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DEVELOPMENT OF AN INTELLIGENT EXHAUST FAN USING LPG SENSOR, TEMPERATURE SENSOR AND SMOKE DETECTOR

This report is submitted in accordance with the requirement of the Universiti

Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering

Technology (Computer Systems) with Honours

by

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: Development of an Intelligent Exhaust Fan using Lpg Sensor, Temperature Sensor and Smoke Detector

Sesi Pengajian: 2019

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DECLARATION

I hereby, declared this report entitled Development of an Intelligent Exhaust Fan using Lpg Sensor, Temperature Sensor and Smoke Detector is the results of my own research except as cited in references.

Signature: …………………………………

Author : SATHISKUMAR A/L SAMUEL BALU

Date: 11 December 2018

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APPROVAL

"I hereby declared that I have read through this report entitle "Development of an Intelligent Exhaust Fan using LPG Sensor, Temperature Sensor and Smoke Detector" and found that it has comply the partial fulfilment for awarding the degree of Bachelor of Computer Engineering Technology (Computer Systems) With Honours". The member of the supervisory is as follow:

Signature: ………………………………………………….

Supervisor : DR. JAMIL ABEDALRAHIM JAMIL ALSAYAYDEH

ABSTRAK

Projek ini yang bertajuk Pembangunan Kipas Ekzos Pintar menggunakan Lpg Sensor, Sensor Suhu dan Pengesan Asap. Arduino sebagai pengawal di antara sensor gas MQ, sensor suhu LM35, buzzer dan kipas. Sistem ini dilaksanakan untuk tujuan keselamatan supaya isi rumah dapat berjaga-jaga kecelakaan di rumah mereka dengan mengesan kebocoran gas dan suhu panas. Ini kerana gas sangat berbahaya jika ia bocor. Ia sangat berguna dalam kehidupan seharian dan sangat penting tetapi pada masa yang sama ia juga berbahaya kepada manusia dan akibat kemalangan yang timbul dari kebocoran gas amat mengerikan. Manusia yang ceroboh juga salah satu sebab sistem ini dilaksanakan supaya dapat menyelamatkan orang-orang dari kemalangan kebakaran. Salah satu ciri gas LPG adalah sukar untuk memberi kesan kerana ia tidak berbau pada mulanya tetapi ia sangat mudah terbakar kerana ia adalah dalam bentuk cecair. Oleh itu, sangat penting bahawa sistem ini dilaksanakan di mana kebanyakannya disasarkan di tapak dapur rumah. Objektif utama projek ini adalah untuk mengaktifkan kipas apabila terdapat kebocoran gas, suhu panas dan asap tebal. Objektif kedua adalah untuk membolehkan pembesar suara apabila terdapat kebocoran gas, suhu panas dan asap tebal. Objektif ketiga adalah untuk menyelamatkan rumah tangga dari kemalangan kebakaran yang menyebabkan kematian. Projek ini akan berfungsi apabila sensor gas mengesan kebocoran gas dan kipas dan buzzer akan berada dalam keadaan aktif. Sebaik sahaja mengesannya, sensor gas akan menghantar isyarat kepada penerima. Seterusnya, apabila suhu melebihi suhu bilik, ia akan menghantar isyarat kepada penerima melalui Bluetooth. Dalam projek ini, sensor gas MQ-2 akan digunakan untuk mengesan kebocoran gas, buzzer akan digunakan sebagai amaran apabila kebocoran gas berlaku. Kipas akan berfungsi sebagai sistem pencegahan supaya gas terkandung udara akan dikurangkan. Akhirnya projek ini dapat selamat rumah tangga dari kebakaran.

