



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART HOUSING SYSTEM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Electronics Engineering Technology (Industrial Electronics) with Honours

by

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I hereby, declared this report entitled “Smart Housing System” is the results of my own research except as cited in the references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor's Degree in Electronics Engineering Technology (Industrial Electronics) with Honours. The member of the supervisory is as follow:

.....
(Mr. Mohd Fauzi Bin Ab Rahman)

ABSTRAK

Sistem perumahan pintar merupakan teknologi yang menggunakan pengawal mikro sebagai sebahagian penting untuk mengawal peralatan perumahan dan sistem elektronik. Integrasi teknologi dan perkhidmatan melalui rangkaian rumah digunakan untuk kualiti kehidupan yang lebih baik. Projek ini menggunakan Arduino sebagai pengawal mikro untuk sistem. Projek ini merupakan prototaip bagi sistem perumahan pintar. Objektif utama projek ini adalah untuk membantu orang-orang kurang upaya dan warga tua pada sistem di rumah untuk keselamatan mereka. Projek ini mempunyai tiga sistem utama. Sistem pertama adalah untuk keselamatan mereka di rumah dan dipanggil sebagai sistem penggera rumah. Sistem kedua adalah langsir automatik dan sistem yang terakhir adalah pengawal kipas automatik. Semua sistem ini akan dijalankan oleh mikropengawal Arduino. Untuk projek ini, beberapa temu bual dan pemerhatian telah dibuat untuk mendapatkan idea lebih. Selain itu, penyelidikan di web, jurnal dan buku telah dirujuk untuk menyelesaikan masalah ini ketika membuat projek ini. Ketiga-tiga sistem akan disatukan dalam satu perisian dan pengekodan. Sistem perumahan pintar sangat akan berfungsi untuk orang-orang kurang upaya dan warga tua kerana ia adalah sistem bergerak sendiri.

ABSTRACT

Smart housing system is a technology that uses microcontrollers as its integral part to control housing appliances and electronic system. This integration of technology and services through home networking is applied for a better quality of living. The project uses Arduino as a microcontroller for the system. The project is to develop a prototype for the smart housing system. The main objective of this project is to help disabled people and elderly on the system in the house for their security. This project has three main systems .First system is for their security in house that is call home alarm system. The second system is automatic curtain and the last system is automatic fan controller. All of this system will be conducted by Arduino microcontroller. For this project, a few of interview and observation was made to get more idea. Besides, the research on the web, journal and book were referred to solve the problem for this project. These three systems will be combined in one software and coding. This smart housing system will highly functional for the disabled people and elderly because of its anonymous system.

DEDICATION

To my beloved parents.

I love U

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TABLE OF CONTENT

Declaration	iii
Approval	iv
Abstrak	v
Abstract	vi
Dedication	vii
Acknowledgement	viii
Table of Content	ix
List of Tables	xii
List of Figures	xiii
CHAPTER 1: INTRODUCTION	1
1.1 Project Background	1
1.2 Problem Statement	2
1.3 Project Objective	2
1.4 Project Scope	2
1.5 Project Significant	3
1.6 Result Expectation	3
1.7 Summary of Introduction	5
CHAPTER 2: LITERATURE REVIEW	6
2.1 Introduction	6
2.2 Smart Home Controller	8
2.3 Home Alarm System	12
2.3.1 Transmitter and Receiver System	14
2.4 Automatic Curtain System	15
2.4.1 Light Sensor	16
2.5 Automatic Fan Controller	17
2.5.1 Temperature Sensor	20
2.6 Summary of Review	21

