UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF MONITORING TEMPERATURE & HUMIDITY DEVICE FOR HOSPITAL RESOURCES via IoT BASED SYSTEM

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer System) with Honours.

by

EYSTEIN A/L DANIAL

B071510852

940526-08-6065

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

TECHNOLOGY

2018

Universiti Teknikal Malaysia Melaka

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DEVELOPMENT OF MONITORING TEMPERATURE & HUMIDITY DEVICE FOR HOSPITAL RESOURCES via IoT BASED SYSTEM**

SESI PENGAJIAN: **2018/19 Semester 1**

Saya **EYSTEIN A/L DANIAL**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

☐	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)
☐	TERHAD	
☐	TIDAK TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

Disahkan oleh:

_____ _____

Alamat Tetap:

LOT 1478 (55-C) KAMPUNG LARUT TIN

JALAN SIMPANG 34000 TAIPING, PERAK

Cop Rasmi:

DECLARATION

I hereby, declared this report entitled "**Development of Monitoring Temperature & Humidity Device for Hospital Resources via IoT Based System**" is the results of my own research except as cited in references.

Signature	:	…….
Author's Name	:	EYSTEIN A/L DANIAL
Date	:	……

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours. The member of the supervisory is as follow:

……

PUAN RAHAINI BINTI MOHD SAID

(SUPERVISOR)

……

PUAN NORFADZLIA BINTI MOHD YUSOF

(CO-SUPERVISOR)

ABSTRAK

Kini, kebakaran adalah salah satu daripada beberapa bencana yang sering berlaku di Malaysia. Sebanyak 6000 kejadian kebakaran dengan lebih daripada 300 mangsa pada 2016- 2017 di Malaysia. Akhirnya, bencana itu juga boleh mensasarkan Hospital. Dalam berita baru-baru ini, kejadian kebakaran berlaku di Hospital Sultanah Aminah di Johor Bharu yang membakar sumber hospital dan sebahagian blok serta enam orang terbunuh dalam kebakaran yang berlaku di unit rawatan intensif (ICU). Terdapat keperluan untuk jenis peranti ini untuk jabatan yang berbeza yang merangkumi bilik penyimpanan, bioperubatan dan farmaseutikal yang terletak di hospital. Jika terdapat sebarang penyelewengan atau perubahan dalam keadaan alam sekitar boleh mengakibatkan kehilangan kewangan di sumber hospital dan bekalan farmaseutikal boleh mengancam nyawa kepada pengguna sumber bioperubatan. Objektif sistem yang direka ini ialah untuk memahami tentang pemantauan suhu, kelembapan dan penghantaran data asap melalui ESP 8266 ke platform IoT dan menggunakan modul GSM yang boleh digunakan untuk memberi amaran kepada pengguna melalui (SMS) apabila kejadian kiritikal. Sementara itu, Arduino IDE digunakan untuk menulis program sistem. Tambahan pula, ia amat diperlukan untuk mengguna pakai teknologi Internet Things (IoT) dengan ESP8266 untuk mengintegrasikan dan rekod pemantauan suhu, kelembapan hospital serta pengesan tahap asap. Dengan itu boleh mendapatkan data untuk mengkaji perubahan dalam alam seperti mengunakan (GUI) dan aplikasi Blynk yang memudahkan pengguna untuk menyimpan data, menganalisiskan, dan menghasilkan pelbagai grafik analisis. Pengujian sistem ini telah dilakukan di Hospital Taiping untuk mengumpulkan maklumat yang diperlukan untuk melakukan analisis dengan lawanan varian masa. Dengan memperluaskan keperluan projek ini ke berbagai tempat untuk menjalankan ujian, pemeriksaan dan analisis boleh membantu komuniti dan masyarakat hidup dalam persekitaran yang sihat dan selamat.

ABSTRACT

Nowadays, fire is one of the few disasters that frequently occurred in Malaysia. Malaysia has archived 6000 fire incident with more than 300 casualties in 2016- 2017. Eventually, such disaster can also target Hospital. In recent news, a fire incident occurs at Sultanah Aminah Hospital in Johor Bharu which burns down the hospital resources and most part of the blocks as well as six patients have been killed at the intensive care unit (ICU). There is an urgent need for this type of devices for different department that include storage rooms, biomedical and pharmaceutical which located in hospital. In these department mentioned above there is a need for controlled environmental conditions which mainly include temperature, humidity and smoke. Any deviation or change in the environmental controlled conditions can lead to financial loses in hospital resources and pharmaceutical supplies can be life threating to the users of biomedical resources. The objective of this system is to understand about monitoring temperature, humidity and smoke data transmission via ESP 8266 to IoT platform and to produce alarm through GSM module when the temperature and smoke reaches to a certain critical level. Meanwhile, Arduino IDE that used to write the program of the system. Furthermore, it has become extremely necessary to adopt the Internet of Things (IoT) with integrating ESP8266 technology to record and monitor the hospital temperature, humidity and smoke level. So the data can review changes in the environment through remote computer (GUI) and Blynk application that ease us to store, analyze and produce various analytical graph. The experiment have took place at Hospital Taiping to gather the required information to do various analytic graph versus the time variant. This system can be considered as a prototype and expand it to serve various places not only for Hospital areas but it can also monitor areas like Indoor/Outdoor temperature monitoring, home monitoring system, etc. By expanding the need of this project to various places to carry out testing, inspection and analysis may help the community and society to live in a healthy and safe environment.

