UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF FIRE SYSTEM PREVENTER BY USING ARDUINO AS MICROCONTROLLER

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Elecrical Engineering Technology (Industrial Automation and Robotic) with Honours.

by

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2018

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: **Development of Fire System Preventer by using Arduino as Microcontroller**

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I hereby, declared this report entitled Development of Fire System Preventer by using Arduino as Microcontroller is the results of my own research except as cited in references.

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Author : Fitri Hakim Bin Ismail

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation And Robotic) with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor : Arman Hadi Bin Azahar

Signature: …….

Co-supervisor: Madiha Binti Zahari

ABSTRAK

Tujuan utama penghasilan projek ini adalah untuk mengelakkan berlakunya kebakaran di rumah yang melibatkan kebocoran gas LPG dan juga untuk mengurangkan kadar manusia yang lemas akibat asap yang terperap di dalam rumah hasil daripada kebakaran. Dengan terhasilnya projek ini, ianya dapat mengurangkan kadar kebakaran hasil daripada kebocoran gas LPG di rumah dan dapat mengurangkan risiko kematian kerana lemas di dalam asap yang terperap di dalam rumah. Projek ini menggunakan komponen MQ-2 sensor untuk mengesan kehadiran gas LPG dan asap yang terhasil. Apabila sensor mengesan kehadiran kedua jenis bahan tersebut, kipas DC dan servo motor akan berfungsi untuk mengeluarkan gas LPG dan asap tersebut supaya tidak terperap di dalam rumah yang boleh merbahayakan orang yang ada di dalam rumah. Dengan menggunakan analisis dan data yang diambil dari system, keberkesanan dan prestasi produk ini akan dinilai dan akan dipelihara untuk penambahbaikan.

ABSTRACT

The main purpose of this project is to prevent the occurrence of fires in the house involving the LPG gas leaks and also to reduce the drowning rate of human caused by smoke in the house which is produced by fire. By completing this project, it can reduce the rate of fire from LPG leaks at house and can reduce the risk of death due to drowning in smoke that is stuck in the house. This project use the MQ-2 sensor to detect the presence of LPG and smoke. When the sensor is detecting the presence of both substances, the DC fan and the servo motor will operate to remove the LPG and smoke that is trapped inside the house that can harm to human inside the house. Thus, by using the analysis and data that is taken from the system, the effectiveness and the performance of the product will then evaluate and kept for further improvement.

DEDICATION

To my beloved parents

Ismail bin Mahmod

Zuriati binti Ismail

Siblings

Farhana binti Ismail

Farah Husna binti Ismail

Fakhrul Haziq bin Ismail

Filzah Huda binti Ismail

Supervisor

Arman Hadi bin Azahar

Co-Supervisor

Madiha binti Zahari

Thank you very much for the support, love, encouragement, help and blessing.

ACKNOWLEDGEMENT

First of all, I would like to praise Allah SWT cause give me a strength to complete this project. He gave me a good health, and mental to settle down this project.

I would like to thank and give my appreciation to my supervisor, Mr. Arman Hadi Bin Azahar and co-supervisor, Pn. Madiha Binti Zahari for their guidance and share their knowledge and opinion to make this project. They also give me the inspiration, spirit, time and also willingly become my advisor.

Other than that, my thanks and appreciation to my panel which is Pn Rosilawati Binti Mohd Nor as my panel one and Dr. Sahazati Binti Md Rozali as my panel two because they give an idea and opinion to improve my project and help me to gain extra knowledge.

Furthermore, I would like to give my appreciation and feel so thankful to my family especially my mother because give me an inspiration and support till my project is finished.

Lastly, I would like to thank to all of my friend, my lab partner, UTeM lab assistance and others because continuously help me during making the project.

