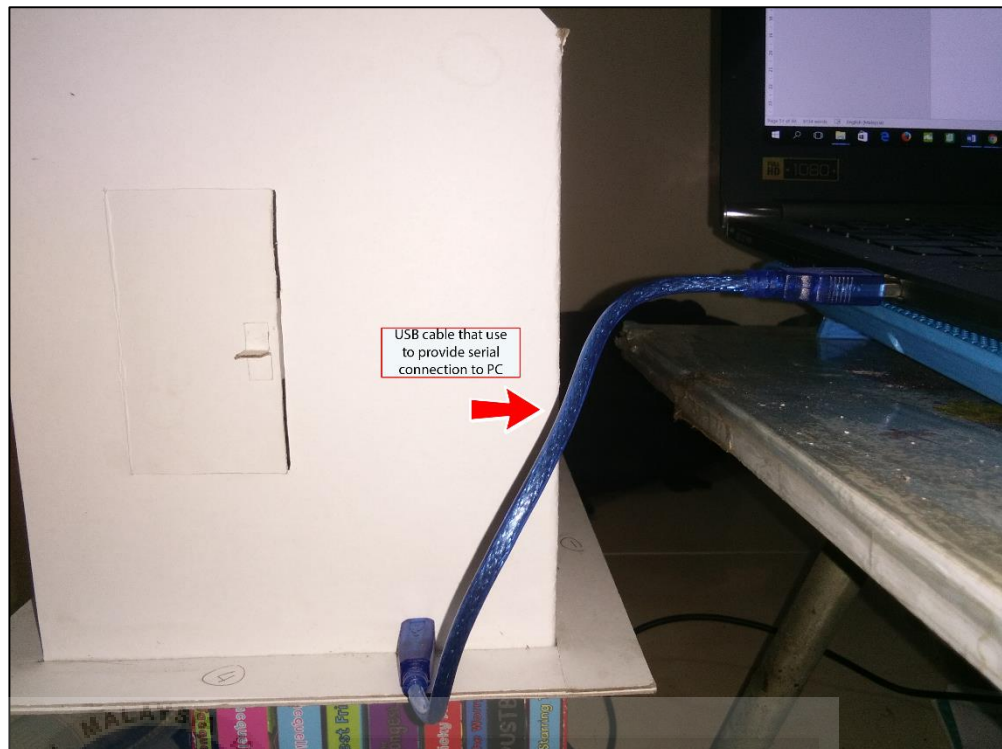
Figure 5.4 Connection of Arduino to PC

The hardware setup also will include connection from Arduino USB to PC which provide communication which enable software interaction between Arduino and servers that being setup in PC.

5.2.2. Software Development Setup

In this part, we will explain software environment of this project. Figure 5.5 explain deployment of software in this project.
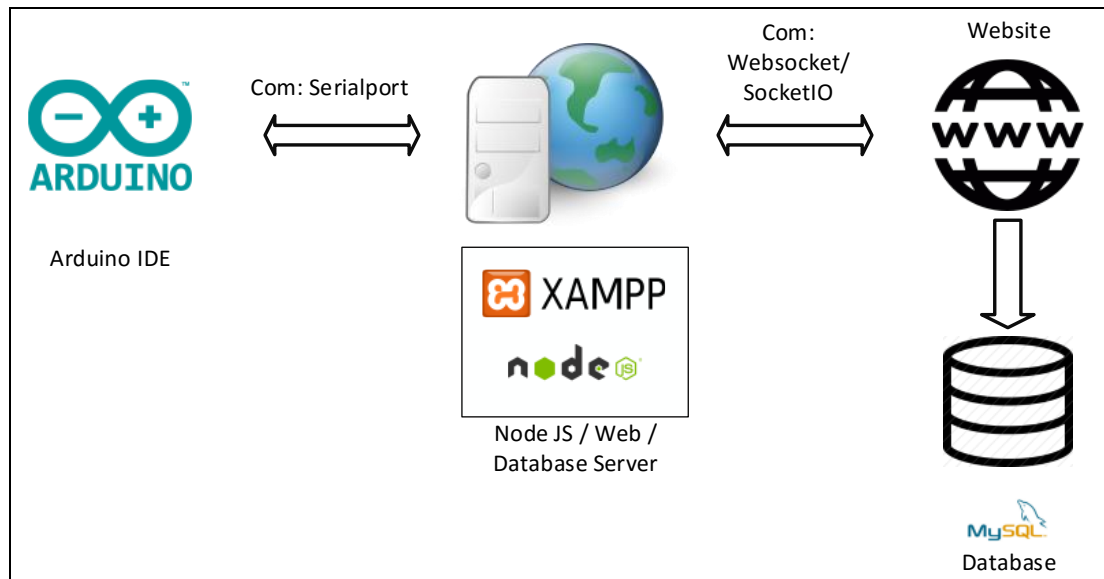
Figure 5.5 deployment of software environment setup

In this part, we will explain software environment of this project. Figure 5.5 explain deployment of software in this project. In Arduino a software will be used to called Arduino Integrated Development Environment will be use writing code and uploaded into hardware. In the server there are three software component that will be used to execute this project.

Firstly, Node JS server is an open source cross-platform runtime environment that use to communicate with Arduino IDE that basically using JavaScript engine. Secondly, a XAMPP software that use to create web server including database that useful for testing and deployment. This server will communicate with Node JS server that provide data from Arduino using web socket.

5.3. Software Configuration Management

5.3.1. Configuration Environment Setup

This section describes configuration management for this project which include few configurations listed below:

i.   Arduino IDE Configuration

Arduino IDE will be used to write code and upload into hardware.

a. Installing Arduino IDE

This software can be found at https://www.arduino.cc/en/Main/Software.

b. Process of writing

After installing the software, we can start writing code.

-      Code that written in this project will be at appendix of this report.

ii.   Node JS

Before configure Node JS all pre-requisites should be install to make sure this software running properly.

a. Software can be found at https://nodejs.org/en/download/

- When installing node it also provide installation for npm(packet manager for JavaScript)
- Checking if installation success:

```
C:\Users\zahid\Desktop\AlaMoSys>node -v
v4.4.5

C:\Users\zahid\Desktop\AlaMoSys>npm -v
2.15.5
```

Figure 5.6: Check version of node and npm

b. After installing this software wen can start configure and writing code that allow communication between serial port for Arduino and web socket for website.