ABSTRACT

This project entitled Development of an Intelligent Exhaust Fan using Lpg Sensor, Temperature Sensor and Smoke Detector. The Arduino as a controller between gas sensor MQ, LM35 temperature sensor, buzzer and fan. This system is implemented for safety purpose so that household can be alert of accident in their house by detect gas leakage and hot temperature. This is because gas is very dangerous if it is leaked. It is very useful in daily life and very important but at the same time it is also harmful to humans and the consequences of accidents that arise from the gas leak are terrible. Human careless is also one of the reasons this system is implemented so it can save people from fire accident. One of the characteristics of LPG gas is that it is difficult to impact because it does not smell at the beginning but it is extremely flammable as it is in the form of liquid. Therefore it is very important that the system is implemented at which is mainly target at home kitchen site. The main objective of this project is to activate the fan when there is a present of gas leakage, hot temperature and thick smoke. The second objective is to enable the buzzer when there is a present of gas leakage, hot temperature and thick smoke. The third objective is to save household from fire accident which cause in dead. The project will work when gas sensors detect gas leakages and the fan and buzzer will be in active state. Once its detect, the gas sensors will send signals to receiver. Next, when the temperature is exceeding the room temperature, it will transmit the signal to the receiver through Bluetooth. In this project, MQ-2 gas sensors will be used to detect gas leakage, the buzzer will be used as a warning when a gas leak occurs. The fan will act as the prevention system so that the air contained gas will be reduced. Finally this project can safe household from fire accident.

DEDICATION

To my beloved parents, thanks for helping and guide me to complete this project. Hence, thanks for understanding while I'm in developing this project.

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I would like to thanks my supervisor, Dr Jamil Abedalrahim Jamil Alsayaydeh for his guiding me during my final year project period so that i will be able to done through the Projek Sarjana I and Projek Sarjana II subject successfully. I also would like to thanks my co-supervisor for her concern and care about my project during my final year project period. Besides that, i would like to give my appreciation to my final year project panels, Sir Rosman Bin Abd Rahim and Sir Shamsul Fakhar Bin Abd Gani for giving their time to observe my presentation and evaluate my work. I want to thanks them because giving a recommendation and advices in this project. In addition, I would like to thanks to my mother, Danam a/p Sinnappan for her understanding and giving support during my hardship. Thanks also to her for their patience to understand me. Lastly, I would like to thanks my beloved friends at Universiti Teknikal Malaysia Melaka who giving me support, advices, and help me when I need them throughout my project.

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CHAPTER 1

INTRODUCTION

1.1　Introduction

The main idea of developing of an Intelligent Exhaust Fan using LPG gas, Temperature sensor and Smoke detector system are attached in this chapter. In this chapter, the details of the project background, problem statement, objectives and project scope are being discussed for a better understanding about this project. Moreover, the flow of this project will be clarified on how it is working and its goods for household in this section. This chapter additionally imperative since its will be the guidance and direction for the user. The designer likewise can achieve the objectives based on this section included with clear clarification stated.

1.2　Background of the project

Nowadays, fire accident at houses is increasing constantly especially start from kitchen side. Our government also tries to reduce it by giving awareness speeches and campaigns. Unfortunately, their actions are become inefficient and fire accidents happen in houses are increasing year by year. In this context, to produce something useful to our customers and society, I decide to help government and save fire accident victims by modifying the normal exhaust fan that only purifying the air from pollution and excessive heat into Intelligent Exhaust Fan. An exhaust fan is used to control the inside condition by venting out undesirable scents, particulates, smoke, dampness and different contaminants which might be available noticeable all around. The modification includes adding three types of sensor and a timer. The sensors are LPG detector, temperature sensor and the smoke detector. These sensors will transmit signal to the receiver when there is a present of gas leakage, hot temperature and thick smoke by activate the alarm so that household are alert. With the invitation, ninety nine percent ensure that the security aspects that are installing would avoid and detect cause of fire.