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LIST OF SYMBOLS

^{o}C	-	Degree Celcius
cm/sec	-	Velocity
Kg/l	-	Heating Value
%	-	Percentage
^{o}F	-	Degree Fahrenheit
MHz	-	Mega Hertz (Frequency)
V	-	Volt (Voltage)
kΩ	-	kilo ohm (Resistance)
mm	-	milimeter (length)
rpm	-	round per minutes
g	-	gram
A	-	Ampere (Current)
s	-	Second
^{o}	-	Degree
ms	-	millisecond
GND	-	Ground

LIST OF ABBREVIATIONS

LPG	Liquefied Petroleum Gas
IBS	Intelligent Building System
CO	Carbon Monoxide
COHb	Carboxyhaemoglobin
LCD	Liquid Crystal Display
RMB	Ren Min Bi (Official Currency of China)
C4H10	Butane
C3H8	Propane
atm	Atmospheric Pressure
C8H8O	Acrolein
HCN	Hydrogen Cyanide
MQ-2	Gas Sensor
HC-05	Bluetooth Module
H2	Hydrogen
Rs	Sensor Resistance
ppm	Part per Million
AC to DC	Alternate Current to Direct Current
USB	Universal Serial Bus
EDR	Enhanced Data Rate
CSR	Cambridge Silicon Radio
CMOS	Complementary Metal Oxide

ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineer
ACGIH	American Conference of Governmental Industrial Hygienists Inc
OSHA	Occupational Safety and Health Administration
MIT	Massachusetts Institute of University
GUI	Graphical User Interface

LIST OF PUBLICATIONS

CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter, the introduction about this project is discussed. The introduction describes about the background of the project, the problem statement that is identified, the objective of the project, the work scope of the project and the thesis outline of each chapter of the project given which is development of fire system controller by using Arduino.

1.2 Project Background

Nowadays, there are many buildings that is constructed such as office, shop lot, house and other. House is one of the important things for human because it is a place for human to sleep, eat, and do some activity with the family. When there are human in a building, the percentage of the building to have fire accident are happened especially at house. It is because house is a place that have electricity system, flammable conductor and others. Fire is caused by a mix of three elements which is oxygen, heat and flammable substance (Sattar, 2012). It needs 16% oxygen, heat source such as spark of electric, spark of friction and flame, and flammable substance in liquid, gas or solid form to make fire. In the house, these three elements are used for a daily used. Therefore, it is not possible why the fire can occur in the house. It is very dangerous especially when there are human inside the house as it can injured the human and also cause a death. This is because the fire can produce smoke. One of the smoke contents is carbon monoxide which is harmful toxic for a human body. When human inhale the

smoke, the human blood will become carboxyhaemoglobin. It can cause the death because it is one of the toxic gas that mix with the human blood (Alarie, 2002). According to the statistic(Alarie, 2002) Station Bukit Katil Malacca, there are about 11829 call for fire at the house in Malacca in 2012 to 2017. Figure 1.1 below shows the total number of call that the fire station at Malacca got for a house fire incident.