- Node JS to Arduino

    To provide communication between this two software Node JS will need to install serialport module.

Figure 5.7: Install serialport module

- Node JS to Website

    To provide communication to website websocket module will be install

Figure 5.8: Install websocket module

c. After installing all needed module, we can start writing code that allow to communicate simultaneously between Arduino and Website. This server will act as middle man that send and receive data.

-   Declaring in code

```
var serialport = require('serialport');
SerialPort = serialport.SerialPort,
portName = process.argv[2];
var WebSocketServer = require('ws').Server;


var SERVER_PORT = 8081;
var wss = new WebSocketServer({port: SERVER_PORT});
var connections = new Array;


var myPort = new SerialPort(portName, {
  baudRate: 9600,

    parser: serialport.parsers.readline('\r\n')
});
```

Figure 5.9: Declare in code

From figure 5.9 show that piece of code written in Node JS, declaring websocket to use port 8081 and serial port that baud rate of 9600 and read port from input.

-   Executing Node JS

```
C:\xampp\htdocs\AlaMoSys>node wsServer.js COM3
port open. Data rate: 9600
```

Figure 5.10: Execute Node JS

iii.   Install XAMPP an open source cross-platform web server, this software also provide database that will be use in this project.

a. This software can be found at
    https://www.apachefriends.org/index.html

b. After setting up this project we will develop a website which will be located in C:\xampp\htdocs\AlaMoSys.

c. This location will also store all implementation file for this project.

d. It also provides environment to run PHP language that will be use in this project.

iv. Database setup and connection.

a. In this project database will be setup and configure to keep track of alarm that trigger. PhpMyAdmin will be used for this project to store the data.

b. PhpMyAdmin not require to be install, it already embedded in XAMPP software.

c. Configuring database for this project.

1. Enter phpMyAdmin homepage by enter URL: http://localhost/phpmyadmin/
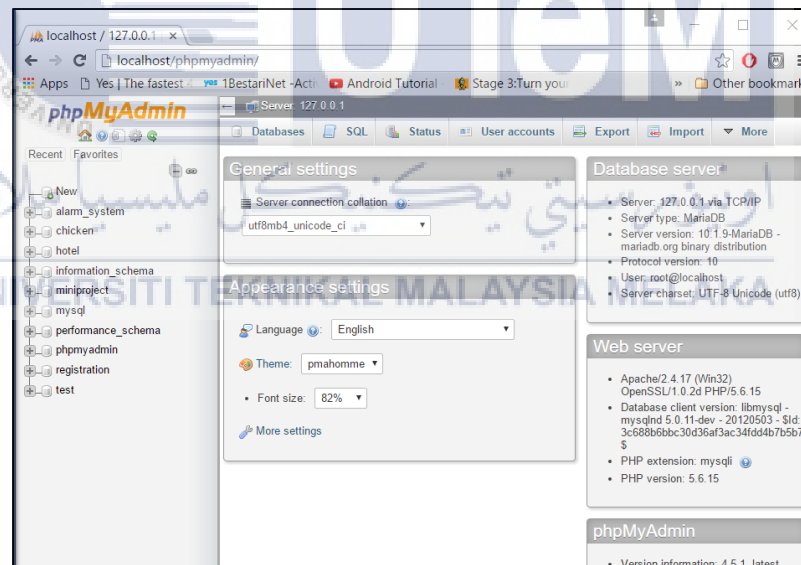

Figure 5.11: phpMyAdmin Homepage

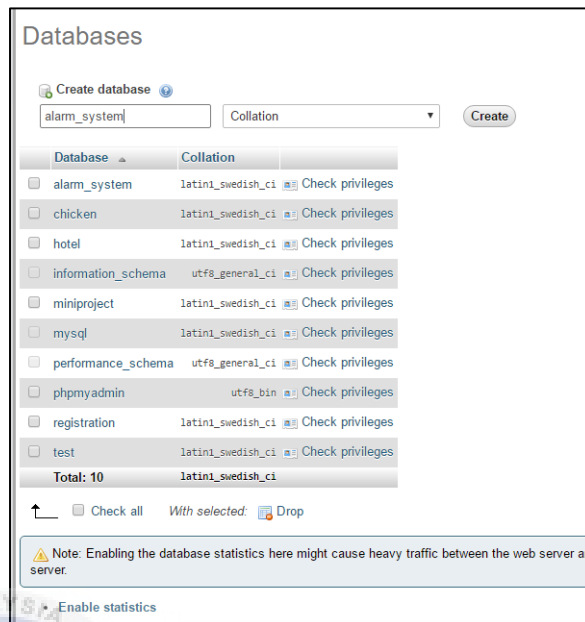2. Create database name as alarm_system

Figure 5.12: Create Database
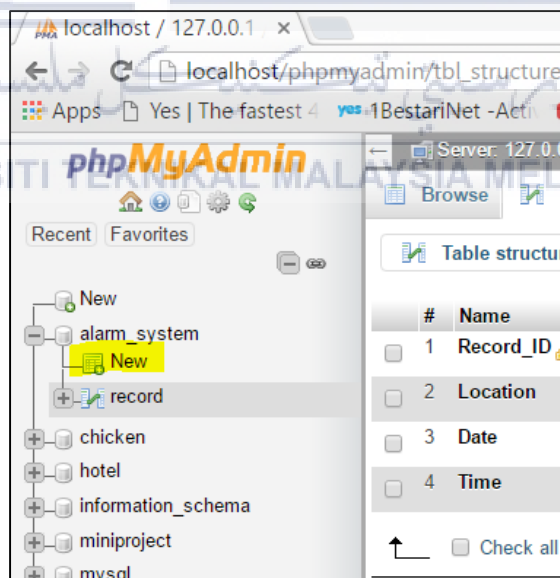
3. Create new table name record in alarm_system database

Figure 5.13: Create new table

From below figure 5.14 show that field that should be insert in table record.

	#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	Record_ID 🔑	int(20)			No	None	AUTO_INCREMENT	🖉 Change ⊖ Drop 🔑 Primary
☐	2	Location	varchar(20)			No	None		🖉 Change ⊖ Drop 🔑 Primary
☐	3	Date	date			No	None		🖉 Change ⊖ Drop 🔑 Primary
☐	4	Time	time			No	None		🖉 Change ⊖ Drop 🔑 Primary

Figure 5.14: table record field

v.   Setup connection to database using PHP language.