CHAPTER 3: METHODOLOGY	22
3.1 Project Methodology	22
3.1.1 Stage 1: Investigation of Smart Housing System by Using Arduino	22
3.1.2 Stage 2: Design a Smart Housing System by Using Microcontroller Arduino with a Hardware Model of House	23
3.1.3 Stage 3: Testing and Evaluations A New Technology for Security in House and Easiness Way to Control System in House	24
3.2 Hardware Model Implementation	26
3.3 Experiment Setup	30
3.4 Programming of Smart House	32
3.4.1 Flowchart Programming of Smart House	33
3.5 Project Development Process Steps	35
3.6 Hardware Development	39
3.6.1 Mechanical Development	39
3.6.2 Circuit Development	42
3.7 Analysis Element Steps	46
3.7.1 IR LED TX-RX Sensor	46
3.7.2 Light Dependent Resistor (LDR)	49
3.7.3 LM35 Sensor	52
3.8 Summary of Methodology	54
CHAPTER 4: RESULT AND DISCUSSION	55
4.1 Definition Process	55
4.1.1 Smart Housing System	55
4.2 Home Alarm System	58
4.3 Automatic Curtain System	61
4.4 Automatic Fan Controller	64
4.5 Analysis Element 1	67
4.5.1 IR LED TX-RX Sensor	67
4.6 Analysis Element 2	68
4.6.1 Light Dependent Resistors (LDR)	68
4.7 Analysis Element 3	71
4.7.1 LM35 Sensor	71

4.8	Discussion	73
4.9	Summary	75
CHAPTER 5: CONCLUSION AND RECOMMENDATION		76
5.1	Conclusion	76
5.2	Recommendation	77
REFERENCES		78
APPENDICES		
A	List of Respondents	
B	Datasheet	
C	Coding	

LIST OF TABLES

2.1	The Temperature and The Fan Speed	19
4.1	Voltage of IR Sensor Detection With 5 Difference Distance	67
4.2	Voltage of LDR with Difference Luminosity	69
4.3	Resistance of LDR with Difference Luminosity	70
4.4	The Voltage and Resistance of LM35 with 5 Difference Temperatures	71

LIST OF FIGURES

1.1	Design of Hardware Model	4
2.1	Examples of the Smart Devices	9
2.2	Smart Home Network	10
2.3	Arduino Uno	11
2.4	Example of Home Alarm Circuit	13
2.5	Design of Home Alarm System	13
2.6	Operation Sequences of Home Alarm System	14
2.7	Example of Transmitter and Receiver	15
2.8	Basic Circuit of TX and RX	15
2.9	Design of the Automatic Curtain System	16
2.10	Operation Sequence of Automatic Curtain System	16
2.11	Photocell Light Sensor	17
2.12	Light and Dark Sensor	17
2.13	Schematic of the Automatic Fan Speed Controller	18
2.14	Design of Automatic Fan Controller	18
2.15	Operation Sequence of Fan Controlling	19
2.16	Relationship of Junction Temperature and Standby Power	20
2.17	LM35	21
3.1	Arduino Uno	23
3.2	Example of Smart Housing System	23
3.3	Flow of Three Modules	24
3.4	Flowchart of Project methodology	25
3.5	The Illustration of the Smart Housing System	26
3.6	The Sensor Output vs. Temperature	27
3.7	DC Servo Motor	28
3.8	12V DC Fan	29
3.9	The Connection between Arduino with LCD 2x16	30

3.10	Flowchart of Project Function Flow	31
3.11	Flowchart programming of Smart House	33
3.12 a	Circuit of Smart House	37
3.12 b	Sensor and Actuator of Smart House.	37
3.13	Flowchart of Project Flow	38
3.14	Material for the Prototype	39
3.15 a	Window 1 and Window 2 designed	39
3.15 b	Window designed	40
3.16	Application of Chloroform	40
3.17	DC fan designed	41
3.18 a	The L-shape Aluminium	41
3.18 b	Wire connected to Aluminium	41
3.19	The making of LM35 and LDR sensor circuit	42
3.20 a	Sensor Object at Window 1 and 2	42
3.20 b	Sensor Object at Door 1	43
3.21	The DC Servo Motor designed	43
3.22	Circuit Design by using Proteus Software	44
3.23 a	Before the Installation of Circuit	44
3.23 b	After the Installation of Circuit	45
3.24	Fully Prototype of Smart House	45
3.25	Equipment for Analysis 1	46
3.26	Door 1(D1) Voltage at Distance 0.5cm	47
3.27	Door 1(D1) Voltage at Distance 2.5cm	47
3.28	Window 1(W1) Voltage at Distance 0.5cm	48
3.29	Window 1(W1) Voltage at Distance 2.5cm	48
3.30	Window 2(W2) Voltage at Distance 0.5cm	49
3.31	Window 2(W2) Voltage at Distance 2.5cm	49
3.32	Voltage of LDR in Bright Luminosity	50
3.33	Voltage of LDR in Dark Luminosity	50
3.34	Resistance of LDR in Bright Luminosity	51
3.35	Resistance of LDR in Dark Luminosity	51
3.36	Voltage Reading using Ice	52

