



DEVELOPMENT LOW COST AIR MONITORING SYSTEM



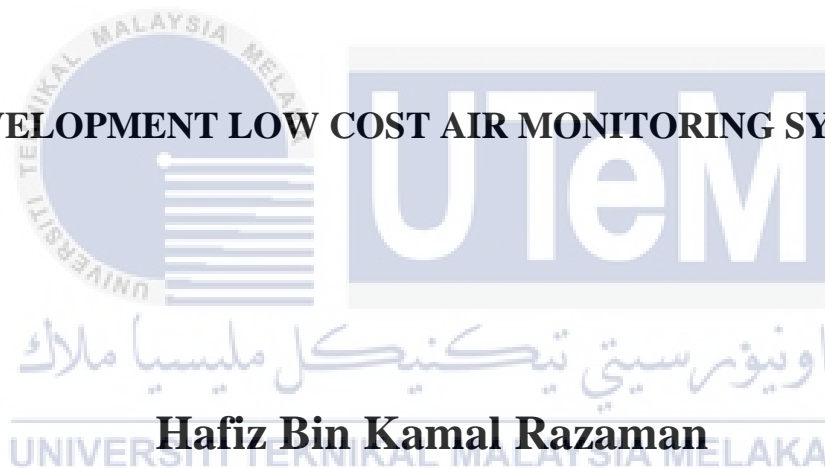
Bachelor's Degree in Electrical Engineering (Electronic Engineering) Technology

2020



Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT LOW COST AIR MONITORING SYSTEM



Hafiz Bin Kamal Razaman

**Bachelor's Degree in Electrical Engineering (Electronic
Engineering) Technology**

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DEVELOPMENT LOW COST AIR MONITORING SYSTEM

HAFIZ BIN KAMAL RAZAMAN

**A thesis submitted
in fulfillment of the requirements for the Bachelor's
Degree in Electrical Engineering (Electronic
Engineering) Technology**



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2020

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

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DEDICATION

Thank you to my beloved parents, Kamal Razaman bin Hasan and Azizah bin Hussien, my family has been a great support to me, my lecturers and my friends.



ABSTRACT

Nowadays, in the world the development of technological is very fast. Mostly countries develop because of their own technological development. Each country is racing to pursue and come up with new ideas for technological competition between countries. The air monitoring system is one of the most technologically advanced devices because it is very important to monitor air quality. Most of these countries have this system, which is due to human generated pollution such as factory, vehicle shocks, open burning and so on. It can affect human health and life on earth. But the air monitoring system that commonly used outdoor is not suitable use in home because the systems is large and expensive. To produce the air monitoring system that usually used in indoor should be smart equipment and inexpensive. The objective of this project is to develop low cost air monitoring system which is to monitor the presence and quantity of dust, rate of the wind speed, temperature and humidity of air conditioner by using the android application based on IOT project. The Arduino Uno wifi based Esp 32 is a main microcontroller that will connect with these sensors to sense their condition. This project is simplify to user because it can be monitor remotely.

