



Faculty of Electrical and Electronic Engineering Technology



DEVELOPMENT OF GAS LEAKAGE DETECTOR WITH IoT

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Bachelor of Electrical Engineering Technology with Honours

2022

DEVELOPMENT OF GAS LEAKAGE DETECTOR WITH IoT

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**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours**



Faculty of Electrical and Electronic Engineering Technology

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

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Tajuk Projek : Development of gas leakage detector with IoT

Sesi Pengajian : 2022/2023

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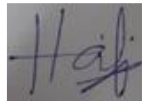
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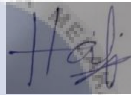
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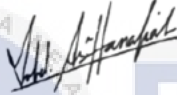
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APPROVAL

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 Electrical Engineering Technology with Honours.

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DEDICATION

Special thanks to my beloved family

My supervisor

My colleague



ABSTRACT

The issue of gas leakage and fire continues to be a key impediment to building a comprehensive, safe, and sustainable kitchen model in the growing smart home designs. On the other hand, in this digital era, security has been a huge concern. In metropolitan areas, most kitchens are tiny and lack appropriate ventilation. Spillage of gas raises the chance of a fire, death, or a blast in such a situation. Smart management systems, gas leak detection systems, and fire detection systems should all be created to address this problem. The Arduino ESP32 microcontroller was used to create a smart gas detection system utilising a variety of sensors such as gas sensors, flame sensors, and actuators (exhaust fan, buzzer). When a gas leak is detected, the client will be notified by SMS and an application. The suggested system can detect gas leaks and can also take additional actions to reduce gas concentrations using auto air ventilation. The proposed strategy will aid in improving safety, lowering mortality tolls, and reducing environmental harm.



ABSTRAK

Isu kebocoran gas dan kebakaran terus menjadi penghalang utama untuk membina model dapur yang komprehensif, selamat dan mampan dalam reka bentuk rumah pintar yang semakin berkembang. Sebaliknya, dalam era digital ini, keselamatan telah menjadi kebimbangan besar. Di kawasan metropolitan, kebanyakan dapur adalah kecil dan kekurangan pengudaraan yang sesuai. Tumpahan gas meningkatkan peluang kebakaran, kematian atau letupan dalam keadaan sedemikian. Sistem pengurusan pintar, sistem pengesanan kebocoran gas dan sistem pengesanan kebakaran semuanya harus diwujudkan untuk menangani masalah ini. Pengawal mikro Arduino ESP 32 digunakan untuk mencipta sistem pengesanan gas pintar menggunakan pelbagai penderia seperti penderia gas, penderia nyalaan dan penggerak (kipas ekzos, buzzer). Apabila kebocoran gas dikesan, pelanggan akan dimaklumkan melalui SMS dan aplikasi. Sistem yang dicadangkan boleh mengesan kebocoran gas dan juga boleh mengambil tindakan tambahan untuk mengurangkan kepekatan gas menggunakan pengudaraan udara automatik. Strategi yang dicadangkan akan membantu dalam meningkatkan keselamatan, menurunkan kadar kematian, dan mengurangkan bahaya alam setikar.



ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Professor Madya Mohd Ariff Bin Mat Hanafiah for his precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) for enables me to accomplish the project. Not forgetting my fellow colleague, my course mate for the willingness of sharing his thoughts and ideas regarding the project.

My highest appreciation goes to my parents for their love and prayer during the period of my study.

Finally, I would like to thank all the people who helped me in completing this project, fellow colleagues and classmates, the faculty members, as well as other individuals who are not listed here for being co-operative and helpful.

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LIST OF SYMBOLS

- IoT* - Internet of Things
- WSN - Wireless Sensor Network



LIST OF ABBREVIATIONS

<i>IoT</i>	-	Internet of things
WSN	-	Wireless system network
	-	
	-	
	-	
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CHAPTER 1

INTRODUCTION

1.1 Background

Fires caused by gas leaks have escalated dramatically in recent years. According to the Malaysia Fire Department, there were 309 instances recorded in 2017 and 582 cases in 2018. Implementing an Internet of Things (IoT) system that can detect and monitor any gas leaks that may occur in the house and alert the user is one of the methods that can be used to solve this problem.