3.37	Voltage Reading in Normal Room Temperature	52
3.38	Voltage Reading Heated By Lighter In 1s	53
3.39	Resistance Reading using Ice	53
3.40	Resistance Reading in Normal Room Temperature	54
3.41	Resistance Reading Heated By Lighter In 1s	54
4.1	Circuit of Smart House	55
4.2 a	Front View of Smart House	56
4.2 b	Right View of Smart House.	56
4.2 c	Left View of Smart House	56
4.2 d	Upper View of Smart House	57
4.2 e	Back View of Smart House	57
4.3	Home Alarm at Door 1(D1)	58
4.4	Home Alarm at Window 1 (W1) and 2(W2)	59
4.5	Function of Door 1(D1) Home Alarm	59
4.6	Function of Window 1(W1) Home Alarm	60
4.7	Function of Window 2(W2) Home Alarm	60
4.8	Curtain Open when Bright Luminosity	62
4.9	LCD Display of LDR in Bright Luminosity	63
4.10	LCD Display of LDR in Dark Luminosity	63
4.11	Curtain Close when Dark Luminosity	64
4.12	DC fan for Automatic Fan Controlling	65
4.13	LCD Display 24°C and DC Fan Movement	65
4.14	LCD Display 26°C and DC Fan Movement	66
4.15	LCD Display 47°C and DC Fan Movement	66
4.16	Scatter graph of Voltage vs. Distance	68
4.17	Histogram graph of Voltage vs. Luminosity	69
4.18	Histogram graph of Resistance vs. Luminosity	70
4.19	Scatter Graph of Temperature vs. Voltage vs. Resistance	72

CHAPTER 1

INTRODUCTION

1.1 Project Background.

Nowadays, Smart housing technology that uses microcontroller as its integral part to control housing appliances and electronic system is becoming popular. Smart home technology has been existing for more than a decade that introduces the concept of networking devices and equipment in the house. The increasing trend is due to the needs of the system by disabled people and elderly. There are many situations whereby disabled and elderly people house being robbed. Furthermore, this system will ease them to control the electrical devices in the house. In this project, three controlling modules that consist of home alarm, automatic curtain and automatic fan controller will be developed and integrated. The systems will be controlled by Arduino microcontroller.

Each module has its particular function; home alarm module acts as intruder alert, automatic curtain open or close that depends on the received light density, and automatic fan that controls the speed of the fan. At the end of the project, a smart housing system prototype will be developed, and the performance of each module will be analysed and summarized.

1.2 Problem Statement

Most of the elderly and disabled people around the world need a system that can assist them in daily life such as controlling speed of fan and opening or closing curtains. Other than that, this project also will give solution with regard to home security. Nowadays, there are many home burglary cases especially at elderly house and disabled people house. With the integrated home alarm system installed, it can decrease burglary case. It also helps people who are working because the house will be vacant and the probability of home burglary happen is high. Smart housing system contributes to the support of elderly, people with chronic illness and disabled people that living alone at home.

1.3 Project Objective

The objectives of this project are as follows:

- (1) To investigate the parts and working principles of smart housing system by using Arduino.
- (2) To design a smart housing system model by using microcontroller Arduino.
- (3) To test and evaluate the performance of the integrated system.

