Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF IoT BASED FIRE ALARM SYSTEM

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Bachelor of Computer Engineering Technology (Computer Systems) with Honours

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DEVELOPMENT OF IoT BASED FIRE ALARM SYSTEM

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A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Computer Engineering Technology (Computer Systems) with Honours

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

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Sesi Pengajian : 2021

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I declare that this project report entitled "**Development of IoT Based Fire Alarm System**" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature	:	
Student Name	:	MOGGEN A/L KANIAPPAN
Date	:	04 JANUARY 2022

APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

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Supervisor Name : MA TIEN CHOON

Date : 11/1/2022

DEDICATION

To my beloved mother, Sivajothi, and father, Kaniappan, who give me motivation and moral support during this research is being conducted. I want to express my appreciation to my research supervisor, Mr Ma Tien Choon for his helpful advice, assistance, and remarkable tolerance all through the research's development. I had also like to ask my colleagues to assist me with this project when I am having difficulties. Thank you.

ABSTRACT

Fire alarm systems are critical for warning people before a fire destroys their houses. Unfortunately, today's fire alarm systems necessitate a significant amount of wiring and work to set up. Users are discouraged from placing them in their homes due to this. As a result, this study aims to present an IoT-based wireless fire alert system that is simple to set up. This proposed system consists of Flame sensors, MQ6 sensor, DHT22 sensor, and PIR sensor that constantly scans the surrounding area for the presence of fire, smoke, temperature, and motion, respectively, to avoid false alarms. The main component in this system is NodeMCU ESP8266 which uses IoT-based technology. In the event of a fire, to prevent the fire from damaging the house property or smoke getting spread as it would kill human beings, this device introduces a Water pump and DC fan to control fire and smoke from getting out of control. If all the sensors are triggered, the communication module in this system is a GPS module that will send the fire incident location to the nearby fire station provided through the Telegram application. The user can monitor the fire alarm security in the house through the IoT application named Blynk app where it gives the surrounding temperature of the house.

ABSTRAK

Sistem penggera kebakaran adalah penting untuk memberi amaran kepada orang ramai sebelum kebakaran memusnahkan rumah mereka. Malangnya, sistem penggera kebakaran hari ini memerlukan sejumlah besar pendawaian dan kerja untuk disediakan. Pengguna tidak digalakkan untuk meletakkannya di rumah mereka kerana ini. Hasilnya, kajian ini bertujuan untuk membentangkan sistem amaran kebakaran tanpa wayar berasaskan IoT yang mudah disediakan. Sistem yang dicadangkan ini terdiri daripada penderia Nyalaan, penderia MQ6, penderia DHT22 dan penderia PIR yang sentiasa mengimbas kawasan sekeliling untuk kehadiran kebakaran, asap, suhu dan gerakan, masing-masing, untuk mengelakkan penggera palsu. Komponen utama dalam sistem ini ialah NodeMCU ESP8266 yang menggunakan teknologi berasaskan IoT. Sekiranya berlaku kebakaran, untuk mengelakkan kebakaran daripada merosakkan harta benda rumah atau asap merebak kerana ia akan membunuh manusia, peranti ini memperkenalkan pam Air dan kipas DC untuk mengawal kebakaran dan asap daripada keluar dari kawalan. Jika semua sensor dicetuskan, modul komunikasi dalam sistem ini adalah modul GPS yang akan menghantar lokasi kejadian kebakaran ke balai bomba berdekatan yang disediakan melalui aplikasi Telegram. Pengguna boleh memantau keselamatan penggera kebakaran di dalam rumah melalui aplikasi IoT bernama Blynk app di mana ia memberikan suhu sekeliling rumah.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, **Mr. MA TIEN CHOON** for the valuable guidance and advice. He inspired me greatly to work in this project and it made me to have much pleasure to work on this project that was great interest to me. His willingness to motivate me contributed tremendously to my FYP. I also would like to thank him for showing me some example that related to the topic of this project and I have gained a lot of extra knowledge from all of it.

In addition, I would like to express the deepest gratitude to the Faculty of Electrical and Electronic Engineering Technology of University Technical Malaysia Melaka (Utem) because they are financially supporting us throughout the project. Last but not least, I sincerely thanks for the FYP committee because they are always being so helpful and provide a lot of FYP talks to guide us in doing the FYP and give us the hints on writing a good report.

Finally, an honorable mention goes to my family and friends for their understandings and supports us in completing this project. Without the help of the particulars mentioned above, I would face many difficulties while doing this project.