In this project database will be used to store data that trigger in website. To make sure that database receive data from website configuration have to be made using PHP language. Figure 5.15 show that code that will be use to made connection to database

```php
<?php
session_start();
$host = 'localhost';
$user = 'root';
$pswd = '12345678';

$conn = mysql_connect($host, $user, $pswd) or
    die ('Error connecting to MySQL');


$dbname = "alarm_system";
mysql_select_db($dbname) or
    die ("Error connecting to Database: ".$dbname);

?>
```

Figure 5.15: PHP code that made connection to database

vi. After setting up and made connection to database, PHP and JavaScript code is used to store data if alarm is trigger. From the website a JavaScript code that using JQuery POST method will be written to catch the data from the website which show in figure 5.16, later data will be send from JavaScript to PHP code that will query data to be store in database show in figure 5.17.

```javascript
function send(){

var i;
var parameters;

if(a[1] == "OPEN"){
    parameters="location=Front Door";

}else if(a[2] == "OPEN"){
    parameters="location=Back Door";

}else if(a[3] == "OPEN"){
    parameters="location=Right Window";

}else if(a[4] == "OPEN"){
    parameters="location=Left Window";
}

if(a[1] == "OPEN" || a[2] == "OPEN"|| a[3] == "OPEN"|| a[4] == "OPEN"){

    var xhr = $.ajax({

        // sending type
        type: "POST",
        //pass value to PHP
        url: "php/insert.php",
        //data that will be send
        data: parameters,
        success: function(msg){
            alert( "Data Saved: " + msg );
        }
    });

    xhr.abort();
    }
}
```

Figure 5.16: JavaScript code use to send data to PHP

```php
<?php
//create connection
include("connect.php");

//data from javascript
$location = $_POST['location'];
//current date
$curdate=date("Y-m-d");

$sql = "SELECT * FROM record WHERE date = '$curdate' AND HOUR(Time)=HOUR(CURTIME()) AND location = '$location'";
$res = mysql_query($sql);
$c = mysql_num_rows($res);

//insert data to database
if (mysql_num_rows($res)<=0){
    mysql_query("INSERT INTO record (location, date, time) VALUES('$location', '$curdate', CURTIME())") or die (mysql_error());
    echo "Data Inserted!";
}
mysql_close($conn);
session_write_close();
?>
```
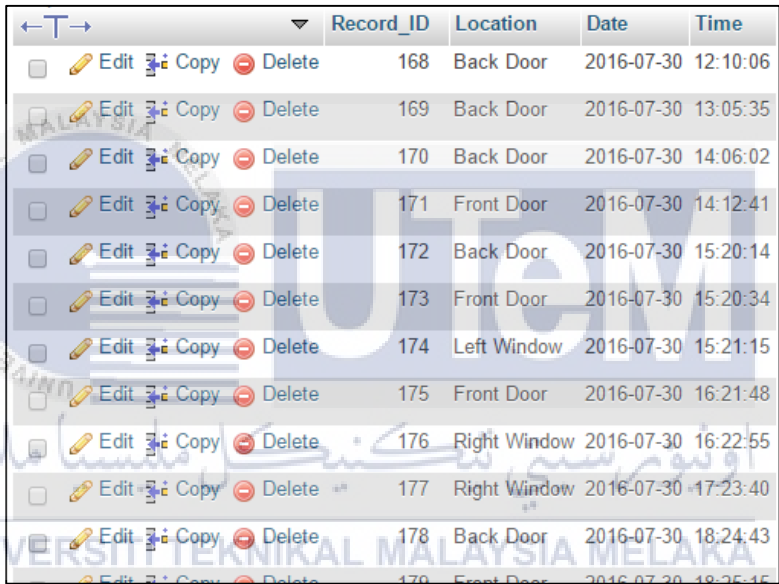
Figure 5.17: Insert data to Database

Figure 5.18: Database receive data from website

vii.   Based on the objective this system will generate a report using a graph that will be preview in the website. It will necessarily to configure website to produce graph for this project.

a.   To generate report all data in the database that being inserted early will be retrieve back to website. To retrieve back the data PHP code will be written that query to select value from database, from figure 5.19 show code that use to retrieve data.

```
function get_chart($conn){
    //select location from table record
    $sql = "SELECT DISTINCT(Location) as loc FROM record";
    $res = mysql_query($sql);
    //store data in array
    $location = array();
    // selecting data according to previous month
    $premonth = date("m", strtotime("-1 months"));
    //loop
    while($row = mysql_fetch_assoc($res)) {
        //selecting from database
        $sql = "SELECT count(*) as c FROM record where Location='".$row['loc']."' AND MONTH(Date)='$premonth'";
        $resCount = mysql_query($sql);
        $rowCount = mysql_fetch_assoc($resCount);
        $location[$row["loc"]]=$rowCount["c"];

    }

return $location;

}
```

Figure 5.19: PHP code that retrieve data from database

b. After retrieve data a graph will be generate from the data. To perform that morris.js will be use the produce graph. Morris.js is JavaScript graph library that usually use along with html bootstrap. This library is very good in producing a responsive html graph. Below shows step to generate graph in website:

i. Add morris.js and it dependency to website

```
<!-- jQuery -->
<script src="js/jquery.js"></script>
<!-- Bootstrap Core JavaScript -->
<script src="js/bootstrap.min.js"></script>

<!-- jQuery -->
<script src="dashboard/bower_components/jquery/dist/jquery.min.js"></script>

<!-- Bootstrap Core JavaScript -->
<script src="dashboard/bower_components/bootstrap/dist/js/bootstrap.min.js"></script>

<!-- Metis Menu Plugin JavaScript -->
<script src="dashboard/bower_components/metisMenu/dist/metisMenu.min.js"></script>

<!-- Morris Charts JavaScript -->
<script src="dashboard/bower_components/raphael/raphael-min.js"></script>
<script src="dashboard/bower_components/morrisjs/morris.min.js"></script>


<!-- Custom Theme JavaScript -->
<script src="dashboard/dist/js/sb-admin-2.js"></script>
```

Figure 5.20: Morris.js and its dependency

ii. Adding code in website that will contain graph, it also has
ID that will refer to JavaScript

```html
<div class="panel-body">
    <div id="locationchart"></div>
</div>
```

