



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF REMOTE MONITORING ROOM USING
ARDUINO**

This report is submitted in accordance with the requirement of Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

by

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2016

DECLARATION

I hereby, declared this report entitled “DEVELOPMENT OF REMOTE MONITORING ROOM USING ARDUINO” is the results of my own research except as cited in 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 of Electronics Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

.....

(Project Supervisor)

ABSTRAK

Pada masa kini terdapat banyak kes kecurian dan kes-kes kebakaran di rumah yang dilaporkan. Kebanyakan kes ini berlaku apabila di rumah mereka tidak berpenghuni. Perkara ini boleh mengundang bahaya kepada mangsa. Pencuri ini bukan sahaja akan mengambil barang-barang kepunyaan kita, tetapi mereka juga akan cuba untuk mencederakan kita jika kita cuba untuk menghalang mereka. Untuk mengatasi masalah ini, kita perlu mencipta peranti pemantauan bilik jarak jauh yang boleh membantu kita untuk mengesan jika ada sesuatu yang tidak kena berlaku di dalam bilik kita apabila kita tiada di rumah. Peranti pemantauan bilik jarak jauh yang menggunakan Arduino boleh membantu orang ramai untuk mengawasi bilik mereka dari mana-mana sahaja di dunia dengan menggunakan laman sesawang Thingspeak. Projek ini menggunakan Arduino untuk mengawal keseluruhan pengesanan luaran seperti jarak penceroboh, kepekatan gas, kelembapan dan suhu di dalam bilik dan menghantar semua data ini ke laman sesawang Thingspeak itu. Thingspeak akan menunjukkan graf persekitaran bilik termasuk jarak penceroboh, kepekatan gas, kelembapan, dan suhu. Jika tiada penceroboh di bilik, graf menunjukkan perubahan berterusan pengukuran. Dalam kes, jika seseorang memasuki bilik itu atau berlakunya kebakaran, graf akan menunjukkan perubahan dalam bacaan dan juga amaran boleh ditingkatkan sekiranya terdapat apa-apa perubahan mendadak dalam pengukuran graf.

ABSTRACT

Nowadays there are many theft cases and fire cases in the house reported. Most of this case happens when there was no one at their home. This matter can cause dangerous to the victims. The thief will not only will take our belongings, but they will also try to hurt us if we try to stop them. To overcome this problem, we have develop Remote Monitoring Room device which can help us to detect if there was something wrong happens in our room when we not at home. Remote Monitoring Room using Arduino can help people to monitors their room from anywhere in the world by using Thingspeak website. This project use Arduino to control the entire output sensors which are intruder distance, gas concentration, humidity and temperature in the room and send all this data to the Thingspeak website. Thingspeak will show the graph of room environment which include the intruder distance, gas concentration, humidity, and temperature. When no one is around, the graph shows constant variation of the measurement. In case, if someone enters the room, there is change in the measurement which is captured through the graph and also an alert can be raised if there is any sudden change in the measurement.

DEDICATION

Special dedication for:

To my beloved parents, Mr. Abdul Razak Bin Harun and Mrs. Faulina binti Tombi
Ali who always motivates me along the process of completing the project.

To my beloved supervisor, Mr. Win Adiyansyah Indra, thanks for all the guidance in
this project.

Sincerely from my heart, thank you for the support.

ACKNOWLEDGEMENT

In the name of Allah, the Most Beneficent and Most Merciful,

Firstly, thanks to Allah, the Almighty God, that has given me the strength and spirit for me to complete this project.

Secondly, thanks a lot to my beloved supervisor, Mr. Win Adiyansyah Indra that had always supporting me, as well as guiding me and giving me all the needs throughout the project work. All the idea that has been given was very informative and precious to me in order to complete this project.

I also would like to express my deep gratitude to both my parents for supporting me even in a long ranges method. The inspiration and the motivation have pushed me to the best performance. Not to forget to my all friends that had been helping me to complete this project, Muhammad Syafwan, Muhammad Azrul Syafiq, Ahmad Faizuddin, Muhammad Firdaus, Muhammad, Nik Muhamad Zikrillah, Muhammad Rusyduddin, Muhammad Syafiq, Mohammad Nazryen and the others.