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Three types of sensors is use to detect cause of fire starts such as LPG gas detectors, temperature and smoke detector. First, the LPG (liquefied petroleum gas) detector can detect the present and leakage of gas. Secondly, the temperature sensors which can detect current temperature and heat are being installed. Lastly, the smoke detector initial function as detecting the smoke cause by fire and these three types of sensors will trigger the alarm. Timer circuit is including on the intelligent exhaust fan to save the usage of current. Those detectors that have mentioned above are portable (wireless)

1.3   Problem Statement

In past few years, households are becoming a victim of fire accident by lost their things. Not only loss of materials but lead to death cases when they trapped out on heavy smoky environment in their residents mainly in kitchen side. The careless of people when they cook and forget to off and irregularly check the gas pipes is the main causes where the fire get started. With the invitation, fire accident in houses can be avoided. The three type of sensor can perform accordingly to their functions to save human life by activating the alarm. Even household are in deep sleep, the alarm can make them awake. Therefore, by using alarm they might get awake and get away from the area and stay saves. This system also can save electricity because of timer module is installed.

1.4   Project Objective

There are some objectives to be follow in order to make this project successful. The objective can be achieved with the following specified.

1. To activate alarm module when there is a present of gas leakage, hot temperature and thick smoke.
2. To save household from fire accident which cause in dead
3. To save electricity cost when using exhaust fan with the installation of timer module.

1.5   Scope of project

Various scopes have been identified during the research of this project based on objective and problem statement stated. The scopes are to save human life from being victim of fire accident at their resident. Three sensors are implementing in this project to detect the fire causes as an early prevention. The range of these sensor devices to receiver module is 50 meter which can be suitable for placing in kitchen. The sensor can transmit signal to the receiver when one of the three sensor active in state. The gas sensor MQ-2 is chosen to detect the leakage compound around the kitchen area. The sensor LM35 used to detect the temperature. The initial value is between 55°C to +150°ctemperature range. As a smoke detector, the MQ-2 sensor is used in this project. This entire sensor will be transmitted and the alarm will turn on to alert the household. The alarm will only stop when there is no any detect. In addition, it have timer module to save electricity cost. This timer can be set to our desire coding. Apart from that, this project is done fully using hardware devices.

1.6   Conclusion

As a conclusion, this project is developing to detect gas leakage as an earlier stage precaution. Moreover, it"s also able to alert the user by activating the alarm which is built on the receiver module where the exhaust fan is attach on the wall of the kitchen. Besides that, this project can save electricity cost when using exhaust fan with the installation of timer module. Finally, this project is believed useful for the community and can update the development innovation.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

In this chapter, the literature review will focus on related previous project. Studies were carried out from the internet, books and journals. The goal of this project is to design an exhaust fan that can detect LPG gas leakage, Temperature sensor and Smoke detector. This modal is built with alarm so that it can alert the household when there is a fire occurred. The block diagram of this project are shown below in Figure 2.1
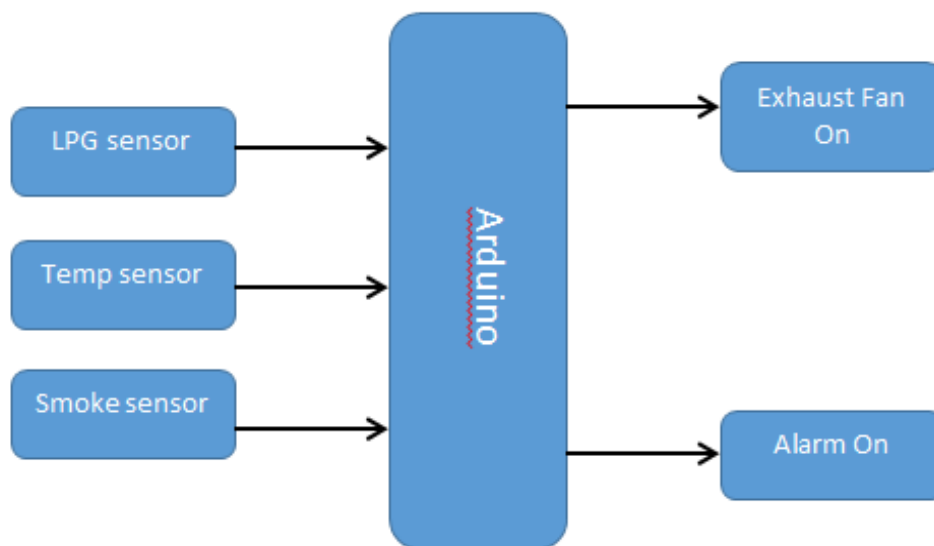
Figure 2.1: Block diagram of the modal