1.4 Project Scope.

In this project a smart housing system prototype that consists of three smart modules; home alarm, automatic curtain and fan controlling will be developed rather than a real mini studio that equipped with those real smart modules. This prototype is controlled by Arduino UNO microcontroller. There are integrated with Android system for control the system electronic in the house. In this project, the Android system is not chosen because; the focus of this project is anonymous system. This smart housing system uses a sensor to react and function. The project will function when the sensor gets the input and that input will be sent to the Arduino

microcontroller. Arduino microcontroller will read the input and sends appropriate output to the actuators. The project function as anonymous system and it does not require the direction from any controller. When the user wants to start or stop the system, they will only need to press the Push Button Start/Stop that was provided. This PB Start/Stop will control the entire module. The coding at UNO will set the home alarm module that acts as intruder alert, automatic curtain for opening and closing the curtain depending on the light density, while automatic fan controlling the speed of the fan. All of these modules will save the electricity at home, easiness to control system electronic in house and make a security in house better for disabled people and elderly.

1.5 Project Significant.

Smart housing system contributes to the support of elderly, people with chronic illness and disabled people living alone at home. By using Arduino UNO, the module of the project will conclude in one program and it is easy to control. According to Guy Dewsbury et al., the social and physical requirements of the occupiers, the functions, form and structure and technology all need to be considered and manipulated simultaneously to achieve the best outcome for all (Guy Dewsbury, n.d.). The main purpose of the project is for elderly, disabled people and people with chronic illness. Besides, this project can also be installed at the renter areas as this project is multifunctional and it is suitable for everyone. The system is simple and it is suitable for house and also for the office.

1.6 Result Expectation

At the end of this project, investigation results of the three systems in one unit by using Arduino UNO will be summarized. It starts with the research and data collection pertaining to smart housing system. There a many systems related to smart

housing but in this project only three modules will be focused that do have relation with helping elderly people.

Furthermore, the design of smart housing system by using Arduino UNO microcontroller with prototype of house will be established. The design of the coding for this entire module that need more research and investigation will be made and the coding will be transferred into Arduino UNO microcontroller. The project depends on the coding that will be made and if the coding is not programmed accurately, the module will not function as planned.

A new technology and easiness way to control system in house, observation of the need of security in house especially for disabled people safety and also easiness control for disable people will be made. At the end, a model of Smart Housing Systems that consists of three modules, home alarm module that acts as intruder alert, automatic curtain for opening and closing the curtain depending on the light density, while automatic fan controlling the speed of the fan will be tested and evaluated based on the real working environment. Data related to sensors as inputs will be gathered and summarize in graphs in chapter four.

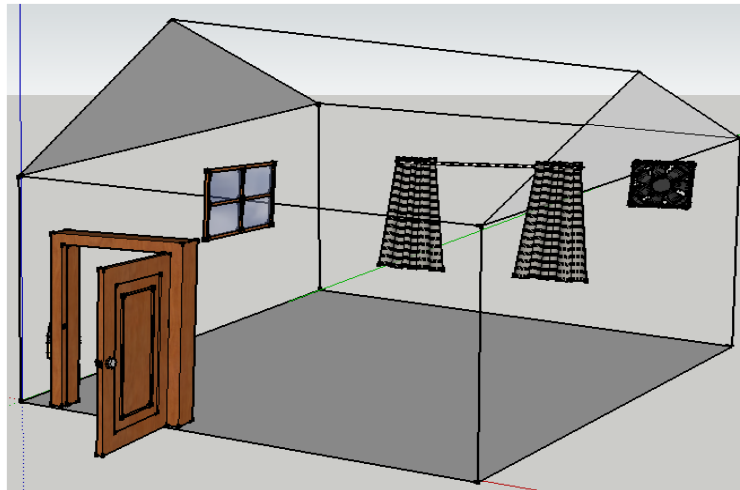


Figure 1.1: Design of Hardware Model

1.7 Summary of Introduction.

In this chapter, introduction with regard to the Smart Housing project such as project background, problem statement, project objective, project scope have been clearly explained. This is to give overall view of the basic ideas and structures with relation to the project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction.