The Internet of Things has grown in popularity as a result of its capacity to minimise human effort and make life easier. The Internet of Things (IoT) is a technology in which a physical thing is connected to a system and can be accessed over the internet to allow interaction and data exchange between the system and the connected physical object. IoT is also employed in a gas leakage monitoring system to assist users in monitoring, detecting, and being alerted when a gas leak occurs in their house. One sort of technology that is typically implemented in smart home systems is a gas leakage monitoring system.

Propane and Butane gas make up liquid petroleum gas (LPG), which is often used for cooking. It has the potential to cause explosions, which is exceedingly dangerous. Ethane (C_2H_6) and Pentane (C_5H_{12}) are also present in LPG, but their quantities are much lower than those of Propane and Butane. Humans may be harmed as a result of the disclosure.

Arduino, Raspberry Pi, and PIC microcontrollers are examples of control devices that may be utilised to construct IoT-based systems. Using Arduino, this project created an IoT-based gas leakage monitoring and warning system. Arduino UNO is a low-cost,

adaptable, and simple-to-use open-source programmable microcontroller board that may be used in a range of electrical projects. This board may be used to operate relays, LEDs, servos, and motors and can be interfaced with other Arduino boards, Arduino shields, and Raspberry Pi boards.

1.2 Problem Statement

LPG (short for Liquid Petroleum Gas) makes cooking easy, fast and economical. It is also a cleaner and more efficient way of cooking with several benefits. LPG is easy to control with instant on and off. That is also the reason why most professional kitchens still use gas stoves and cook with flame rather than electronic stoves. With a simple turn of the dial, the flame gets bigger or smaller so that the change in heat is immediate and precise.

LPG is convenient and safe to use. It also ensures less wasted heat. As you turn off your gas cooktop, the flame is extinguished and the heat source vanishes, not so with an electric stove which continues to emit heat after it is switched off. LPG stoves also emit less overall heat than any other cooking device, thus keeping your kitchen temperature unaffected.

Moreover, as a human never know if there any mishaps happen without unexpected. Thus, is project provided a signal conditioning of the Arduino EPS32 is done by output signal of the sensor, provided input to Arduino. Result is noticed when the gas is present the buzzer will make the sound. At the same time there will message be sent to the phone of the user.

There are also some mechanisms use to reduce the risk of fire and gas suffocation. For example, exhaust fan used to the clear gas leakage to outside so that there no harm occurs if human smell in. other than that, there will a clip that will automatically stop the leakage from spreading even more.

1.3 Project Objective

- a) To analyse the presence of LPG leakage as a part of the important aspect of the project.
- b) To design a project that can sent SMS alert to inform the authorized person.
- c) To install an exhaust fan to work an auto ventilation fan to clear the smoke and spilled gas.

1.4 Scope of Project

For this project, the scope has been outlined to be able to design and develop a prototype of a development of gas leakage detector with IoT. The restraint of this project is only for house which LPG gas as main gas for cooking. This prototype use Arduino ESP32 as the microcontroller that will gas sensor, buzzer that are linked to the application. The microcontroller must be using a programming code to run the hardware which used an Arduino IDE platform to create the code. Next, extra features like flame sensor to detect the presence of flame and ventilation fan to remove the gas/smoke leakage.

1.5 Thesis Outline

There are five chapters in this thesis report. The thesis's first chapter is an introduction. The thesis's second chapter is a literature review, which will look at past projects as well as articles linked to current one. The third chapter will go through the approach and how it was utilised to finish the job. The fourth chapter will go through the project's outcome. Finally, the fifth chapter will explain the project's conclusion and recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

One of the most important aspects before beginning a project is to do a literature study. The prior study project will be reviewed with observations in this chapter. The past project information that we gathered on the internet will assist the project in running smoothly according to the plan. Literature reviews must be conducted to have a better knowledge. This chapter will go through some of the past work that has been done on the subject.