2.2 Fire

Fire goes about as quick procedure of oxidation material that experienced ignition. To burning to occur, petrol, oxygen and a start source are main substance. Petroleum, oxygen and a start source must be in contact before the fire can begin and the fire can't be started, or then, if one is not present or released. There are four classes involved such as Class A ordinary combustibles, Class B flammable liquids and gases, Class C fires involving live electrical equipment, Class D combustible metals and Class K fires in coking appliances that involve coking medium. (Swartz, 2016)
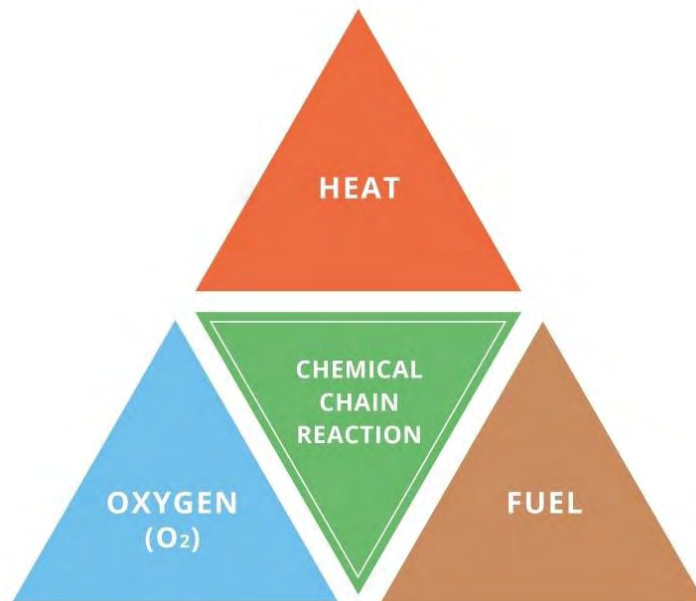
Figure 2.2: Fire Triangle

Based on fire triangle by above can be represented by three sides of the triangle (Lilly et al. 2014). This triangle works in bidirectional. It's reducing the straight expose of ignition and fuel substances. There are two main types of burning sources such as flame and hot gases. These burning materials will characterize the fire behavior and for practical purposes, the course of burning sources on flame behavior has been frequently examined rather than elucidating the hot and mass transfer processes. Reaction occurs when O2 and fuel mixture is hot enough

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Within first 30 seconds, fire effectively spreads. Splashed oil or oil buildup on a messy stovetop will start on fire. As the fire becomes higher and more sizzling, more combustible articles and decorations will light from spreading flares, including wooden cupboards, backdrop, hanging crates, and curtains. With the fire moving past the stovetop and different regions starting to consume, a denser crest of hot air and smoke rises and spreads over the roof.

As the flames escalate, the smoke and hot air ascending off the fire are in excess of 190 degrees F. Warmth from the fire transmits to different parts of the kitchen, warming up tables, seats, racks and other burnable items. When the fire expends kitchen cupboards and other wooden parts, it"s hot enough to kill people when the temperature in the upper layer of hot gases reaches to 400 degree. It"s only takes 3 minutes; the warmth from a room fire can achieve 1100 degrees. As this happens, flashover happens. Everything in the room blasts into flames

2.2.1 Fire Statistics In 2013

According to the Figure 2.2 below, the statistics show the fire cases occurred in a year of 2013. The highest number of fire accident happen is in residential area. This is because household are not aware of fire mainly in kitchen side and it lead to fire.