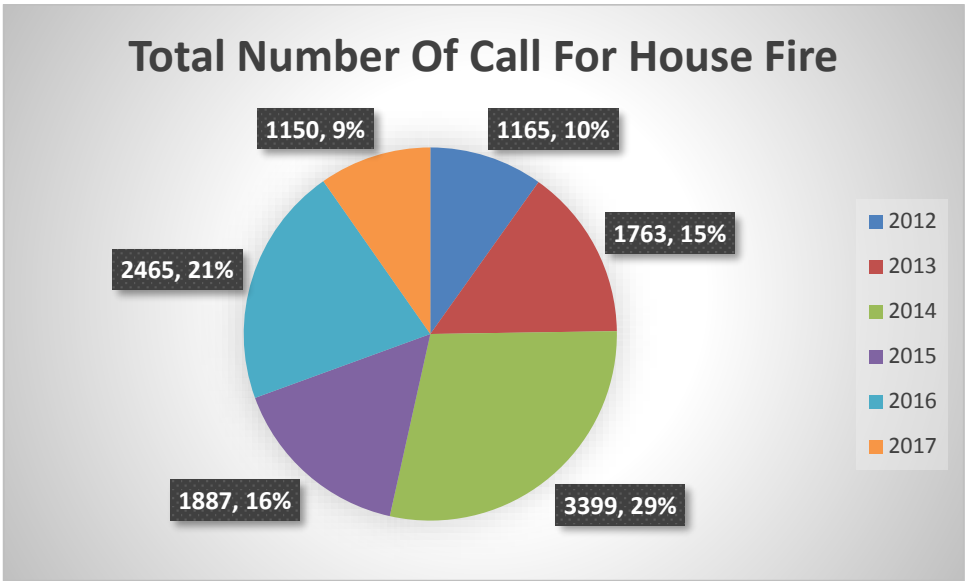
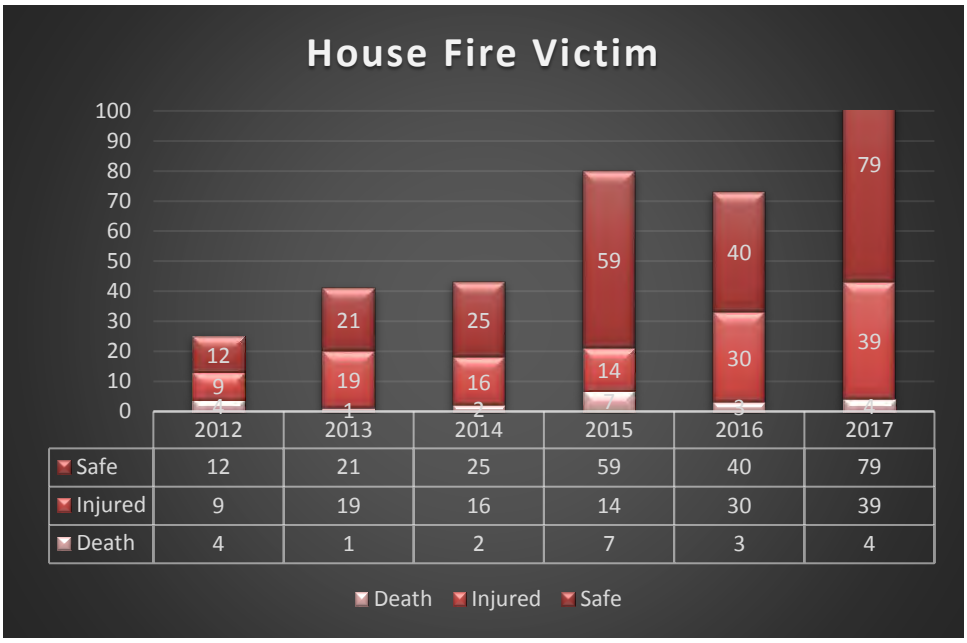


Figure 1.1: Bukit Katil Fire Station statistic about total number of call for a house fire from 2012 to 2017

For six years of statistic from year 2012 to 2017 call for house fire to the fire station in Malacca, about 384 victims involve in the house fire. According to that value, about 236 is safe without any injured, 127 are injured and 21 victims are dead. The statistic state from year 2012 to 2017 have dead victim for a house fire. Most of the victim die because they inhale the smoke from the fire. It is because oxygen had been used for flammable substance, so the volume of oxygen is decreased when fire occur. Thus, the victim is lack of oxygen and inhale the carbon monoxide gas that is produced by fire. Besides, the most injured victim is the victim's physical that burned by fire,