2.2 Past Studies

Nagib Mahfuz, Shawan Karmokar and Md. Ismail Hossain Rana they develop a multilayer warning system with a gas detecting mechanism that is adequate. The suggested electronic gadget also has the ability to monitor real-time gas leakage circumstances, as well as SMS query and warning functions, according to them.[1]

Afsana Mim Anika projects Develops five major issues which were gas spillage location, fire detection and auto ventilation, alarm system (SMS, Notification through flexible application) and water syphoning framework.[2]

Brij Bhushan Sharma, Pankaj Vaidya and Nagesh Kumar tried to make a project that used to minimize the effects of LPG leakage, many systems have been proposed. Gas leak detection system is a process of identifying potentially dangerous gas leaks using sensors and creating an appropriate electronic device.[3]

Next, Shawkat Jahan, Md. Minhajul Azmir and Md. Mahafuzul Islam, their research paper shows how an IoT-based gas leakage monitoring system was utilised to build and

execute a smart cooker. As a result, even if the user is away from home, he or she will be warned and will be able to take the required precautions to avoid an accident.[4]

Md. Tarikul Islam Juel, Md. Sajid Ahmed and Tabassum Islam project was to monitor the fire risk factors from the server in some particular places by using this device based on IoT.[5]

Prasanta Pratim Bairagi, and Prof. (Dr.) L. P. Saikia developed a project to spot the gas leakage using gas sensor and keeps track of the weight of the cylinder by using load sensor. Other than that, it also calculated the weight of the remaining gas in the cylinder and when it crosses the low level, instinctively sends SMS to the registered mobile no and displays it on LCD display to inform users.[6]

Priyanka Sankpal, Sourabh Jamadagni, Nikita Chougule and Shailesh Gurav project was gas leakage and fire detection is the process of using sensors to detect potentially dangerous gas leaks and fires. The sensors then transmit an SMS over GSM to inform others. When the sensor senses gas or fire, it generates a voltage, which is then sent to the Raspberry Pi as an input. When gas and fire are detected, the GSM sends an SMS.[7]

Sourav Debnath, Samin Ahmed, Suprio Das, and Abdullah-AI Nahid they create a project with the primary goal of sensing the LPG gas that causes the fire and detecting the presence of the fire, as well as sensing smoke flowing out of the light. At the same time, the project is a practical, cost-effective, and reasonable undertaking.[8]

Sony Shrestha, V. P. Krishna Anne, and R. Chaitanya project was a system that uses a gas sensor, a fire sensor, and a load cell to detect gas leakage, fire, and continually monitor the amount of gas in a cylinder In addition, the user will receive a notice indicating that the gas in the cylinder is soon to run out. The user will be notified through SMS or phone call if there is a gas leak or a fire.[9]

2.4 The need of Gas leakage detector system

For a variety of reasons, gas leak detection services are necessary, the most significant of which is public health. Combustible gases can cause fires or explosions in your home or workplace, causing harm to you, your family, friends, or coworkers. Due to cumulative exposure, gas leaks have the potential to cause long-term health concerns. In rare circumstances, gas leaks may be silent killers.

Furthermore, gas leaks are not only harmful to your health. Repairing gas leak damage may be expensive, time-consuming, and unpleasant, as well as expose you to potentially hazardous substances. If you don't have access to gas leak detection services to figure out what's causing the problem, the effects of the leak might return, costing you even more money.

Lastly, this project will create a mechanism that will be able to stop a gas leak if action is done quickly. As a consequence, property and life losses can be minimised.

2.5 Type of gas leakage detector for kitchen

2.5.1 HD1000 Home gas detector

The HD1000A Household Standalone Combustible Gas Detector was created to detect flammable gas leaks such as LPG, city gas, natural gas, methane, and so on. It uses complex electrical components and a very accurate advanced semi-conductor sensor to provide a high degree of functionality, dependability, and adaptability. The HD1000A series detectors are calibrated to alert before 7 percent LEL or as defined by the customer, and the built-in relay can control solenoid valves, sirens, or any other signal or danger management device.