Figure 5.21: <div> code contain graph

iii. Add <script> block at end of page contain code that show
in figure 5.22.

```php
<?php
$location=get_chart($conn);
$location2=get_chart2($conn);
?>
<script>
// using bar graph and id for element to draw graph
new Morris.Bar({ element: 'locationchart',data: [
//get data from previous php code
<?php
while ($total = current($location)) {
  echo "{ location: '".key($location)."', value:".$total." },";
  next($location);
}
?>
    ],
    //x-values name
    xkey: 'location',
    //y-values contain data from php
    ykeys: ['value'],
    //display data when hover to graph
    labels: ['Value'],
    xLabelAngle:45,
    resize:true,
    });
```

Figure 5.22: Code with comment to generate graph

iv. After finish configure morris.js and php code the result of
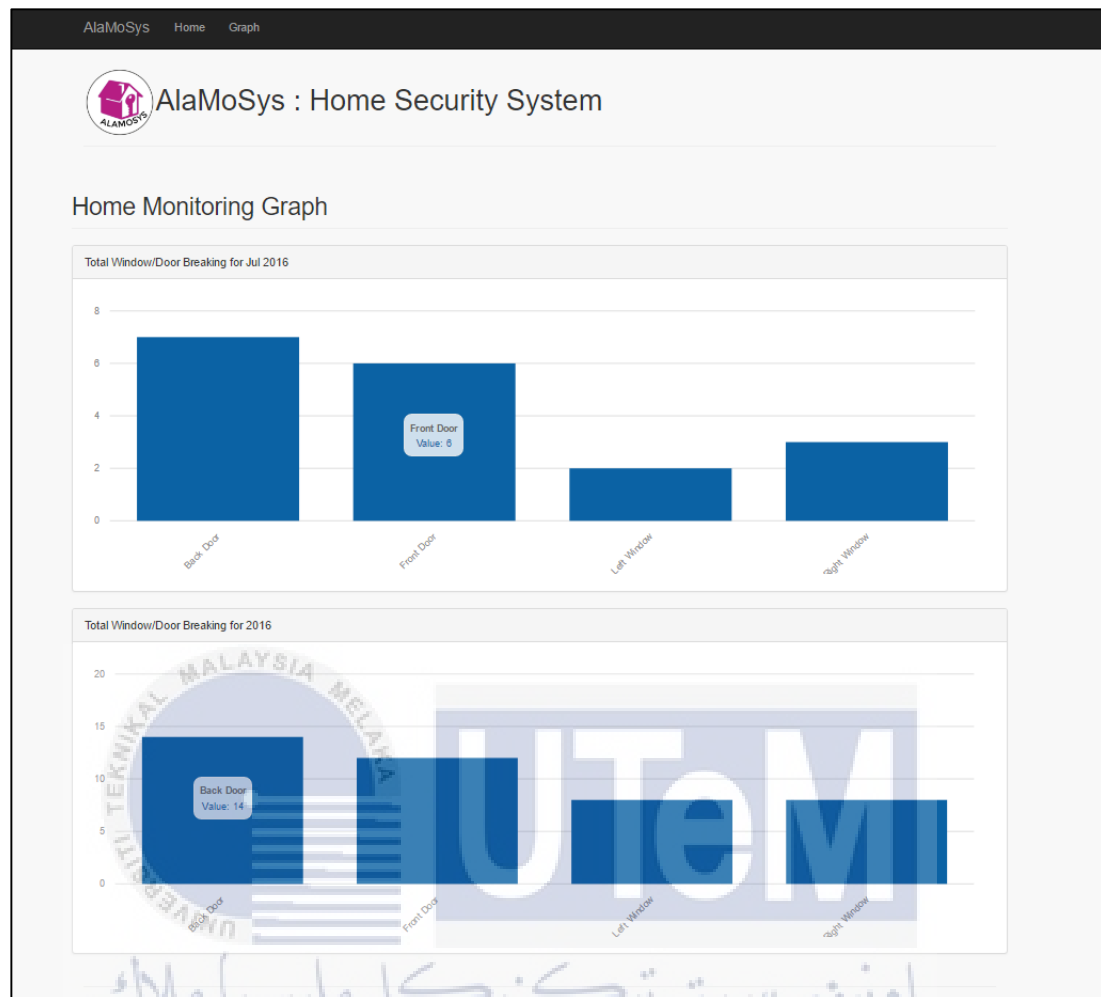graph should be generated based on figure 5.23.

Figure 5.23: Generate graph in website

viii.   After finish setup website and all related to it this implementation will
be proceed to testing part of in this project.

5.3.2. Version Control Procedure

AlaMoSys Home Security System product is the first project
documented, the first final version of dis product to be implement is 1.0.

5.4. Implementation Status

In this part, it will explain about status of development for each component or configuration will be explain.

Table 5.2: Implementation Status

No	Component	Description	Duration of complete
1.	Assemble of Hardware	Process of assembling of all hardware to Arduino based on assign pin	10 days
2.	Building Home prototype	This process mainly creating a prototype and attaching sensor according to real situation	3 days
3.	Configuring and uploading script into Arduino IDE	Process of configuring script based on requirement and uploading it into Arduino IDE	5 days
4.	Installing and configuring Node JS/XAMPP	Process of installing Node JS and XAMPP, also installing pre requisite that need for stated software. Configuring both server.	10 days
5.	Develop website	Website will be developing and configure.	5 days
6.	Configure database	Configure and running up database server.	5 days

5.5. Conclusion

This chapter explain about implementation of this project which consist of step by step process of hardware installation, software setup and configuration. This chapter provide a clear picture of this project to produce actual working product in order to achieve objective of this project. The next chapter will discuss about testing, which determine whether product is working properly.

CHAPTER VI

TESTING

6.1. Introduction

This chapter will discuss basically about testing of this AlaMoSys: Home Security System. From implement chapter all hardware device will be assemble according to the schematic design of that electrical circuit, software will be configure including configuring node js server that will interact with Arduino serial communication and web server will be deploy to run a web pages. This Testing phase is important to help identify all possible drawback or malfunction within it. This chapter also help to identify performance of system in a controlled environment.

6.2. Test Plan

This test plan will explain about the basis for testing the system. It also covers activities and scope of the system. Test plan will help to find and issues that occur on this system.