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°	-	Degree Angle
°C	-	Degree Celcius

LIST OF ABBREVIATIONS

V	-	Voltage
mA	-	milliAmpere
ppm	-	Parts per million
KB	-	Kilobyte
MB	-	Megabyte
IP	-	Internet Protocol
ID	-	Identity Document
GPS	-	Global Positioning System
LCD	-	Liquid Crystal Display
SMS	-	Short Message Service
MQTT	-	Message Queuing Telemetry Transport
CTS	-	Critical Temperature Switch
MCU	-	Microcontroller Unit
HSV	-	Hue Saturation Value
IoT	-	Internet of Things
TTL	-	Transistor-Transistor Logic
RAM	-	Random Access Memory
MHz	-	Megahertz
nm	-	Nanometer
LED	-	Light Emitting Diode

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CHAPTER 1

INTRODUCTION

1.1 Background

Humans discovered fire in the early stone age, and it has aided us in a variety of ways in our daily lives. It benefits humans in a variety of ways in daily lives. When under control, fire can be advantageous. When under control, fire can be advantageous. However, uncontrolled fire could lead to disaster. In Malaysia, Rescue Department of Malaysia (FRDM) provided the data obtained from the annual reports from year 2014 to 2018 the number of cases of fire accidents respectively shows in Figure 1.1. Based on this data, the average number of fire accident cases for each year more than 5800 cases which are high number of cases per year. Building types will be further subdivided into a few categories such as residential, retail, factory, institution, office, public area, and others. Residential properties were involved for the most building fire incidences each year, out of all of these groups.

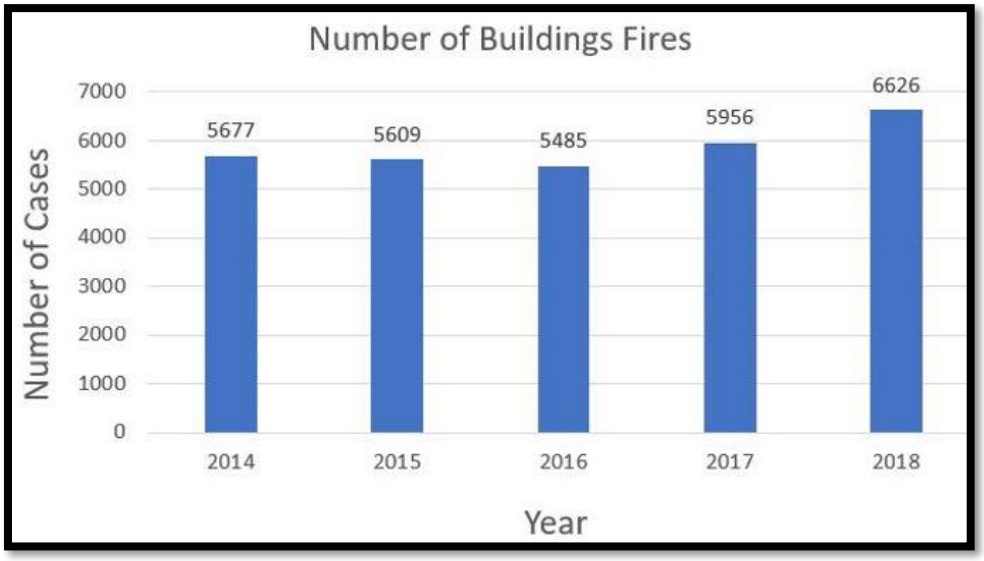

Figure 1.1 : Data annual reports of number of fire accidents for 5 years (FRDM,2020)

National Fire Protection Association (NFPA,2019) reported that, the majority of people are killed in fire accident by smoke inhalation instead of burns. They were get killed by inhaled the smoke from the fire even before they find the way out the building. Moreover, the visual effect of smoke makes victims even harder to find exit door of the building. The oxygen level in surrounding will decrease when fire burning and produce the carbon monoxide which is dangerous to a person if they inhales it. The reduce of oxygen result victims to feel dizziness and worst-case scenario they may encountering risk of death after unconsciousness.

When oxygen levels are at...	...a person experiences:
21 percent	Normal outside air
17 percent	Impaired judgment and coordination
12 percent	Headache, dizziness, nausea, fatigue
9 percent	Unconsciousness
6 percent	Respiratory arrest, cardiac arrest, death

Figure 1.2 : The effect of low oxygen level to humans (NFPA,2018)

This demonstrated why, instead of burns, smoke inhalation would be the leading cause of death in fires. If smoke could be spotted early, the person will have more time to evacuate from the building. As a result, it is essential to construct a fire alarm system equipped with smoke detectors that can detect fires early and inform victims

