UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FIRE ALARM MONITORING SYSTEM
(FIREAMS)

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Telecommunication) (Hons.)

by

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Fire Alarm Monitoring System (FIREAMS)**

SESI PENGAJIAN: **2015/16 Semester 1**

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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 Engineering Technology (Telecommunication) (Hons.). The member of the supervisory is as follow:

……

(Project Supervisor)

ABSTRAK

Tajuk projek adalah Fire Alarm Monitoring System (FIREAMS). Projek ini digunakan untuk membangunkan system yang menggunakan Arduino dan mengesan pengesan asap yang aktif. Jabatan Bomba boleh melihat status pengesan asap selagi mereka memantau aplikasi tersebut. Ia bertujuan untuk mengurangkan kadar kematian disebabkan mangsa tidak dapat bertindak balas terhadap pengesan asap yang aktif. Dengan sistem ini, ia dapat membantu pengguna dalam pelbagai aspek, terutama untuk memberitahu Jabatan Bomba, jadi mereka boleh mengambil langkah-langkah awal. Pelaksanaan perkakasan dalam projek ini adalah pengesan asap, Arduino Mega dan Router tanpa wayar. Hasil daripada projek ini amat berguna untuk dilaksanakan di rumah dan industry. Ini dapat membantu dalam pengesanan asap dan memberi amaran kepada pekerja yang berada didalam bangunan dan orang yang berada di sekeliling bangunan tersebut.

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ABSTRACT

This project title is Fire Alarm Monitoring System (FIREAMS). The project is used to develop a proof of concept application that runs on a Arduino software and detects an activated smoke alarm. Otherwise, Fire department can be notifying the smoke reading status as long as they are monitoring this application. It is designed to reduce the possibility of death by persons unable to respond to an activated alarm. Through this system, it can help users in many aspects, especially to notify the Fire Department and send a so they can take early steps. The hardware implementation in this project is a Arduino Mega, Ethernet shield and Wi-Fi router. The result from this project is useful to be implemented in home and industry.

DEDICATION

I would love to dedicate this to my beloved parents, family and friends who have supported me through all the ups and down journey and have been a wonderful source of motivation and inspiration for me in order to complete this project.

ACKNOWLEDGEMENT

I would like to express my gratitude and appreciation to all those who gave me the possibility to complete this report. A special thanks to my final year project supervisor, Mr. Hasrul' Nisham Bin Rosly, who has helped me simulating suggestions, giving a lot of encouragement and also helped me to coordinate my project especially in writing this report.

I would also like to acknowledge with much appreciation the crucial role of the staffs of the electronic laboratories, who gave the permission to use all required device, equipment and all the suitable materials to complete my project.

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Last but not least, I also would like to appreciate the guidance given by other supervisors as well as the panels especially in our project presentation that has improved our presentation skills through their comments and tips.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

UTeM	-	Universiti Teknikal Malaysia Melak
SDK	-	Software Development Kits
API	-	Application Programming Interface
FIREAMS	-	Fire Alarm Monitoring System
IDE	-	Integrated Development Enviroment
Mbps	-	Mega bits per second
IRED	-	Infra Red
IO	-	Input Output

CHAPTER 1
INTRODUCTION

As a final year student of the Faculty of Engineering Technology (FTK), the final year project gives an opportunity to me as a student, a chance to practice and use all the possible knowledge and skills that we have gained throughout the whole expedition starting from the first semester until the last semester. Also with the gain along the academic session which consists of theory and practical will definitely help in solving problems throughout the project in order to be a better student and a good technologist.

1.1 Project Background

In everyday life, safety systems are emphasized. There are several types of security such as, safety in the workplace and the most important is the safety at home. This is because safety is paramount at home today. One of the facts that should be emphasized is the fire problem at home. Based on the statistics of accidents caused by fire in the house, the number of deaths is increasing, one reason is natural increase in age related hearing loss and the younger demographic only having mobile phones and due to the lack of early fire detection.

Therefore, the case has been forwarded to create a project that will help reduce the risk of death from fires. In addition, this project will reduce the losses to be incurred by the victim. So the idea is to solve the problem of the occurrence of fires by creating a project called 'FIREAMS'. This prototype is to show the operations of the project.

The concept of this project is to inform and notify fire department if fire occurs and would make an early step direct to the location. The main brain of this project is Arduino Mega. MQ-2 Smoke Detector is used to detect the smoke level. If these hazardous smoke or gas level exceeds normal level that is above 300, then an alarm is generated immediately, and notifies the Fire Department through Fire monitoring websites that has been built.

