

FIRE ALERT SYSTEM VIA IoT

SHARIFAH NURUL ATIKAH BINTI SHAHID AHMED

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PROJEK SARJANA MUDA II

Tajuk Projek : FIRE ALERT SYSTEM VIA INTERNET OF THINGS (IoT)

Sesi Pengajian :

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(COORDINATOR/STAF PENYELIDIKAN)
Dr. Nurul Huda Binti Abdul Hamid
Pensyarah Kanan
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Melaka (UTeM)
Hang Tuah Jaya
76100 Durian Tunggal, Melaka

Tarikh: 1/6/17

DECLARATION

"I hereby aware of my responsibility of the declaration and certify with my signature that my thesis entitled Fire Alert System via Internet of Things (IoT) is entirely the result of my own work. I have faithfully and accurately cited all my sources, including journal, books and datasheet."

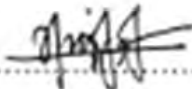
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Name: DR. NORIHAN BINTI ABDUL HAMID

Date: 1/6/17

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ABSTRACT

Purpose of this project is to overcome a problem of fraud called happen and difficulties to trace a location of fire incident. An Internet of Things (IoT) application is use to send the notification to the rescue team and authorized person. This project is focus on circuit designs, coding development and an application that can be integrate with IoT. In order to achieve the objectives, knowledge about the configuration circuit system using Espresso Lite V2.0 Arduino ESP8266 WIFI Module is applied. Nevertheless, knowledge on circuit literature and development should also emphasize. This project is started with preliminary study, design circuit, test and develop prototype. As result, the system will operate when gas sensor detect presences of gas, notification will be send through Blynk Application and Email at the same time buzzer will triggered simultaneously.

ABSTRAK

Tujuan projek ini adalah untuk mengatasi masalah panggilan palsu dan kesukaran untuk mengesan lokasi kejadian kebakaran. Aplikasi “Internet of Things” (IOT) digunakan untuk menghantar notifikasi kepada pasukan penyelamat dan pihak berkenaan. Projek ini adalah memberi tumpuan kepada reka bentuk litar, penghasilan koding dan aplikasi yang boleh mengintegrasikan dengan IOT. Dalam usaha untuk mencapai objektif, pengetahuan mengenai sistem litar konfigurasi menggunakan “Espresso Lite V2.0 Arduino ESP8266” modul WIFI di aplikasikan. Walau bagaimanapun, pengetahuan mengenai sastera dan penghasilan litar juga perlu ditekankan. Projek ini bermula dengan kajian awal, reka bentuk litar, menguji dan membangunkan prototaip. Hasilnya, sistem akan beroperasi apabila sensor gas mengesan kehadiran gas, notifikasi akan dihantar melalui Blynk Aplikasi dan E-mel pada masa yang sama penggera akan diaktifkan.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Fire alert system via Iot is a system that will operate when the sensor detect the smoke occurred in that placed and then will send the notification about the accurate location and time of the fire occurred. As we know, there are many fired happen in our place, not only house but also big building. But, what we know is, every building will must have their building safety. That is depends on the owner of the building or their head department in order to keep the building safety.

Basically, an automated action will be taken if there was a fired occurred is give a called to an emergency response that are firefighter, police and ambulance to give an information about fired happened. But, at sometimes there will be a fraud called happened when there is an un-responsible people make a called about there is fired happen, but obviously there is no fire at that place or area. Not only that, there is some problem occurred when the emergency response cannot trace and difficult to find right location of the fire even emergency response was given a right address. The main objective of this project is to overcome problem of fraud called happen. Besides that, this project also wants to overcome the difficulties to trace right location of fired happened.

1.2 Problem Statement

Nowadays, there a few problems occurred to the emergency response in order to get right information about fire incident. Sometimes, there are un-responsible

people that will give fraud called to the emergency response and give fake information to them. Not only that, when there are fire incident, there will be a difficulties to the emergency response to trace location even though address given is the right address. So, Fire Alert System via IoT will be developed to avoid all the problem occurred. Fire Alert System will develop to avoid fraud called and fake information given. This system is using IoT as a base station to send the notification about location to the emergency response, so that firefighters, polices and ambulances can trace the location accurately and easily. By adding IoT, all the problems can be avoided and solved.

1.3 Objectives

The objectives of this project are:

- a) To study and investigate the configuration circuit system using Espresso Lite V2.0 Arduino ESP8266 WIFI Module.
- b) To develop a Fire Alert System that could send notification wirelessly to an authorized person.

1.4 Scope of Works

For this project, scope of works that need to complete are do the preliminary study on how fire alert system via IoT function, study and analysis, system developments and testing system.

For preliminary study, all the information or previous research that related to the project need to gather from all types of sources. Information about IoT also needs

to gather in order to know how IoT will operate with the system. Study and analysis for this project is need to do on how gas sensor detects the gas and how buzzer will be used as the alarm to alert people around there.