DEDICATIONS

This thesis is dedicated to:

My beloved parents,

My supervisors,

My lecturers

My family,

And all my friends,

Thank you for the guidance, encouragements and support.

ACKNOWLEDGEMENT

I would like to express my deep sense of gratitude and respect to our supervisors, Puan Rahaini Binti Mohd Said and Puan Norfadzlia Binti Mohd Yusof, Department of Electronics & Computer Engineering Technology, University Teknikal Malaysia Melaka for their excellent guidance and suggestions. They have been very kind, supportive and patient to me while suggesting the outlines of the project and has also been very helpful in the successful completion of the same. I thank them for their overall support.

Last but not the least I would like to extend my heartfelt gratitude to our lecturers who have thought me throughout this degree, Department of Electronics & Computer Engineering Technology, University Teknikal Malaysia Melaka for their support and guidance. Their helping nature and suggestion has helped me to complete this present work.

I am really thankful to University Teknikal Malaysia Melaka for permitting me to utilize the facilities in its laboratories for smooth execution of my experiment.

I extend my warm gratitude to my friends and course mates, for their constant motivation and support throughout the course of my Bachelor Degree Project research. Finally, I would like to thank my seniors, juniors and my fellow students who enthusiastically supported me by providing the necessary data.

TABLE OF CONTENT

CHAPTER 4: RESULT AND DISCUSSION

CHAPTER 5: CONCLUSION AND FUTURE WORK

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

ADC	**Analog to Digital Conversion**
APP	**Application**
ASCII	**American Standard Code for Information Interchange**
CO	**Carbon Monoxide**
DC	**Direct Current**
DHT	**Digital Humidity and Temperature sensor**
ECSN	**Embedded Controlled Sensor Network**
GPRS	**General Packet Radio Services**
GSM	**Global System for Mobile**
GUI	**Graphical User Interface**
ICU	**Intensive Care Unit**
IoT	**Internet of things**
IP	**Internet Protocol**
LCD	**Liquid Crystal Display**
LED	**Light Emitting Diode**
MQTT	**Message Queuing Telemetry Transport**
OS	**Operating System**
OSHA	**Occupation Safety and Health Environment**
PC	**Personal Computer**
PPM	**Parts Per Million**
QoS	**Quality of Services**
RX/TX	**Receiver Transmitter**
SDLC	**System Development Life Cycle**
SMS	**Short Message Service**
SOP	**Standard Operating Procedure**
SPI	**Serial Peripheral Interface**
SQL	**Structured Query Language**
SSID	**Service Set Identifier**
TCP/IP	**Transmission Control Protocol/Internet Protocol**
USB	**Universal Serial Bus**
WHO	**World Health Organization**
Wi-Fi	**Wireless Fidelity**
WSN	**Wireless Sensor Network**

CHAPTER 1

INTRODUCTION

1.0 Background

Present innovations in technology mainly focus on controlling and monitoring of different activities. These are increasing and emerging to reach the human needs. An efficient environmental monitoring system is required to monitor and assess the conditions in case of exceeding the prescribed level of parameters (e.g., temperature, humidity and smoke levels). The major industries in Malaysia include biomedical, and pharmaceutical which forms backbone of countries economy. The continuous monitoring of temperature and humidity is a major criteria also the controlled environment forms a foremost criteria in all of the above industries. In the " Technical Codes for the Construction of a Clean Operation Department in Hospitals", there are definite regulations about the following indexes such as temperature ,relative humidity, in the storage of hospital drugs puts forward strict requirements on the ambient temperature and humidity. Any kind of deviation in the environmental conditions or the pre-set parameters can cost heavy financial losses due to alterations in productivity in the Hospital.

Meanwhile, fire occurrence does not know place and time, and can be happened anywhere and anytime. The cause of such incident is varying, but mostly because of short circuit in electricity or human error. Eventually, such disaster can also target in Hospital, whereby using IP camera as monitoring the state of the environment is an essential task for ensuring safety of the product and patient. Therefore, providing life support in healthcare sectors the environment controlled conditions is required. The variations in environment of product could be a major loss.