This paper examines the Smart Housing System for disabled people by using Arduino. The project consists of three modules; home alarm, automatic curtain and automatic fan controlling. A prototype will be developed rather than a real smart house that equipped with those real smart modules. These three modules are expected to function as planned and suitable for a disabled people and elderly.

As example from Guy Dewsbury said that, for this smart housing system, there have five basic features. That is in automation, the ability to accommodate automatic devices or perform automatic functions. Multi-functionality because the ability to perform various duties or generate various outcomes. Other than that, this project should be adaptability that is ability to interact with or allow for interaction among users and interactivity whereas it was for interacts with or allow for interaction among users. Furthermore, the feature is about efficiency that is the ability to perform functions in a time-saving, cost-saving and convenient manner (Guy Dewsbury, n.d.). From this research state that this basic feature is important to design a smart housing system. It can make a smart housing system that perfect for disabled people and elderly.

Most people nowadays are using an Arduino for their smart housing system in their house. The term smart housing is generally used to refer to a modern home provides electronically controlled security and conveniences. Smart home technology is

defined as the integration of home based technology and services for a better quality of life (Berlo, 2002). This research state that a smart housing can make daily life easier and its can save human energy to control the system in the house.

Other than better quality of living, instead for elderly being forced to move into a nursing home when unable to achieve full self-care, they can rely on these smart home appliances. In addition, smart home have a capability of monitoring the vital signs of residents. If elderly or disabled people has a medical condition that could be of concern, the vital signs can be routinely sent to the appropriate medical facility. The smart house equipped with artificial intelligence will learn to distinguish dangerous readings, and alert medical personnel immediately (Nicks, 2009). From this research, it state that smart housing system also can help in medical part such as when elderly or disabled people had a problem with their healthy, it can send a sign to a medical facility by a controller.

The Home Automation filed is popular as electronic technologies converge. The home network encompasses communications, entertainment, security, convenience, and information systems. Nowadays, the most popular Home Controllers are those that are connected to a Windows based PC during programming only, and are then left to perform the home control duties on standalone basics. When integrating the home systems, its allowed them communicate with one another through the home controller, thereby enabling single button and voice control of the various home systems simultaneously, in pre-programmed scenarios operating modes (Kim, February 2010). Otherwise, Rajeev Piyare and Seong Ro Lee state that smart homes also call as domotic that can be explain as new of technology that related with home environment to give us facility, comfort, safety and energy efficiency to residents. From the introduction of the Internet of Things, the findings and execution of home automation are become more popular (Lee, 2013).

Smart home also have a research about network technology. This smart home network technology has two main systems that are wiring system and wireless system. The component will be connected directly to the power supply for wiring system. Moreover, the data will be sent directly because it will be sent to the devices

to activate or deactivate the system. For the wires, there have many types for people to choose to install it in wall. Many people chose the wiring system such as new wire (twisted pair, optical fiber), Powerline and Busline. X10 is the one of example that an outstanding technology because its open standard for home automation. For the wireless system, there have two elements that are transmitter and receiver. In this new era, many new appliances use wireless technology to communicate with other devices. Example of the wireless is Infrared (IR), radio frequency (RF), Wi-Fi, Bluetooth and Android. Moreover, there a few of smart home network technology can work by using both wiring system and wireless system such as example Z-wave wireless communication system. It was more reliable and affordable wireless home automation solution (Meensika Sripan, December 18-19,2012) . From this research, it's show that disabled people capable to make a choice for the wiring system in their house. In this project, there had uses a wireless system such as system transmitter and receiver that will put at the door and the window. Its function when the light connection between transmitter and receiver disconnected. This happened when the strangers entering the house without turning off switch that was made especially for this alarm system.

2.2 Smart Home Controller

Smart home controlling devices is use for controlling the actuators such as fan or motor to open the curtain. It manages the system by sending the data or signal to the actuators. Controlling devices for smart home is not only the remote control, but it also can be controlled by a smart phone, tablets, web browsers and short message service (SMS). Figure 2.1 show an example of smart devices that can be installed in the smart housing system.