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LIST ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

DTMF	-	Dual Tone Multi Frequency
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
PC	-	Personal Computer
O ₂	-	Oxygen
CO ₂	-	Carbon Dioxide
WSN	-	Wireless Sensor Network
PAN	-	Personal Area Network
PCB	-	Printed Circuit Board
RF	-	Radio Frequency
TV	-	Television
LDR	-	Light Dependant Resistance
WIFI	-	Wireless Fidelity
PIR	-	Passive Infra Red
I/O	-	Input/Output
LPG	-	Liquid Petroleum Gas
SNO ₂	-	Tin Dioxide
PPM	-	Part Per Million
IDE	-	Intergrated Development Environment

GUI	-	Graphical User Interface
IOT	-	Internet of Things
PHP	-	Hypertext Preprocessor
JSON	-	Java Script Object Notation
IP	-	Internet Protocol
ADC	-	Analog to Digital Converter
RAM	-	Random Access Memory
EEPROM Memory	-	Electrically Erasable Programmable Read-Only
HZ	-	Hertz
USB	-	Universal Serial Bus
DC	-	Direct Current
PWM	-	Pulse Width Modulator
ICSP	-	In-Circuit Serial Programming
AC	-	Alternative Current
FTDI	-	Future Technology Devices International
GND	-	Ground
VIN	-	Voltage Input
RX	-	Receiver
TX	-	Transmitter
TTL	-	Transistor–Transistor Logic
SPI	-	Serial Peripheral Interface
SS	-	Slave Select

MOSI	-	Master Out, Slave In
MISO	-	Master In, Slave Out
SCK	-	Serial Clock
AREF	-	Analogue REference
SDA	-	Seventh-Day Adventist
SCL	-	Software Collections
TWI	-	Two Wire Interface
UART	-	Universal Asynchronous Receiver/Transmitter,
COM	-	Component Object Model
DFU	-	Device Firmware Upgrade
OS	-	Operating System
HVAC	-	Heating, Ventilation and Air Conditioning
OTP	-	One Time Password
MCU	-	Microcontroller
RH	-	Relative Humidity
RL	-	Load Resistance
CMOS	-	Complementary Metal–Oxide–Semiconductor
SIP	-	Session Initiation Protocol
FYP	-	Final Year Project
H2	-	Hydrogen
CH4	-	Methane

CHAPTER 1

1.1 Introduction

Remote Monitoring Room device using the Arduino as the main component. This device needs to be put in the room. It also uses intruder distance sensor, gas concentration sensor, and humidity and temperature sensor for it to operate. This chapter describes the introduction of research study such as background of the project, problem statement, project objective and scope of the research.

1.2 Background

Nowadays there are many theft cases and fire cases in the house reported. Most of this case happens when there was no one at their home. This matter can cause dangerous to the victims. The thief will not only will take our belongings, but they will also try to hurt us if we try to stop them. To overcome this problem, we have develop Remote Monitoring Room device which can help us to detect if there was something wrong happens in our room when we not at home.

I had choose the Remote Monitoring Room using Arduino because this project can help people to monitors their room from anywhere in the world by using Thingspeak website. This project use Arduino to control the entire output sensors which are intruder distance, gas concentration, humidity and temperature in the room and send all this data to the Thingspeak website. Thingspeak will show the graph of room environment which include the intruder distance, gas concentration, humidity, and temperature. When no one is around, the graph shows constant variation of the measurement. In case, if someone enters the room, there is change in the

measurement which is captured through the graph and also an alert can be raised if there is any sudden change in the measurement.

1.3 Problem Statement

Home is a place where a person lives and does their daily routine such as sleeping, eating, rest and do some work or assignment. There are many theft cases and fire cases in the house reported nowadays. Most of this case happens when there is no one at their home. This matter can cause dangerous to the victims. The thief will not only will take our belongings, but they will also try to hurt us if we try to stop them. Some of the people do not know the condition of their room when they are not at their home. Therefore, they will not know the safety of their valuable belongings.

1.4 Objectives

The objectives of this project are:

1. To develop a Remote Monitoring Room device.
2. To understand how Arduino system operates.
3. To determine the user's room condition from anywhere.

1.5 Scope of Project

This project use Arduino system and the sensors which consist of ultrasonic distance sensor, gas concentration sensor, temperature and humidity sensor as the main equipment. The function of sensor is to detect the intruder distance, gas concentration, humidity and temperature in the room. The type of Arduino use is Arduino Uno. Arduino is one of the microprocessor and it need to be programmed to control all the output sensor which are intruder distance, gas concentration, humidity and temperature in the room and send all this data to the Thingspeak website. This project can help people to monitors their room from anywhere in the world by using Thingspeak website and they can alert if something unusual happen in their room when they are not at their home. My work scope is focus on the room.

1.6 Importance of The Project

This section will be focused on the importance of the project. With the increase of the theft cases and fire cases in the house reported nowadays, this project can help the people to know their room condition when they are not at their home. This project use more sensors compare with the others such as ultrasonic distance sensor, gas concentration sensor, temperature and humidity sensor. This project can help people to monitor their room condition by checking the graph of intruder distance, gas concentration, temperature and humidity in their room at Thingspeak website.

1.7 Report Organization

a) Chapter 1: Introduction

This chapter provides project background, problem statement, and objectives of project, project's scope and the importance of this project.

b) Chapter 2: Literature Review

This chapter covered the literature review and citation about any information that related to this project from any references. In this chapter, the citation about analysis of equipment also is included.

c) Chapter 3: Methodology

This chapter covered more detailed explanation of this project. In addition, this chapter gives information of process flow in this project. Flow chart and table of data is included in this chapter.

d) Chapter 4: Result and Discussion

This chapter discuss about the result and discussion about Remote Monitoring Room by Using Arduino.

e) Chapter 5: Conclusion

This chapter covered the conclusion based on overall process that happened in this project from start until end of this project.