Taking the above factors in consideration the current paper was designed to develop monitoring temperature and humidity for hospital resources via IoT. The technological advancements in various field including instrumentation is kept in mind and care was taken to utilize it. This improves the functionality of the device proposed.

Therefore, to encounter this issue a product is purposed to the hospital to prevent any loses to the resources and may affect the patient life. The temperature, humidity and smoke monitoring are the key factors that need to be monitored and constantly maintained to improve the medicine scope and healthcare. Furthermore, by using this device records and track data of environmental. Besides that, it will be done remotely which can eliminate the need for manual reporting to every place. This creates an effective means to monitor environmental conditions as well as track the location of critical assets and the condition. Along the way, the device also generate automated compliance report for any time period by using IoT which able to improves workflow processes and collects a massive amount of data. Furthermore, able to receive alerts when measurements are sensed above or below set parameters. The sooner staff receives the alerts the sooner they can address and solve it. Lastly, the camera records visual as well as operates as a video surveillance at website and Dlink app which can be monitor 24/7 in case there's an incident happen.

This project comprises with three different application to monitor the system based on wireless technology which comprises data transmission from one point to another. Basically, the aim of this project is to collect data such temperature, humidity, and smoke level. Additionally a GSM module was used to alarm the user in the wake of a critical event. Wireless module using ESP8266 was implemented so as to reduce the complexity of the device during handling. The ESP8266 module which consists of a transmitter and receiver was utilized to send data to the monitoring station from the sensors. Furthermore, it has become extremely necessary to adopt the Internet of Things (IoT) technology. Integrating with IoT monitoring of the hospital temperature and humidity able to control and get data to review changes in the environment through Dlink App, PC Base Interface (GUI).

1.1 Problem Statement

Nowadays, fire is one of the few disasters that frequently occurred in Malaysia. Malaysia has archived 6000 fire incident with more than 300 casualties in 2016- 2017. By the rapid development of information technology and communication in Malaysia, it turns out that the number of incident and casualty still cannot be suppressed. Almost every day through media's, we can witness fire in any place across states. Eventually, such disaster can also target Hospital. In recent news, a fire incident occurs at Sultanah Aminah Hospital in Johor Bharu which burns down the hospital resources and most part of the blocks as well as six patients have been killed in a fire that broke out at the intensive care unit (ICU). Nevertheless, after two weeks from this incident another fire tragedy happened at Raja Permaisuri Bainun Hospital in Ipoh which believed occurs from a wiring faulty connection. Besides that, the cause of such incident is varying, but mostly because of short circuit in electricity or human error. Following, this fire tragedy might involves hospital resources to damage, this can lead to financial shakedown. It is expected that the developed system will provide a solution for hospital resources monitoring and execute a necessary disaster response action in the effort of preventing any fallen casualties and damage to the resources.

1.2 Objective

There are some objectives that need to achieve in this project:

i. To understand about monitoring temperature, humidity and smoke data transmission via ESP 8266 to IoT platform.
ii. To produce alarm through GSM module when the temperature and smoke reaches to a certain critical level.
iii. To analyse and demonstrate the data collected such as, temperature, humidity and smoke detector level.

1.3 Scope

In this project, the Global System for Mobile (GSM) module, Arduino Uno microcontroller, ESP 8266 Wi-Fi module and related sensors involved will be used in order to assemble this hardware. All of these are the main components for this project whereby temperature and humidity as well as smoke detector sensor plays a vital role in getting information of the readings. Arduino is integrated with ESP 8266 so that the data's are able to transmit and retrieve to the IoT platform. Additionally a GSM module was used to alarm the user in the wake of a critical event All the data's collected will be analyse and demonstrated in terms of graph in order for the improvement of this project in the future.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

As for this chapter, the purpose is to reviews proceeding some of the various important masterpiece that have completed by scholar and significant towards the temperature and humidity and achieve each of the information that originate from the literature. The studies and factual information that attain is used to help and benefit this project and plays has an essential part when this project being progress.

2.1 Synopsis of Temperature and Humidity Monitoring

The temperature and humidity monitoring system can use in hospital areas. This system allows to monitor the temperature and humidity continuously without the help of anyone. Which this can reduce the possibility of human recoding the data and it helps to reduce the workload since it can be data monitor in IoT makes the user easy to view the information anywhere. Nowadays, fire incident is a common tragedy, by using this system it able to detect the heat of the fire and alert the user. Besides that, it allows the user the see what's happening via camera visual. This situation can be beneficial to the user to respond immediately without panicking. Furthermore, user can view the data and monitor the parameter with their own smart phone wherever and anytime, which makes reliable and convenient to the user.