PERANGKAAN KEBAKARAN MENGIKUT JENIS BANGUNAN DI MALAYSIA BAGI TAHUN 2013

BIL	JENIS BANGUNAN / NEGERI	PLS	KED	PP	PRK	SEL	KL	NS	MEL	JOH	PHG	TRG	KEL	SBH	SWK	LAB	PUT	JUMLAH
1	KEDAI	6	88	61	31	134	95	35	35	88	25	12	28	42	58	4	0	742
2	KILANG	0	33	36	17	96	12	19	25	42	8	3	3	18	20	0	0	332
3	SETOR	4	15	10	29	55	12	12	6	27	15	8	8	18	14	2	1	236
4	WOKSYOP	1	4	6	2	21	12	2	5	9	9	5	8	4	7	1	0	96
5	HOTEL	0	10	2	0	5	11	1	5	2	4	0	0	7	2	0	0	49
6	PUSAT B/BELAH	0	2	1	1	6	22	1	3	0	1	0	0	3	0	0	0	40
7	PEJABAT	1	13	5	3	34	54	7	4	11	4	4	0	8	15	2	0	165
8	TEMPAT HIBURAN	0	3	1	2	7	9	0	4	2	2	0	0	3	3	2	0	38
9	RESTORAN	1	15	3	6	15	25	0	3	3	1	1	2	5	6	2	0	88
10	RUMAH KEDIAMAN	23	303	188	167	656	482	106	117	252	145	106	106	294	272	16	2	3,235
11	SETINGGAN	1	9	8	5	32	26	2	0	4	5	0	0	10	4	0	0	106
12	BILIK DAPUR	2	8	28	12	35	1	14	5	13	9	6	3	12	4	1	0	153
13	MAKMAL	0	0	2	0	1	1	0	0	6	0	2	0	1	2	0	0	15
14	SEKOLAH	1	16	6	1	20	11	10	3	5	3	5	3	8	5	0	0	97
15	ASRAMA	0	2	2	4	10	4	1	0	9	1	4	0	5	14	0	0	56
16	HOSPITAL/KLINIK	0	1	3	1	1	7	3	0	2	3	3	1	6	6	0	0	37
17	GUDANG	0	5	3	0	17	0	0	0	1	1	0	0	2	2	1	0	32
18	LAIN-LAIN	3	20	22	13	71	13	9	17	38	18	17	12	23	24	0	0	300
	JUMLAH	43	547	387	294	1,216	797	222	232	514	254	176	174	469	458	31	3	5,817

Figure 2.3: Fire Statistics in 2013

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2.3 Sensors

A sensor is a equipment that recognizes and responds to some sort of commitment from the physical condition. The particular information could be light, warm, movement, dampness, weight, or any of an extraordinary number of other natural phenomena. The outcome is for the most part a signal that is changed over to human-readable display

2.3.1 Gas sensors

Gas sensor or well known as gas detector is a type of chemical sensor. Small like a nose, this kind of sensor is used to detect and measures the presence of gases in an area which lead to fire accident. Gas sensors are convenient in wide specifications depending on the sensitivity levels, physical measurements of different components and type of gas to be detected. At the point when a gas contact with this sensor, it burns the small heater inside with an electro chemical sensor for detection take place. The gas sensor module consists of a sensor pins under which a detecting component is housed. This detecting component is soldered to PCB board which current through associating leads. When the current being heat the heater, the various kind of gases which competition with the sensor are being absorb by the sensing component. The MQ series of gas sensors are sensitive for a scope of gasses and are utilized inside at room temperature. The latest gas sensors that are in the market are MQ-2, MQ-3, MQ-4, MQ-5, MQ-6, MQ-7, MQ-8 and MQ-9. Below are the descriptions of each gas sensor mention above. (Zainab Yunusa et al. 2014)

2.3.1.1 MQ-2 Gas Sensor

The MQ-2 gas sensor is the simplest gas sensor to be use. It is suitable for detecting Smoke, Alcohol, Hydrogen (H2), Liquefied Petroleum Gas (LPG) and Carbon Monoxide (CO) in the air. It's concentrations from 200 to 10000ppm. At the point when the targeted leakage exist, the sensor's conductivity is higher along the gas concentration arise. This sensor also capable to detect various burnable gases particularly Methane.