1.8 Chapter Summary

In summary, the starting of this project is due to the problem occurred as stated in the problem statement. Investigation of this project is based on the objectives proposed, either it is achieved the objectives or not. The scope of the research is followed what it is proposed.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, literature review from different journals and sources will be discussed. A literature review can be stated as a discussion on the information in many ways of particular subject. There are many theft cases and fire cases in the house reported nowadays. Most of this case happens when there was no one at their home. This matter can cause dangerous to the victims. The thief will not only will take our belongings, but they will also try to hurt us if we try to stop them. Some of the people do not know the condition of their room when they are not at their home. Therefore, they will not know the safety of their valuable belongings. Thus, this project can help people to know the current condition in their room and they can alert if something unusual happen in their room when they are not at their home. This project use Arduino system and the sensors as the main equipment. The function of sensors is to detect the intruder distance, gas concentration, humidity and temperature in the room. The type of Arduino use is Arduino Uno. Arduino is one of the microprocessor and it need to be programmed to control all the output sensors which are ultrasonic distance sensor, gas concentration sensor, humidity and temperature sensor in the room and send all this data to the Thingspeak website. This project can help people to monitors their room from anywhere in the world by using Thingspeak website and they can alert if something unusual happen in their room when they are not at their home.

2.2 Remote Monitoring Room

2.2.1 Home Security System

The idea of this project comes from a simple security system. However, that security system is quite basic and only offers simple password lock. Hence this project was invented to enhance the security system with different kinds of sensors. This project Zarlink MT8880C DTMF transceiver chip, so it will dial a desire number that user specify. When the phone connected, Winbond ISD1420 voice record and playback chip will be used to play pre-recorded voice signal. However, due to the lack of the phone jack in the lab, plus the majority of the Cornell campus has digital phone line instead of analog phone line; this idea was put away. Since ISD1420 chip has address bit feature, we decided to make our system playback certain pattern of voice when the system goes into alert status.(Hsieh & Cao 2011)

The speed of the execution is work very well. In the beginning the system will boot up with default password 1234. The user can now navigate through our menu, and enable or disable each type of sensor. If a particular sensor is enabled, the LCD screen will output a * symbol before the sensor name. User can also set the alert temperature, enable/disable voice or buzzer alarm, and even specify the ring tone and frequency of the buzzer alarm and the time before voice alarm goes off. The button de-bounce scheme also works fine so users can navigate through the menu and use the keypad perfectly.(Hsieh & Cao 2011)

After the user enables the security system, the green status LED will lid to indicate the system status. User can now enter proper password to unlock the system. If any sensor goes wrong, the LCD will output ERROR and with proper initial for the sensor (T for temperature, M for motion, S for smoke, D for door or window magnetic switch). The red led light will be flashing at 4Hz to indicate such event. If the buzz alarm is enable, it will sound the tone that user choose. If the voice alarm is enabled, it will wait for few seconds (user specified), if the system is still not locked, then it will start

playing voice to indicate which sensor goes wrong. (For example, "Temperature Error, please check and unlock the security system.") If another sensor goes wrong after that, the system will also act accordingly and indicate that in the voice alert in addition to the LCD screen. ("Temperature Motion Error, please check and unlock the security system.").(Hsieh & Cao 2011)

As soon as user enters the correct password, the system will be unlocked and the buzzer and voice playback will stop. The user can now navigate through our menu and make any changes in the settings. There are two kinds of smoke detectors, ionization chamber and photoelectric smoke detectors. Ionization chamber one is more popular due to its low cost. Our smoke detector from home also has an ionization chamber. However, this kind of smoke detector has a small amount of radioactive material (americium-241), which has a half-life of 432 years (alpha decay). We have checked the specification of such radioactive element and government web pages regarding to such kind of material. We have found such radiation is relatively small as long as we do not inhale or swallow it. The exposures is relatively weak so as long as we are not in touch of it all the time, it is relatively safe to operate the smoke detector.(Hsieh & Cao 2011)

This security system is very practical. It can be used not only in the home environment but also in a business environment too. It can monitor the surrounds to not only protect our properties but also our lives. Besides, it can be highly customized to suit each one's need and preference. So this security system is very useful for us as well as other people.(Hsieh & Cao 2011)

2.2.2 Design of a Room Monitoring System for Wireless Sensor Network

In the near future, all electronic appliances at home will be networked: PCs, telephones, stereos, refrigerators, and even washing machines. Heating and air conditioning, previously controlled by a single, fixed, manual thermostat, can now be managed by an intelligent controller with remote access capabilities. Recently, the use of residential air