6.2.1. Test Organization

This section describe who will be responsible to conduct activity in test process. For this project test process will conduct will be carried out by tester and system developer that experience in testing system based product. There are 2 persons that will test this system to make sure that this system provides exact result.

i.   System Developer
- This person will test the system, finding possible error or issues and check whether the system run smoothly and systematically.

ii.   Normal Tester
- This person will test the system and give their feedback that help to enhance the system.

6.2.2. Test Environment

This section will describe environment this project will be conduct. This project will test connection of Arduino and PC (Node JS server) using serial communication. In the same PC it will also test the connection and data transfer between Node JS server connection to web server. Too make sure that web server can be access anywhere, it will be test in Local Area Network. The hardware and software involve in this testing will be monitor to detect any problem occur.

6.2.3. Test Schedule

This section describes how testing is carried out by developer in a period of time. During the testing process, if error or malfunction occur it is passed back to implementation phase. It will reconfigure back or recheck to find possible error. Then, error being declared and solved in implementation phase. This is a continuation process cycle until the system is successfully executed.

6.3. Test Strategy

This section describes what test strategy that used for this project. For this project the test strategy conduct. This project test strategy uses black box test to determine whether this project function working properly. Website that develop early will be test and make sure it functioning according to the hardware of this project.

6.4. Test Design

6.4.1. Test Description

The test description discusses about the test case identification, test cases and expected result for each scenario which are designed and documented. The test description discusses integration test and functionally test.

Table 6.1: Arduino IDE and Hardware Test Case

Test	Arduino IDE/Hardware Test
Test Purpose	- To check whether that error while writing code in Arduino IDE - To check that hardware behaviour according to code written
Test Environment	Windows 7
Test Step	- Run Arduino IDE. Verify the program and upload to Arduino board. **Positive testing** The coding run without error **Negative testing** The coding shows an error - Once code verify it can be test by entering Serial Monitor
Expected Result	- Coding will run without any error - No issues regarding hardware based on written code

Table 6.2: Connection Test Case

Test	Node JS
Test Purpose	To test connectivity between Node JS and Arduino
Test Environment	Installing Node JS server

Test Step	1. Enter command prompt
	2. To run Node JS, type >>node "file name".
Expected Result	Node JS enable to receive data from Arduino.

Table 6.3: Website Test Case

Test	Website
Test Purpose	To test integration of website and hardware.
Test Environment	Develop website
Test Step	1. Enter URL of website to test it availability
	2. Then click the button turn on the Alarm system
	3. The visualize provide the real time situation of the door. If the door is open this website will notify by changing it colour.
Expected Result	To make sure that website integrate with hardware properly.

Table 6.4: Notification Test Case

Test	SMS Notification
Test Purpose	To test whether SMS notification send to mobile phone
Test Environment	GSM module installation

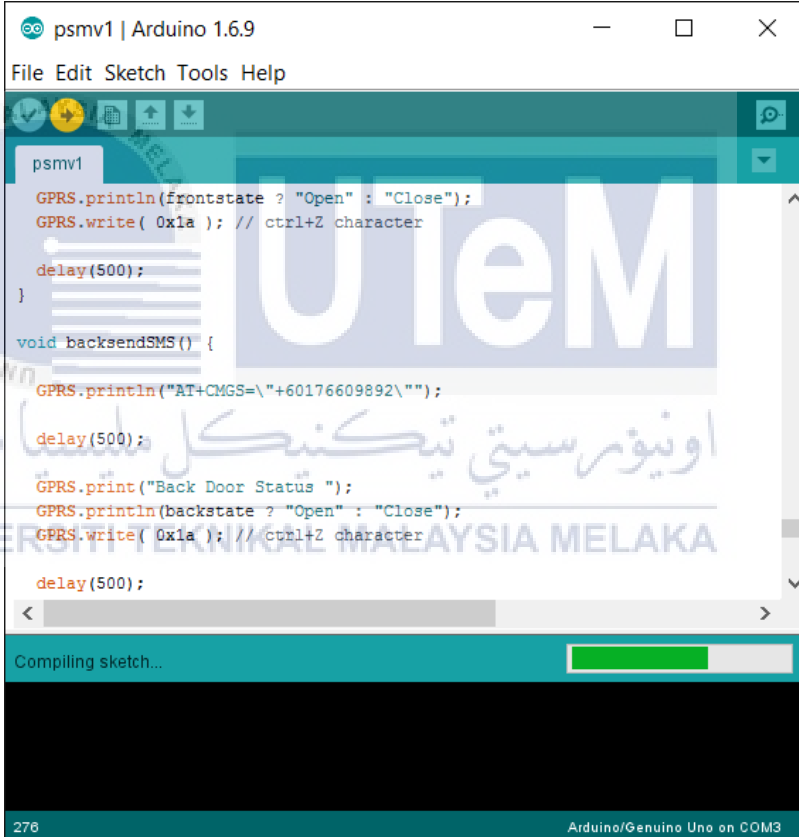| Test Step	1. Writing code in Arduino IDE that able to send notification to mobile phone 2. Notification will automatically send to mobile phone if alarm is trigger.
Expected Result	To make sure that SMS notification deliver to mobile phone if alarm is trigger.

Table 6.5: Database Test Case

Test	Database test individually
Test Purpose	To test integration of website and database.
Test Environment	Database has been setup
Test Step	1. Setup the database environment 2.Create the database name, table, attributes and the values 3. If the door open it will update data to database. 4. After updating to database it will return back to web to produce graph
Expected Result	To make sure that website send and receive value from database

6.5. Test Result and Analysis

1. Arduino Test

   a. Arduino IDE test

In this test code will be written in Arduino IDE, after that it will be uploaded to Arduino UNO. This code is written to make sure that Arduino function according to it functionality.