ABSTRAK

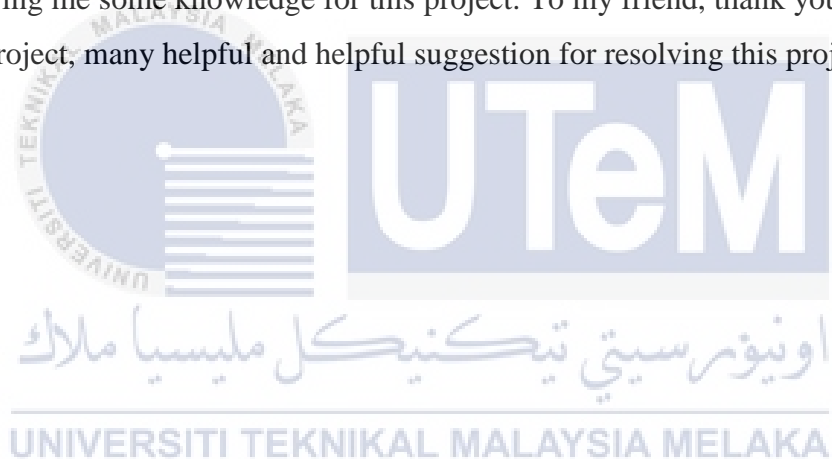
Pada zaman sekarang, perkembangan teknologi setiap negara amat pantas. Kebanyakan negara yang membangun di sebabkan oleh perkembangan teknologi. Setiap negara mengejar dan memberi idea-idea yang baru untuk perkembangan teknologi setiap negara. Sistem pemantauan udara adalah salah satu perkembangan teknologi kerana ia sangat penting untuk memantau tahap kualiti udara tersebut. Kebanyakan negara mempunyai system tersebut, disebabkan pencemaran udara ada setiap negara kerana disebabkan pencemaran yang di hasilkan oleh manusia seperti pembakaran hutan, asap daripada kilang dan kenderaan. Ini boleh menyebabkan kesan kepada kesihatan manusia dan kehidupan di bumi. Tetapi sistem pemantauan yang ada sekarang ini kebiasaanya digunakan untuk pemantauan di luar dan ia tidak sesuai di gunakan di dalam rumah. Dengan itu, untuk menghasilkan pemantauan udara adalah untuk di dalam rumah dimana ia digunakan pada penghawa dingin dengan memantau keadaan habuk, kadar kelajuan angin, kelembapan dan suhu dengan menggunakan aplikasi android mengikut IOT projet. Arduino Uno WIFI based esp 32 adalah mikrokontroler yang akan bersambung dengan sensor untuk mengesan keadaan yang berkaitan dengan itu. Proje ini memudahkan pengguna kerana ia membolehkan untuk mematau dengan jarak jauh.

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A special thank you to the lecturers for helping to teach before this. It has helped me to solve this project after giving me some knowledge for this project. To my friend, thank you for supporting me all on this project, many helpful and helpful suggestion for resolving this project.

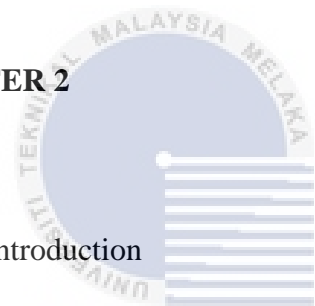


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CHAPTER 1

INTRODUCTION

1.1 Air conditioning system

Air conditioning system is a system or machine that regularly emits air and usually used in closed areas during a cooling cycle for example offices, supermarkets and factory. The main purpose of air conditioning is to get rid of warmer air into cooler air. However, the air conditioner will be less cool than the original condition and may have limited air flow problems when used regularly. Usually it is caused by dust causing the air flow to become obstructed and less cold. Furthermore, due to the presence of dust in the air conditioner, the air flow rate from air conditioner will be limited, air humidity and temperature will be reduced.

In several large supermarkets, ductwork suspended from the ceiling is ventilated throughout the shop. The conduits come either from air handling units or from the rooftop. Thus, if the returned air is within certain limits of CO_2 , humidity, and temperature, some of it may be recirculated to minimize heating or cooling load. After that, the object of the air handling unit that would normally be an exhaust to maintain pressure in the building and remove the used air.

1.1.1 Air quality classification in the air conditioner.

In the air conditioner, the contents found in the air are humidity, temperature, carbon dioxide. But carbon monoxide is also in the water conditioner. It is dangerous if the content is in a human environment. Previously, there was a death in the car because it slept with open air conditioning. Carbon monoxide has been disposed of inside the contents of the air conditioner, which can lead to death during sleep for unconscious people.

1.2 Problem Statement

The problem statement of this project are as follows:

- I. The air monitoring system in the market is typically very expensive.
- II. There are multiple sensors that be used to monitor air conditioning system.
- III. Difficult to monitor the sensor of air quality at the air conditioning system.

1.3 Objectives

The main objectives of this project shall be:

- I. Designing and developing low cost and small portable air monitoring system.
- II. Develop a compact, easy-to-wear, air monitoring system acquisition kit which combine multiple sensors.
- III. To design and develop air monitoring system easy to read air monitoring of the current environment through the android application.

1.4 Project Scope.

The scope of this project will be focused on:

- I. Study the price sensor selection below Rm 500 to development of the budgetary air monitoring system.
- II. Study the type of sensor that suitable to design of the budgetary air monitoring system which is optical dust sensor, pressure sensor and anemometer fan blade.
- III. Study the type of the application used to monitor the air monitoring system.
- IV. Study the type of the microcontroller used suitable to communicate with sensor and android application.