For system development, system is using Espresso Lite V2.0 Arduino ESP8266 WIFI Module as a microcontroller and gas sensor to detect gas. The coding will be develops for IoT, sensor reading and for whole system. The last scope of works that need to be complete is testing system. This involved testing the system together with coding and record also analysis on how this system will operate.

1.5 Thesis Outline

This thesis consists of five chapters that have been outlined in the table of content. The brief summation of each chapter is stated below.

Chapter 1: Introduction

This chapter will cover on the introduction of the project. An explanation about the project will be explained in order to complete this project. In this chapter also, the objectives, problem statements, scope of work, methodology brief explanation and thesis outline of project will be presented.

Chapter 2: Literature Review

For this chapter, it will be an explanation about the similarity and the differences of this project with previous project that have been developed and being sold through the World Wide Web.

Chapter 3: Methodology

A detail explanation on project methodology, designing and developing circuit will be presented in this chapter

Chapter 4: Result and Discussion

In this chapter, the result of this project will be discussed in details.

Chapter 5: Conclusion and Recommendation

The project achievement and the future recommendation on how to improve the project will be suggested.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter basically discuss on technology that has implemented in the project and background of the technology. The reviews about a previous work related to this project were discussed in this chapter. Therefore, IoT technology will be introduced. The use of IoT in this project also will be explained in this chapter. Besides that, this chapter also will introduce about an Espresso Lite V2.0 Arduino ESP8266 WIFI Module will be extracted and also the other component use in this project will be explained.

2.2 Review of Previous Work

2.2.1 Fire Detection in Home Automation with Arduino using IoT

This paper briefly tells about how IoT is using in order to connect network of physical world and computer based system. The fire alarm system is a real-time controlling system that will explore a presence of smoke due to fire and then alarm will be on and PIR sensor is used to alert a person that comes close to the place with the alarm sounded. A servomotor is use to control a gate and LEDs will be used to control lights of the house to turn off or turn on. This system is use in order to develop the fire detection in home automation with Arduino using IoT. This system is currently to remotely send an alert when fire or PIR sensor was detected and to reduce the possibility of a false alert reported to Fire Station. This project is related to Fire Alert System via IoT because the system is same. [1]

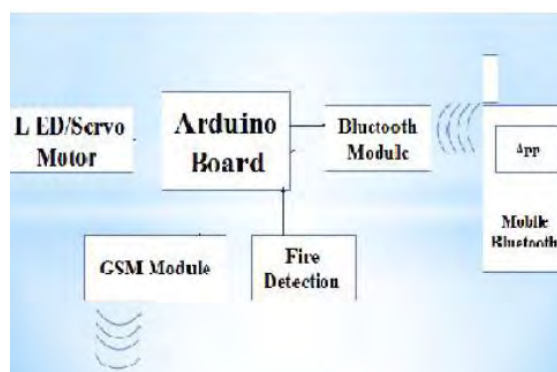


Figure 2.1: Block diagram of Fire Detection with Home Automation

Figure 2.1 shows the block diagram of fire detection with home automation. This project mentioned that used IoT, however how the IoT operate in their system, they never mention it. Meantime, for Fire Alert System via Iot will use an application using IoT to send notification wirelessly.

2.2.2 GSM Based Fire Sensor Alarm using Arduino

This paper introduces a fire sensor alarm using Arduino but send notification through the GSM. Fire Alarm System is very suitable for a security purpose and can get a clear view of fire hazard in a system. By using power electronic switches, an efficiency of this system will be increases a lot. Thermistor is use as sensing device that will use in the fire detection and prevention system. The sensing devices that will be used are Resistance Temperature Detector (RTD) and also thermistor. This system is basically user friendly and low cost home together with industrial security system. Not only that, this system is a real-time security purpose system that developed with simple hardware. It can be easily to be implemented with maximum reliability and high security with low cost of enhancement from the existing system for home security. This system quite same with fire alert system that will be develop. But, to send notification, fire alert system will used the IoT and only detect the gas using gas sensor. Using IoT, this system became more user-friendly. [2]

2.2.3 An Intelligent Fire Detection and Mitigation System Safe from Fire (SFF)

This project involves two system there are fire detection system and mitigation system safe from fire (SFF). Safe from Fire (SFF) is known as an intelligent self-controlled smart fire extinguisher system that assembled with multiple sensors, actuators and will be operate by using micro-controller unit (MCU). SFF will takes an input signals from a various sensor that placed in different position of the monitored area and will combined an integrated fuzzy logic to identify fire breakout location. A data fusion algorithm will facilitated the system in order to discard the deceptive fire situation such as cigarette smoke, welding and others. Along with ringing of alarm that will announces the fire affected location, fire hazard SFF will notifies by text message and telephone calls. In order to prevent the fire from spreading, it breaks electric circuit of an affected area and extinguisher gas will be released pointing to an exact fire location.