Figure 6.1: Uploading code into Arduino

Figure 6.2: Verify uploaded code into Arduino

From figure 6.1 and 6.2 show process of uploading code into Arduino Uno and verify whether code that uploaded into Arduino is valid and working based on it functionality.

b. Hardware test

This part will test whether hardware behaviour act according to written code in Arduino IDE, from this test it will find any hardware issues that act not based on written code.
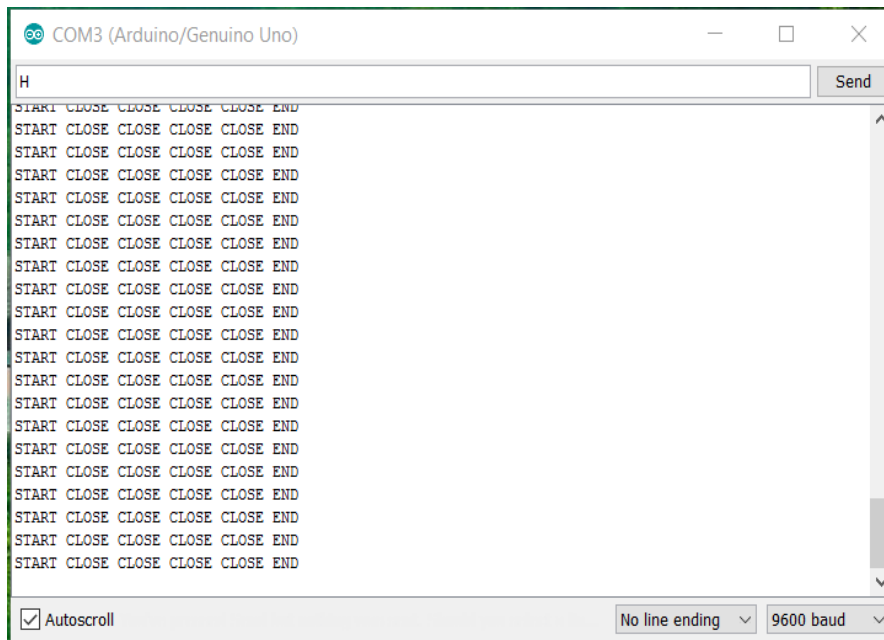
Figure 6.3: Sending signal from Serial Monitor

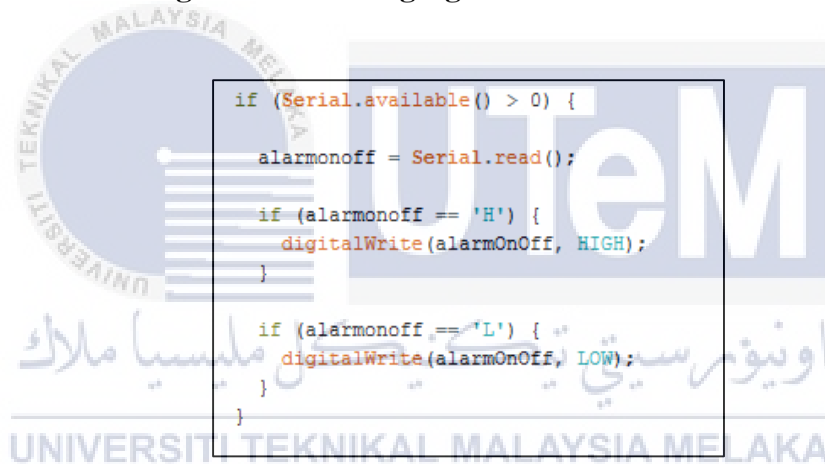**Figure 6.4: code fragment to active alarm system**

From figure 6.3 show step to test whether hardware is act according to the written code show in figure 6.4. When sending 'H' from serial monitor it will send signal to hardware to active the system by indicate LED, if value 'H' is send LED will turn ON and if 'L' value is send LED will turn off. Figure 6.5 indicate LED is turn ON based on value send in figure 6.3.

Figure 6.5: LED is turn ON
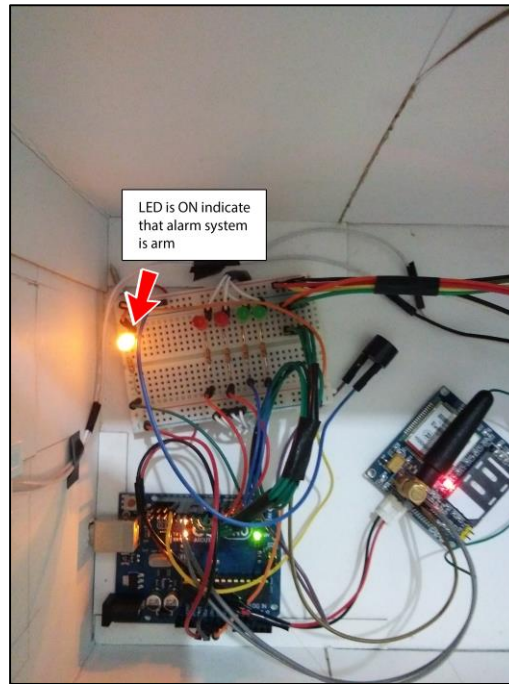
2. Connection from Node JS to Arduino UNO Test

To make sure that this system working fine the crucial part must be test, which is testing communication between Node Server to Arduino UNO. Node JS must be running before testing connection between them. To run Node JS server below step show how to test connection between them.

a. Run Node JS server:

Figure 6.6: Running Node JS

b. Testing connection:

Figure 6.7: Check Node JS Connection

From figure 6.3 show that Node JS successful made connection to Arduino UNO.

3. Website Test.

Developing website is main objective of this project it is important to make sure that website development is based on the objective, to make sure that website running according to objective test will be conduct to make sure it working fine.