1.5 Thesis Outline.

This report have 5 chapeters to discuss in more detail about this project, the information is described this way:

- Chapter 1. Introduction to that. Describes in this chapter the research background, research issues, objectives and scope of the study.
- Chapter 2. Literature review. This section started with the finding of 10 articles for a literature review of each topic related to the project to be undertaken. Therefore, it will explain the objective, problem statement, method and result. Once, each artilce can be compared by looking for the advantages, disadvantages, comparison, and give opinions for this artilce.
- Chapter 3. Methodology. This chapter present a methodology in which it covers method that will used such as hardware and software selection to be used in development air budgetary air monitoring system.
- Chapter 4. Case studies. Throughout this section, the models developed are being tested and evaluated by methods of an air monitoring system..
- Chapter 5. Conclusion. This following section summarizes the work carried out and the accomplishments of this project.

CHAPTER 2

LITERATURE REVIEWS

2.1 Introductions

The aim of this chapter is to study research by a different researcher with a similar title. There are 10 artillery and journals that need to be identified and must be linked to the title project. Through this way, it will help share the insight and approaches used by researchers to complete this project. After that, it will support and promote the successful completion of the project. Besides, it is also a clear description and ideas that are very close to the implementation of a budgetary air monitoring system. Furthermore, the outcome of these article are result, differences, method, problem statement, objective and similarities related to this project will be discussed in each post.

2.2 Related Studied

2.2.1 Development of Dust Measurement System.

Pollution is prevalent in every country of the world. Those are because certain development generate material that will pollute the environment such as manufacturing, excavations, vehicles and so on, which would lead to emissions in the atmosphere (Ewetumo et al., 2018). It's one of the threats to the environment and this is the point set out in this

article. (Ewetumo et al., 2018). The method that used to develop of a dust measurement system is sharp sensor created by the main of the sensor and Arduino mega is a microcontroller for communication between sensors. And the data from this sensor will transfer to the Arduino mega, which will be compiled and convert into the value to observe the output via the LCD. The microcontroller is the difference between this article project and the project used to develop budgetary air monitoring system. The microcontroller used in this article is Arduino mega while the microcontroller that will used while in design is Arduino WIFI Uno Based ESP 32. In this article, the purpose of this project is almost same to the project that will built because it uses the same sensor such as dust sensor. After that, from this project article needs improvement in monitoring of the reading of the sensor. For example, the android application can be used to read or track dust reading on sensors. Lastly, it make easier for the user to monitor the amount of dust density.



2.2.2 Low Cost Air Pollution Monitoring System Review Of Protocol And Enabling Technologies

For this article, it is closely linked to the project idea of a low-cost air pollution monitoring system. The problem statement for this article concerns the non-scalability of conventional air monitoring system (Idrees & Zheng, 2020).Furthermore , it has renewed and upgraded its rating system to address the problem. In addition, the existing air monitoring system has previously been very expensive. Therefore, it wants to renew the idea to reduce costs with the same system and more elusive system. The problem statement in

this article relates to the partial access to data, which is due to lack of storage to store the recorded data, which makes it necessary to delete the previous data. It is a issue when existing data is lost due to a lot of new data coming in and that is an inadequate source of storage. This is an earlier deficiency that will be revived for the project.

There are several objectives in this article is upgrade and renew the air pollution system as used by low-cost ambient sensor to solve that problem statement. Previously, the air quality system was used as costly tracker sensor. Reforms have also been made to reduce these costs, in partilcular the price of the sensor. One of the advances of this project is that the device uses IOT and wireless sensors. With this item, it can store data on the internet and can view the data. This way, problem such as incomplete access to data can be solved.

As far as method is concerned, It is separated into sections, hardware and software. For the hardware part, there are several sensors used for the hardware component, such as JN5158, Octopus 11, Ipu 8930. But the main sensor used is the node sensor. Additionally, the tool used to collect and store the data on the website or internet. This make it easier for the end-user to process and save the data. The end-user can do this through mobile application and web page.