The SFF system will be presented as it can be minimize hazard. The location of fire will be announced and can be able to detect the severity. The fire can be prevent with breaking the electric circuit of the affected area, release the fire extinguisher gas on the hazard spot, calling fire services and inform a building monitoring committee by text message or telephone called. The SFF system is an intelligent system that can takes prompt attempt to accomplish these tasks.

An automatic fire extinguisher system needs to be implemented in order to protect lives and asset from the fire hazards. A government should impose rule of SFF system or automatic extinguisher system must be installed. Then, this system can be used in every building in cities to become smart cities and can protect every invaluable lives and assets from fire and safety. [3]

2.2.4 Smart Security System for Home Appliances Control Based on Internet of Things

This Home Appliances Control of Smart Security System project using IoTs uses computers or mobile devices to control basic home functions and features through internet from anywhere around a world. This security system differs from other system by allowing user to operate the system from anywhere around the world through internet connection. With an implementation of Arduino Mega microcontroller as an embedded device, security system design was constructed with many sensors and web server database. The Arduino Ethernet shield is used to eliminate the use of a personal computer (PC). A motion sensing circuit, temperature and humidity sensing circuit, smoke or gas sensing circuit, door lock sensing circuit, light on/off circuit were designed to be connected with Arduino Mega

microcontroller and Ethernet shield. This system can monitor temperature and humidity values and the state of some sensors for intruder detection. It can also control the electric appliances like lights and door at home. Real time result was displayed on web server page via the internet.

In order to live in peace, the important thing to do is to ensure that home is installed with perfect home security monitoring system. This security system not only can be used for home, it also can be used for residential, industrial and for all domestic and commercial purpose using this technique. The basic components that use to develop this security system are motion detectors, temperature detectors, humidity detectors, door lock detector and smoke detector. This home smart security using Internet of Things is very effectively to achieve by using web server language. In this system, server will control all the sensors and it can be easily to handle more hardware. [4]

2.2.5 Design of a Home Automation System Using Arduino

This project involve flexible home control and environmental monitoring system is employs embedded by micro-web server in Arduino Mega 2500 microcontroller with IP address for accessing and controlling devices by remotely. It will be controlled by using web application or Bluetooth Android based Smart phone application. The concepts of remote devices for home appliances can be controlled using an internet from anywhere and anytime. A Wi-Fi shield will act as a web server for the Arduino to connect between the Arduino board and computer which enables to work as a standalone device. This shield needs the internet connection from a Wi-Fi router and will acts as a gateway for the Arduino to communicate with the internet. A smart phone that built with support of the Wi-Fi and Bluetooth are able the devices to access and control at home. If the Wi-Fi cannot be connected, 3G or 4G can be used in order to access the system. [5]

2.3 Introduction to Arduino

Nowadays, electronics world is growing fast due to technology enhancement. This section will elaborate more about one of favourite technology that had been used widely. One of main part of this board is purposely to control all flow of the system that conducted by certain coding. Arduino is an open-source platform used for constructing and programming of electronic devices that need to be conducted. It also a friendly use for user to create a system because it simplifies process of creating any control system by providing a standard board that can be programmed and constructed to the system.

This Arduino uses a microcontroller programming like circuit board with a chip that can be programmed to do a various number of tasks. Not only that, this board also can sends information from a computer program to the Arduino microcontroller and finally to a specific circuit to execute the specific command. The users can just simply using USB cable in order to upload a code to the board. For the code, it will use C++ language to create a coding in Arduino software.


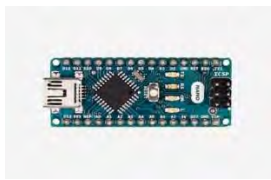


Table 2.1: Lists of main components on Arduino board.


Component	Function
USB cable	The main part of the board which can upload a program to microcontroller and has a 5V power which is can power up the board.
External power supply	To give supply to the board within 9 to 12 volts in case if USB plug does not provide enough power.
Reset button	It uses to reset the Arduino when user wants to upload another command.
Microcontroller	Using the ATmega328p microcontroller that will receive and transmit an information command to the respective circuit.
Analog pins (0-5)	Analog pin input from A0 to A5.
Digital I/O pins	Digital input, output pins is 2 to13
In-circuit programmer	Another source to upload or program the system
Power pins	Consists of 3.3V and 5V pin

2.3.1 Types of Arduino

Arduino can be categorized by several types. Table 2.2 below show the differences between each type of Arduino.