1.2 Objective of Project

The objectives of this project are:

i. To develop a website with an application that can alert and notify the Fire Department
ii. To design an application that can measure the smoke level
iii. To create a secure website that can be monitor for preventing any possible accident.
iv. To identify the compatibility of the device and the application with Android platform.

1.3 Problem Statement

Changes in population demographics and lifestyle choices have led to an increased risk of higher mortality from house fires. 87% of fire damages occur due to lack of early fire detection. This cause by the aging population with its natural increase in age related hearing loss and the younger demographic only having mobile phones and no land-lines means there is a need for alternative warning methods of smoke alarm activation. In this era of globalization, the problem of fire occurs in home is widespread and should be prevent immediately. By creating a " FIREAMS", the aim is to reduce these cases, due to the existing system have disadvantage for users because the system just provide a sound (alarm) to detect emergencies. The project is to notify the Fire Department to avoid from any lack of an early detection. This system can prevent the fire occurs because Fire Department can take fast actions

if they receive a notification from the website. This project aims to reduce the risk of death due to fire occurs and damage of stuff at home. Fire Department can be notified as long as they monitor the website.

1.4 Scope of Project

In this report, this project only focus on developing the 'FIREAMS' by using Arduino programming as the core programming in order to develop the web base application. This project also covered the part of troubleshooting and configuring the Wi-Fi router in order to build the LAN network among the Ethernet shield, router and laptop.

In order to build this project, the scope is developed within these areas:

1. Study the system and the technology of Arduino.
2. Develop and analyse the controlling device.
3. Simulate the circuit and construct circuit by using Proteus software.

1.5 Project Significance

This project will bring good significance to many people especially in Malaysia. The project will aim all the authorities especially Fire Department and give them an early fire detection in making sure the safety of the community is their top priority. Therefore this project will significantly reach to Fire Department in Malaysia to be more aware about the incident that might happen. Other than that, this project will help Fire Department to do their job which is to save and rescue with giving them early fire detection before the incident is getting worse that have potential to cause injury or death.

1.6 Report Outline

The target from this project is able to develop a proof of concept application that runs on the web page monitored by Fire Department and detects an activated smoke alarm. Plus, the purpose is to provide a smoke detector system that will improve more efficiently and a need for alternative warning methods of smoke alarm

activation. Furthermore, this application will be able to reduce the number or percentage of death or injury by persons unable to respond to an activated alarm. In this report structure, the short explanation for each chapter would be discussed.

Chapter 1 : The first chapter introduces brief idea of the project. It focused on the introduction of the project, detailing the objectives, the problem statement, work scope, project methodology and expected outcome of the project.

Chapter 2 : Literature review about project. The method, concept, theory and some characteristics of component or hardware are used in this project. This chapter contains a definition of terms used throughout the report.

Chapter 3: The third section is methodology chapter. This chapter explains the procedure taken throughout the project. Methodology chapter is a schedule or steps that need to be completed. A detail report of studies is done to achieve aimed objectives.

Chapter 4 : All the simulations, data collection and analysis obtained were discussed in details. The results were compared with the outlined objectives.

Chapter 5: Conclusions are detailed out in this chapter. It is followed by some recommendations on how to improve the performance of the system based on the achieved results

CHAPTER 2
LITERATURE REVIEW

This section basically will be described about previous study based on this project. It provides a study of hardware used by others researchers in order to use it on this project. Firstly, this section will discussed about the system used for this project and will be followed by the hardware use for the project.

2.1 Smoke Detector System

A smoke detector is a device that detects smoke, normally as an indicator of fire. Commercial security devices issue a sign to a fire alarm control panel as major of a fire alarm system, while household identifiers, known as smoke cautions, generally issue a neighbourhood capable of being heard or visual alarm from the detector itself.

Smoke detectors are commonly housed in a circle formed plastic fenced in area around 150 millimetres (6 in) in diameter and 25 millimetres (1 in) thick, however the shape can vary by maker or product line. Most smoke detectors work either by optical detection (photoelectric) or by physical process (ionization), while others use both detection methods to expand sensitivity to smoke. Sensitive alarms can be utilized to detect, and consequently discourage, smoking in areas where it is banned. Smoke detectors in huge business, industrial, and private structures are usually powered by a central fire alarm system, which is powered by the building power with a battery reinforcement. But, in many single-family disconnected and

smaller multiple family lodgings, a smoke alarm is regularly powered only by a single disposable battery.