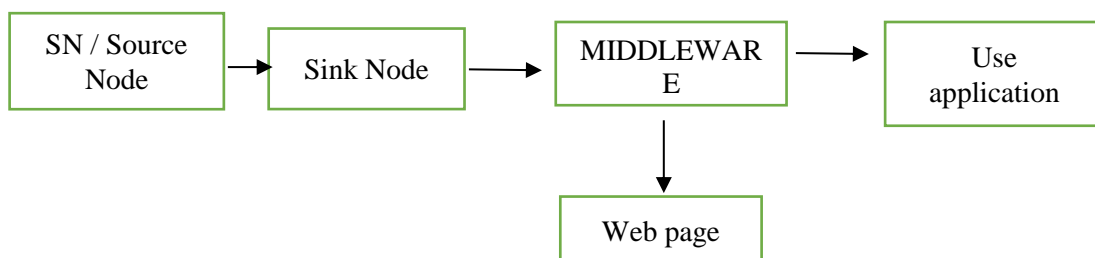


Figure 2.0: Process of the Low Cost Air Pollution Monitoring System

2.2.3 Real Time Wireless sensor network (WSN) indoor Air quality monitoring system.

The goal of this article is to reduce pollution and monitoring of indoor environmental quality, especially at home. This is because people spend about 90% more time at home in single day (Salman et al., 2019). In addition, the purpose of the project is to preserve safety and to take precautionary measures against harmful air content without human awareness. This is one of the objectives of creating an air quality monitoring system. The problem statement with this article is that, in general, people who are in a building or home are unaware of the air quality in the area. The method used in this project is to use 2 sensors, such as the Sensirion SCD 30 and Sensirion (2019) to measure the air content of the co2 precisely. In addition, the sensor senses air content and transmits MBED creation boards to the ARM Microcontroller. The data is then transferred to the ZigBee module. MATLAB is also used in this project to conduct GEO statistical interpolation on the data obtained and to produce the projected maps.



Figure 2.1: Process of the Low Real Time Wireless sensor network (WSN) indoor Air Quality Monitoring system

2.2.4 Air Quality Evaluation With A Low Cost Dust Sensor For Hencoop.

The objective of the whole system is to keep the surroundings healthy. It has taken steps to produce this project to maintain the health of human and animals inside the hencoop (Beyaz, 2019). This is because the dust inside the hencoop will negatively affect the health of both animals and humans. In addition, air filtration techniques can be used with dust removal machines to meet the requirements for dust balance.

Arduino Uno R3 was used as the key microcontroller and process. It has 14 pin pair with optical input and output ports. The detector or sensor used in this project is indeed an optical dust sensor. It helps track the particles in the hencoop. Furthermore, the output data will be moved to the SD Card module as a server. The DS3231 real time clock (RTC) module also used in this project to keep track of the time even when the module is not powered. This way, it can track the time every data goes into the Arduino with optical dust can be monitored. Besides that, The HC-05 Bluetooth is used for the wireless data transmission. This way, data can be processed and transmitted data remotely from the computer. Measurement of air quality can be achieved within 4 weeks. This way, the level of air quality throughout the atmosphere can be determined and can solve the problem dust inside the hencoop. In my opinion, the hardware consumption can be reduced, especially with use the Bluetooth module. After that, when using the Arduino WIFI Uno based ESP

32, it can reduce the hardware consumption because it have integrated Bluetooth and Wifi module.

2.2.5 IOT Based Real Time Air Quality Monitoring and Control System to Improve the Health and Safety of Industrial Workers.

The purpose of this article is to protect the health of worker and control the pollution of the air in the factory. Chemical and pollutants released in the factory such as carbon monoxide, ammonia, and carbon dioxide (Veeramanikandasamy et al., 2020). It is caused by mixing in the air the solid or the dust and liquid. It has caused air pollution in this plant. A device where ESP 32 was used is the main microcontroller in this project to resolve this issue. So in this board of ESP 32 includes an integrate WIFI and Bluetooth module. But it may be smart device and IoT program. Furthermore, the sensor used in this project is BME 280, which is capable of detecting the humidity, temperature and pressure in high level accuracy. So the output of humidity will show in percentage, temperature in degree Celcius and pressure with associated sea-level elevation. After that, the 3 reading value of the associated environment is shown in this sensor. In addition, SDS 011 is also used in this project for calculate the electron density in air between 0.3 and 10um.. So it will translate the density of the mass of the particles. Lastly, MQ135 is a gas sensor used to detect the gas in atmosphere, such as oxygen, sulfur, and smoke. So it going to detect harmful gases. This is a way of detecting air pollution and can keep the industry safe from emission by using the IOT principle to regulate the air condition in the industry.