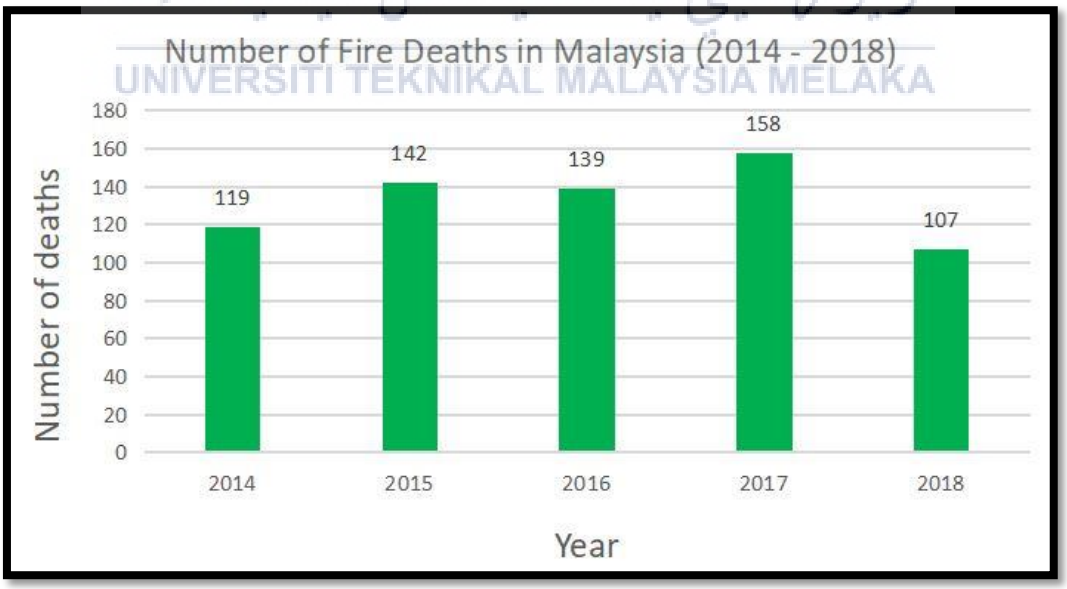

Figure 1.3 : Statistics of Fire Deaths (FRDM,2020)

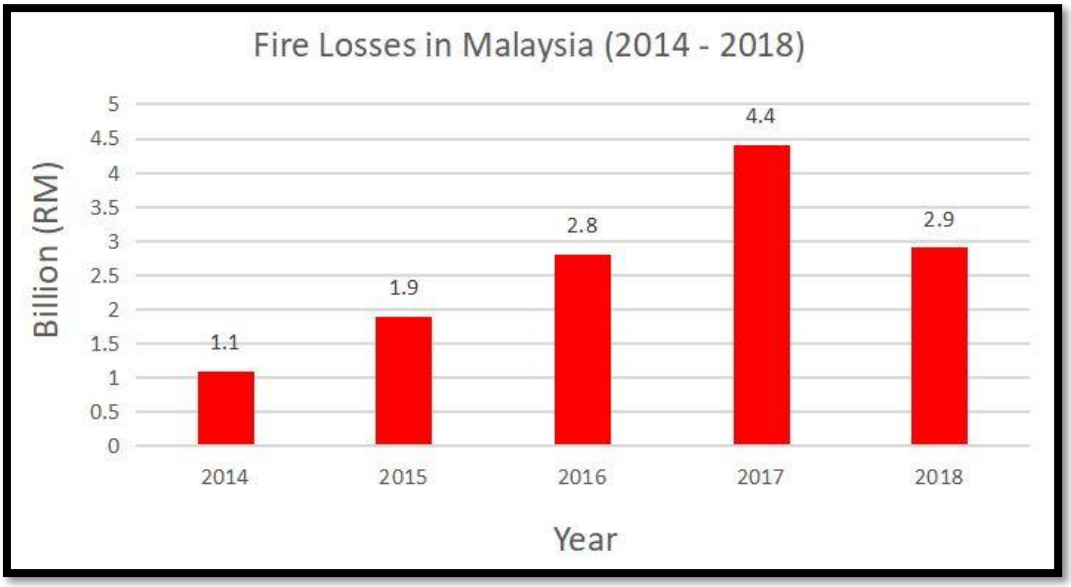

Figure 1.4 : Statistics of Fire Losses in (RM) (FRDM,2020)

All of the information shown in Figures 1.3 and 1.4 demonstrate the importance of the building fire threat to society. This not only endangers human life but also creates property loss. As a result, it is critical to build a more dependable alarm system capable of reducing property and life losses. Hence, discussing based on the elements, it is essential to develop the device for fire alert system which automatically control the fire from getting out of control.

1.2 Problem Statement

A regular fire alarm system consists of different smoke detectors and calls points. One of the drawbacks of the conventional fire alert system is that it is unable to provide the exact location address of the fire, but it only gives the details on which zone the fire takes place. Besides that, the conventional fire alert system is not equipped with a prevention system of a false alarm. The system triggered by insects or dust, high humidity, cigarette smoke, or chemical odors is called a false alarm. Moreover, it will create a situation where it will give

a misleading report of an emergency, result in unnecessary panic, or bring fire department services to a location where there are unnecessary.

1.3 Project Objective

Following a complete analysis of the issue statement, the primary goal of the lead PSM is to suggest a systematic and effective approach. The details of the objectives are:

a) To design the precise fire alarm system using temperature, smoke, and flame sensor with IoT notification.

b) To develop an automatic fire alarm system that helps contact fire stations with the precise location without human monitoring.

c) To develop the automatic smoke absorber and water sprinkler system to extinguish and control the fire from expanding uncontrollably.

1.4 Scope of Project

The scope of this project are as follows:

a) Develop an IoT-based system, so users monitor the system through the IoT wireless platform from anywhere and anytime.

b) Use three types of sensors: Flame, Smoke, Temperature sensor to avoid the possibility of false alarms.

c) GPS as communication module and Telegram application as a platform when sending location to fire station.

d) DC Fan and Water pump to control the fire from getting out of control and prevent property damage.