a. Enter website URL

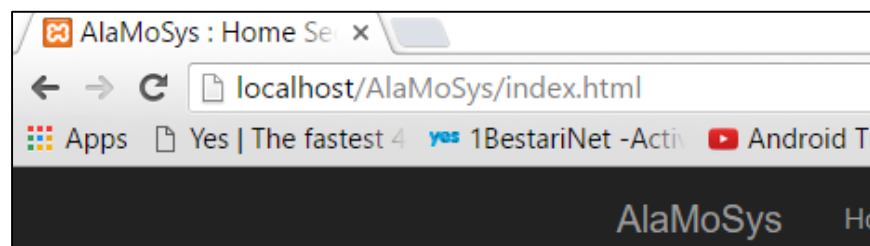**Figure 6.8: Website URL**

b. Testing website availability
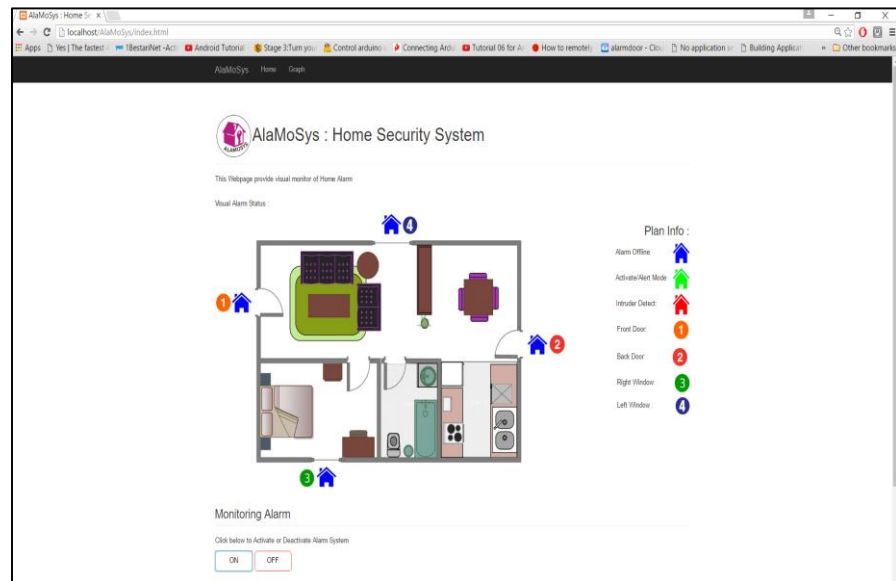
Figure 6.9: Website is online

Based on figure 6.5 show that website is running or online.

c. Testing integration with sensor or alarm

Figure 6.10: Alarm system is online

From figure 6.6 indicate that system is online, which mean all hardware from prototype are ready and alert if sensor can detect any break-in happen.
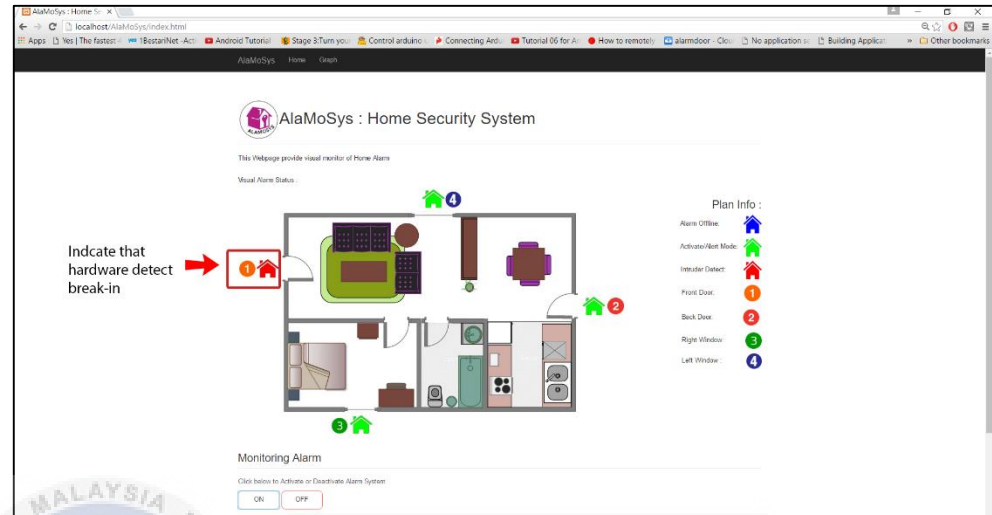
Figure 6.11: Hardware detect break-in happen

From figure 6.7 show that system detect that break-in happen, it also means that sensor successful connect to website to provide information that break-in happen.

4. Notification Test

This part will test if SMS notification is deliver if alarm is trigger at any entrance of home. Notification will be send automatically according to code that being written to Arduino.

From figure 6.8 show that notification is successfully deliver to mobile phone when sensor detect that entrance of home is being enter without authorization.
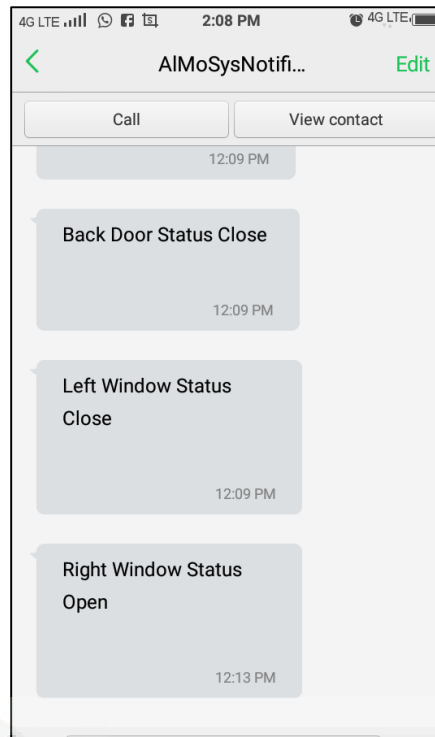
Figure 6.12: SMS notification in mobile phone

5. Database Test

This part where database will be test to make sure that data will save or not. If alarm is trigger it will keep track record and store it in database. Figure 6.9 show that data is save into database. Figure 6.10 show that data will be extract from database and graph is produce from extracted data.

			Record_ID	Location	Date	Time
☐	✏ Edit	⅜ Copy ⊖ Delete	179	Front Door	2016-07-30	18:25:15
☐	✏ Edit	⅜ Copy ⊖ Delete	180	Front Door	2016-07-30	00:46:07
☐	✏ Edit	⅜ Copy ⊖ Delete	181	Left Window	2016-07-30	00:46:19
☐	✏ Edit	⅜ Copy ⊖ Delete	182	Right Window	2016-07-30	00:48:38
☐	✏ Edit	⅜ Copy ⊖ Delete	183	Back Door	2016-07-30	00:50:38
☐	✏ Edit	⅜ Copy ⊖ Delete	184	Back Door	2016-07-30	01:08:54
☐	✏ Edit	⅜ Copy ⊖ Delete	185	Front Door	2016-07-30	01:09:04
☐	✏ Edit	⅜ Copy ⊖ Delete	186	Back Door	2016-08-07	02:35:47
☐	✏ Edit	⅜ Copy ⊖ Delete	187	Left Window	2016-08-07	02:43:15