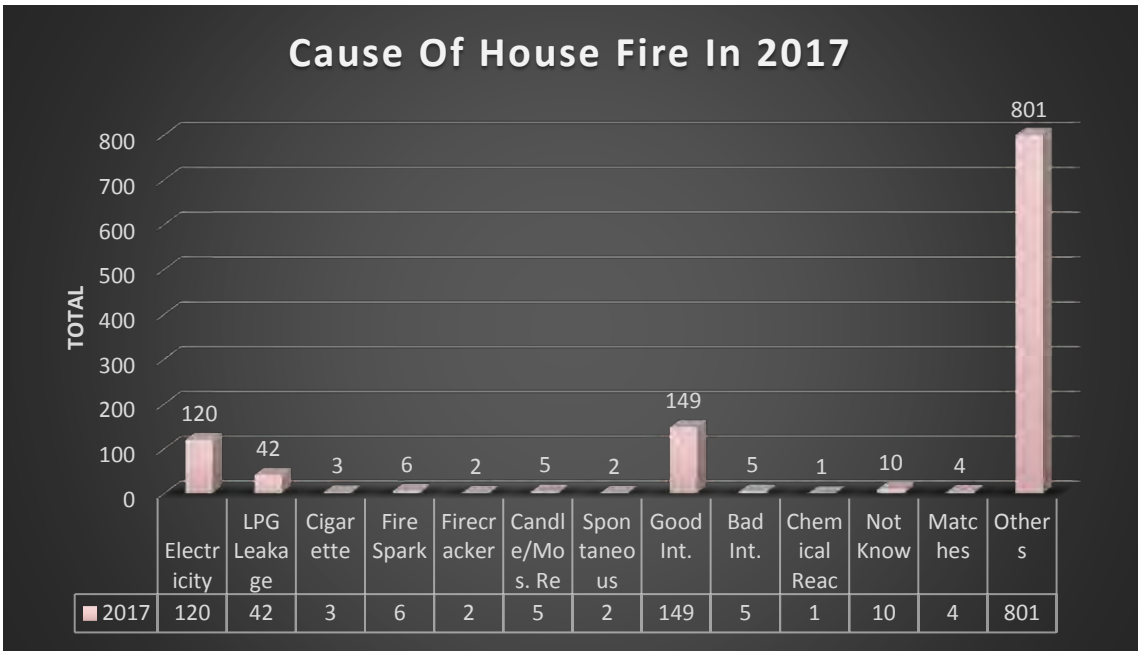
victim is plunged by broken ceiling inside the house, or other broken inside the house. Table 1.1 below shows the graph for victims of house fire from 2012 to 2017.

Table 1.1: Bukit Katil Fire Station statistic about victim of house fire from 2012 to 2017



Based on the statistic from Bukit Katil Fire Station, there have 13 reason of house fire which is from electricity, cigarette, fire spark, firecracker, mosquito repellent, candle or colok, liquefied petroleum gas leakage, spontaneous reaction, good intention burning, bad intention burning, not knowing the cause, chemical reaction, fire match and other cause. Based on the statistic in table 1.2 below, the electricity problem and liquefied petroleum gas leakage record the most potential reason of fire accident to occur in Malacca. It is about 120 times house fired from electricity problem and 42 times house fired from leakage of liquefied petroleum gas. These two causes are one of the incidents that is hard to prevent because it is happen without human realization. Table 1.2 below shows the statistic from reason of house fire.

Table 1.2: Bukit Katil Fire Station statistic about cause of house fire in 2017



As everyone know, the house is not complete without electricity system. Electricity also can make a house on fire. This is because electricity is one of the heat conductors and if there is an electricity problem where it can cause a fire. Electricity problem is divided into three parts which are improper wiring circuit for the house, illegal installation connection of wiring and lastly the broken component and cannot function such as broken circuit breaker. These problems will cause a short circuit for the house and can produce a fire. Figure 1.2 below shows the fire happen by the short circuit.

Figure 1.2: Example of broken component circuit breaker and cause a short circuit

Other than electricity, liquefied petroleum gas or known as LPG also is one of important things in the house. This type of gas is used in the kitchen for cooking activity. LPG is one of the most flammable substance. Therefore, when this type of gas is leak, it is dangerous and can cause a fire with only a small spark from electricity.