Table 2.2: Types of Arduino

Types of Arduino	Picture	Explanation
Arduino Uno (R3)		Arduino Uno R3 is a microcontroller board that based on ATmega328 microcontroller chip. This board can be power up through USB cable or an external barrel jack. The Arduino Uno a very compatible with most available Arduino shields
Arduino Nano		Arduino Nano is small and breadboard-friendly based on ATmega328. This microcontroller separates by itself from others by having USB to serial chip and connector on board. It has 8 simple pins and 14 advanced pins.
Arduino Mega		This Arduino Mega microcontroller based on ATmega2560. It has 54 I/O pins, 16 analog inputs and 14 PWM outputs. The Arduino Mega utilizes an alternet processor permitting more prominent system size.
Ethernet Shield		The Arduino Ethernet is a combination of Arduino Uno and Ethernet shield in a single board. It also a typical Arduino Uno where ATmega8 chip and USB fitting are changed for an Ethernet port.

Espresso Lite V2.0		The Espresso Lite V2.0 is uses ESP8266 as main microcontroller and support Arduino environment. This board is supports the Arduino IDE with own board manager and libraries.
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2.3.2 Arduino Board Used

Selection of Arduino platform in this project is suitable as it is a prototype project that can control by microcontroller. The microcontroller need to command and performs a lot of work in a time such read a sensor, triggered buzzer and send notification.

In this project, Espresso Lite V2.0 Arduino ESP8266 WIFI module is used as the main processor to this system. This board was fully controlled by coding that created in Arduino IDE software. Figure 2.2 below shows the Espresso Lite V2.0. This board is uses ESP8266 as main microcontroller and supports Arduino environment. It has two user-programmable buttons that connected to pin 0 and 13, are reset button, and green SMD LED indicator. This board will operate at 3.3V voltage regulator with maximum current 800mA and the input voltage is 5 to 12 VDC. Not only that, Espresso Lite V2.0 board supports Arduino IDE software with it own board manager and libraries, also this board is auto program loading from Arduino IDE because it no need manual resetting required.

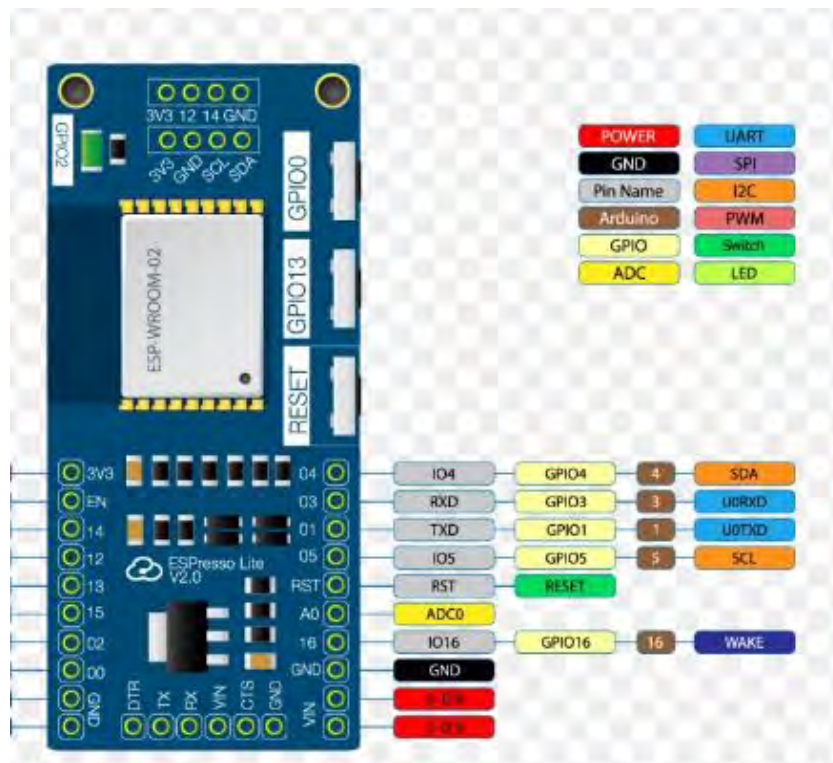


Figure 2.2: The Espresso Lite V2.0

CHAPTER 3

METHODOLOGY

This chapter basically discuss on methodology and designs taken in the project. The hardware and software will be explained in this chapter. Besides, function of the components used to design hardware will be explained and discussed in this section. The software design and steps taken to program this Fire Alert System via IoT system are reviewed and described step by step. Finally, a product packaging after the hardware assembling and software programming also will be discussed in this chapter.

3.1 Project Design and Overview

This project is basically used to alert people about fire happened and to give notification to an authorized people. The development of this system is to send notification of location of fire happened to the authorized person using Internet of Things (IoT). Main components used to develop this project are:

- Espresso Lite V2.0 Arduino ESP8266 WIFI Module
- Gas sensor
- FTDI USB to UART Converter
- Buzzer
- Arduino IDE