Figure 6.13: Database receive data from website
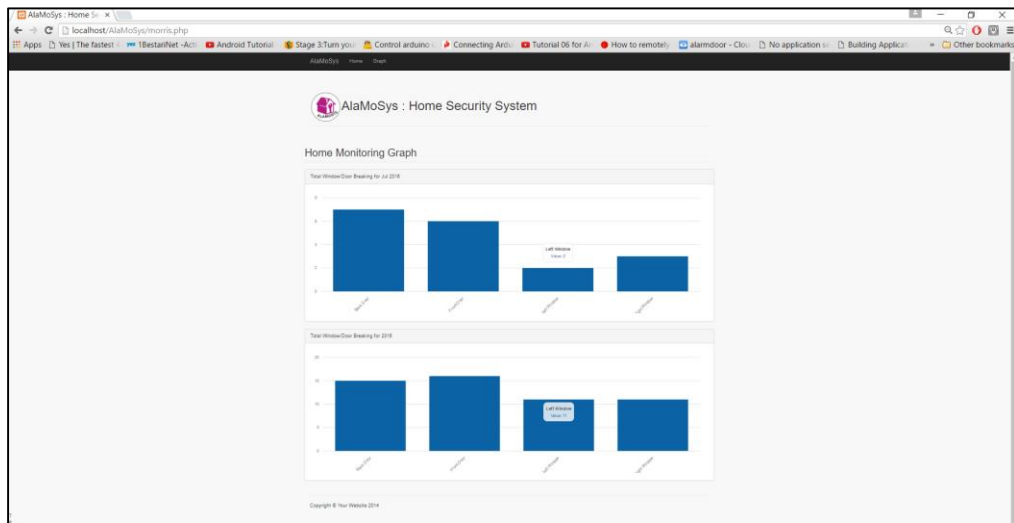
Figure 6.14: Data from database represent as graph

6.6. Conclusion

As a conclusion, all the in this chapter it helps to identify any issues or malfunction that happen. It also helps to test the functionality of the product prototype. Testing phase is very important that increase performance of the product. In the next chapter, the project conclusion will be discussed. It includes information such as project summarization, limitation and future works.

CHAPTER VII

PROJECT CONCLUSION

7.1. Introduction

This final chapter will discuss overall of this project where project report is summarized from beginning of objective that being stated all the way to testing. Conclusion will be made in this chapter where all project objective should be achieved. This chapter also will describe contribution of project and what are the limitation of this project. Future work is part of this chapter that help to improve product of this project to make it more efficient and effective.

7.2. Project Summarization

This project is about an integrate product – AlaMoSys, a home security system that powered by Arduino Microcontroller. This product is an integrated of a system that consist of a real time web-based application and sensor device that attach to all entry to house. This system is created to provide a home security system that help to guard owner home from being break-in or trespassing to their home.

The first objective of this project is to develop a system that can monitor, alarm and visualize a home security in real time. This objective is achieving by develop a real time web-based application, this web page has the ability to monitor by visualize house plan, all entry point of house will be tag, so if house is break-in it will immediately display in web pages. This pages also contain a features that can arm or disarm the alarm remotely.

The second objective of this project is to keep record and generate report from home security system. To accomplish this a database will be setup that will keep all record if system detect break-in or unauthorized activity happen. A graph will be generated from record that stored in database, with his graph we can find weak point of entry point of home and increase it security measure.

The last objective of this project is to send SMS notification to owner's mobile phone if the security system detects a break-in or unauthorized activity happen. To objective is completed by providing a GSM module to Arduino that will send alert or notification to owner if any break-in activity take place.

This home security system has been tested and the product – AlaMoSys that meet all objective. This integrated system has provided web-based application that has ability to monitor, alarm and visualize home and sending alert to owner. Moreover, this system result shows a susses in integrating between web-based application and Arduino microcontroller.

a. Project Weaknesses:
   - **Notification is limited to area that have GSM network access only,** this system has can alert owner using SMS notification in area that have GSM network coverage, if owner is out of range no notification will be receive by owner.
   - **Connection to Arduino using a USB**, there are a lot of access can be use to access to Arduino such as Wireless or Ethernet connection that have its own flexibility, for this system the connection only limited access using USB connection to Arduino.

- **Power consume**, this system is using Arduino and a server that need to be operate 24/7 a week, a full operation without downtime it need lot of power so it can secure our home.

b. Project Strength:

- **System provide backup plan if blackout happen**, this system can provide a back plan if power cut off. If blackout happen web server cannot be operated, but with Arduino that can be equip with external battery it can still operate and send alert as the GSM module is attach to Arduino.
- **A real time web**, this system provided a real time web that able to update in real time situation if anything happens or if alarm trigger.
- **Provide an alert directly to owner of house,** by providing a SMS notification it will inform to owner directly if anything happens.
- **Easy installation and maintainable,** compare to other security product this system is very easy to be install, manage and maintenance. To operate this system, it only need to install sensor, suitable place for Arduino and server.

7.3. Project Contribution

AlaMoSys is aim to provide a security system at house environment and benefit to home of owner or individual. It will serve to make sure that owner home will be under protection and will prevent from break-in happen.

It also provides a real time monitor of home condition and provide notification to owner if anything happen to their home. The contribution of this project not only benefit security measure, by providing Arduino microcontroller it also allows to upgrade this system to another beneficial feature including home automation.

7.4. Project Limitation

In this project there are some limitation, such as to send notification it must have good coverage of GSM network in that place whether location of home or owner. If the location of owner is not in GSM coverage it will not receive notification and owner will not receive any update of it alarm condition.

Other that than, because lack of experience in electrical component the circuit are plan according to logical knowledge, to increase its efficiency and effectiveness of system it circuit must be plan carefully according to its capacity.

7.5. Future Works

There are many things that can be improve in this system, for example that this system can be use in large scale environment such as office environment that has many entrance to be monitor. With this system it also can be use as live feed system monitor from security room in office.

Beside that in this era of fast technology improvement sending notification using SMS is outdated and it can be improve by sending notification with another platform such as WhatsApp or Telegram that free compare to SMS that cost when sending massages.

Another crucial project improvement that can be consider is increasing features of Arduino controller itself by adding another function that useful for home environment which including adding temperature control, light sense, home electricity consumers and other function which benefit for home.

7.6. Conclusion

The conclusion of this project is to develop a system which powered by Arduino microcontroller that provide a home security system that allow user to monitor their home from remote location. In additional this system will provide alert SMS notification if any break-in happens. The project meet all objective as stated in chapter 1. The implementation, testing and result are consistent to objective. Lastly, this project is a success and all objective accomplished, AlaMoSys is a home security system that meet the requirement to provide safety to home while are away from it.

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