Roughly 30 percent of these alarms are assessed to not work, because of aging, removal of batteries, or failure of owners to change dead batteries. In the United States, the National Fire Protection Association evaluates that almost 66% of deaths from home fires happen in properties without working smoke detectors.

2.1.1 Smoke Alarm Type

Research demonstrates that photo-electric smoke alarms may be more compelling at distinguishing smouldering fires and fires beginning in areas remote from smoke alerts, and that ionisation smoke alarms may be more effective at recognizing flaming fires. Both sorts of fires may occur in structures where people sleep. It is suggests where possible that photo-electric smoke alarms are installed in paths of travel between sleeping areas and exits to the outdoors or to common corridors.

Some smoke alarms can also screen levels of carbon monoxide. These alarms generally utilized sound to alert occupants of fire. Other methods for cautioning occupants include alarms with emergency lights, alarms for the Deaf and Hearing Impaired and unique models for kitchens and relocatable homes.

- Photoelectric
- Ionisation
- Carbon monoxide
- Alarms for the Deaf and Hearing Impaired
- Special models for kitchens and relocatable homes
- Heat alarms

2.1.1.1 Photoelectric smoke alarms

Photoelectric smoke alarms 'see' the smoke. They identify visible particles of burning, for example smouldering cigarette smoke. They respond to an extensive

variety of fires, but they are particularly responsive to smouldering fires and the thick smoke given off by foam filled furnishings or overheated PVC wiring.

2.1.1.2 Ionisation smoke alarms

Ionisation smoke alarms 'feel' the smoke. They distinguish invisible particles of burning, for instance from cooking toast. They activate more rapidly for fast, flaming fires with minimal obvious smoke.

2.1.1.3 Carbon monoxide alarms

Carbon monoxide alarms are not smoke alarms and do not fullfil the legislation. They may be utilised in addition to smoke alarms for increased warning. Individuals can't see it, taste it, or smell it, yet low levels of carbon monoxide can make individuals wiped out and abnormal states can slaughter. Carbon monoxide is a by-result of combustion.

Machines, such as heaters, ovens, and cooktops which burn gas, oil or wood can discharge carbon monoxide. While carbon monoxide alarms are broadly used overseas to check the sheltered operations of central heating systems, they are yet to be commonly used for the detection of fire in the home.

Carbon monoxide alerts are in addition to a working ionisation or photoelectric smoke alarm. They should not be used as the sole smoke alarm.

2.1.1.4 Alarms for the hearing-impaired

There are particular smoke alarms available for people who are deaf or have a hearing loss disease. These have a flashing strobe light and/or a vibrating pad that can be placed under the pillow which activate when the smoke alarm sounds and are intended to interconnect with conventional audible alarms in distinctive locations within the home. If one of the alarms senses smoke, all alarms will sound, the strobe will streak and the vibrating pad will work.

2.1.1.5 Special models for kitchens and relocatable homes

Smoke alarms specifically outlined for confined areas like relocatable homes and kitchens are available from hardware and specialty stores.

2.1.1.6 Heat alarms

There are some locations in the home where smoke alarms may not be suitable, eg kitchen. In these regions the legislation allows a heat alarm to be used in lieu of a smoke alarm.

2.2 MQ-2 Smoke Sensor circuit built with an Arduino

This is a sensor that is not only sensitive to smoke, but also to flammable gas. The MQ-2 smoke sensor reports smoke by the voltage level that it yields. The more smoke there is, the more the voltage that it outputs. On the other hand, the less smoke that it is exposed to, the less voltage it outputs.

The MQ-2 additionally has an implicit potentiometer to adjust the sensitivity to smoke. By altering the potentiometer, it can change how sensitive it is to smoke, so it's a form of calibrating it to adjust how much voltage it will put out in relation to the smoke it is exposed to.

It will be wire the MQ-2 to an Arduino so that the Arduino can read the measure of voltage output by the sensor and sound a buzzer if the sensor outputs a voltage above a certain limit. This way, the person will know that the sensor is recognizing smoke and it will sound a buzzer alerting a person such as a homeowner to this fact.

Components Needed for Arduino Smoke Sensor Circuit

- MQ-2 Smoke Sensor
- Arduino board
- Buzzer