UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF INHALER MONITORING SYSTEM

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

by

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Sesi Pengajian: 2019

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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ABSTRAK

According to the World Health Organization (WHO) report, 300 million people have suffered from asthma throughout the world and the number will amplify to 400 million by 2025. It is determined that the primary reasons of the problem are inappropriate use of inhalers correctly and environmental affair such air pollution and smoking. Hence creating the idea of Development of Inhaler Physiological Monitoring System.

The Inhaler Physiological Monitoring System works when it is turn on by the user. Then the three sensors which are dust, temperature and humidity sensor will take the reading of the patient physiological surrounding every 30 seconds and send the data collected to the node MCU. The data then will process by the node MCU and if the data exceed a certain limit set in the coding the LED will blinking to indicate the area is not suitable for the user. Simultaneously for every 30 seconds, the data will be uploaded to the Internet of Thing cloud which is the Thingspeak application to be recorded.

The development of inhaler physiological system device proved to be useful with the combination of Internet of Thing (IoT) technology. The data that been uploaded can be analyses and at the same time can be use by medical personal or even patient family to monitor the asthma patient therefore the patient. Overall, with the development of inhaler physiological system can make the asthma patient live healthier life and free from asthma disease in the future.

ABSTRACT

Menurut laporan Pertubuhan Kesehatan Sedunia (WHO), 300 juta orang telah menderita asma di seluruh dunia dan jumlahnya akan meningkat menjadi 400 juta pada tahun 2025. Antara punca utama masalah adalah cara penggunaan inhaler yang salah dan masalah alam sekita seperti pencemaran udara dan merokok. Dari permasalahan itu, timbulnya idea untuk menghasilkan 'Development of Inhaler Physiological Monitoring System'.

Projek 'Development of Inhaler Physiological Monitoring System' berfungsi apabila ia dihidupkan oleh pesakit asma. Kemudian tiga alat pengesan iaitu alat pengesan debu, alat pengesan suhu dan kelembapan akan mengambil bacaan fisiologi sekitar pesakit setiap 30 saat dan menghantar data yang dikumpulkan ke 'node MCU'. Data tersebut akan diproses oleh 'node MCU'dan jika data yang diambil melebihi had tertentu, LED akan berkedip untuk menunjukkan kawasan tersebut tidak sesuai bagi pesakit asma. Pada masa yang sama, data akan dimuat naik ke 'Internet of Thing cloud' yang merupakan aplikasi 'Thingspeak' untuk direkod.

Projek 'Development of Inhaler Physiological Monitoring System' terbukti berguna dengan gabungan teknologi Internet Thing (IoT) dimana data yang telah dimuat naik boleh dianalisis dan pada masa yang sama boleh digunakan oleh ahli perubatan atau keluarga pesakit untuk memantau persekitaran pesakit asma. Secara keseluruhannya, projek 'Development of Inhaler Physiological Monitoring System' dapat membantu pesakit asma hidup lebih sihat dan bebas dari penyakit asma di masa depan.

DEDICATION

I dedicate this to my beloved mother and late father, Siti Saodah binti Nawir and Mohamad bin Mohamad Nasir.

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-	-	Negative terminal
+	-	Positive Terminal
A/D	-	Analogue to Digital
AC	-	Alternate Current
AREF	-	Analogue Reference
AVR	-	Alf and Vegard's RISC
BT	-	Bluetooth
℃	-	Celcius
CFC	-	Chlorofluorocarbon
CNNs	-	Convolution Neural Networks
COPD	-	Chronic Obstructive Pulmonary Disease
DC	-	Direct Current
DHT	-	Digital Humidity/Temperature
DIP	-	Dual-Inline-Package
EEPROM	-	Electrically Erasable programmable read-only memory
EMDs	-	Electronic Monitoring Devices
ESP	-	Espressif
FSR	-	Force Sensing Resistor
FTDI	-	Future Technology Devices International
GMM	-	Gaussian Mixture Model
GND	-	Ground

GPIO	-	General-purpose input/output
I/O	-	Input or Output
ICSP	-	In-Circuit Serial Programming
IDE	-	Integrated Development Environment
INCA	-	Inhaler Compliance Assessment Study
IOT	-	Internet of Thing
KB	-	Kilobytes
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diodes
LM	-	Linear Monolithic
mA	-	milliAmpere
MDI	-	Meter Dosed Inhaler
MHz	-	Megahertz
NNs	-	Neural Networks
OS	-	Operating System
%	-	Percentage
pMDI	-	pressurised Meter Dosed Inhaler
PWM	-	Pulse Width Modulation
RH	-	Relative Humidity
Rx	-	Receiver
SCL	-	Serial Clock
SDA	-	Serial Data
SRAM	-	Static random-access memory

STEMTera’	-	Science, Technology, Engineering and Math Era
Tx	-	Transmitter
USB	-	Universal Serial Bus
Wi-Fi	-	Wireless Fidelity
WHO	-	World Health Organization
V	-	Volt
Vo	-	Voltage Out
VCC	-	Collector Supply Voltage

CHAPTER 1

INTRODUCTION

This chapter focuses on the project introduction, background, problem statement, objective, and project scope about this entire project. The development of Inhaler Physiological Monitoring System will be explained briefly in this chapter. Besides that, the motive of this project will additionally be expresses in the problem statement. Furthermore, all the section that is associated to the theory of this project will be clarified as to indicate the perception of this project.

1.1 Background

According to the World Health Organization (WHO) report, 300 million people have suffered from asthma throughout the world and the number will amplify to 400 million by 2025. It is determined that the primary reasons of the problem are inappropriate use of inhalers correctly and environmental affair such air pollution and smoking. Generally, the children, the elderly and extremely breathless patients are the one suffered a lot and addition with the lack of quick aid, they might also undergo heavy stress. On the other hand, in the hospital, patient and nurse ratio is relatively low therefore the patients were not monitored at all time. Besides that, the adherence of patients to their medication, both in terms of following the doctor prescription and using the inhaler device correctly, is one of the most vital factors for the effective management of their condition.

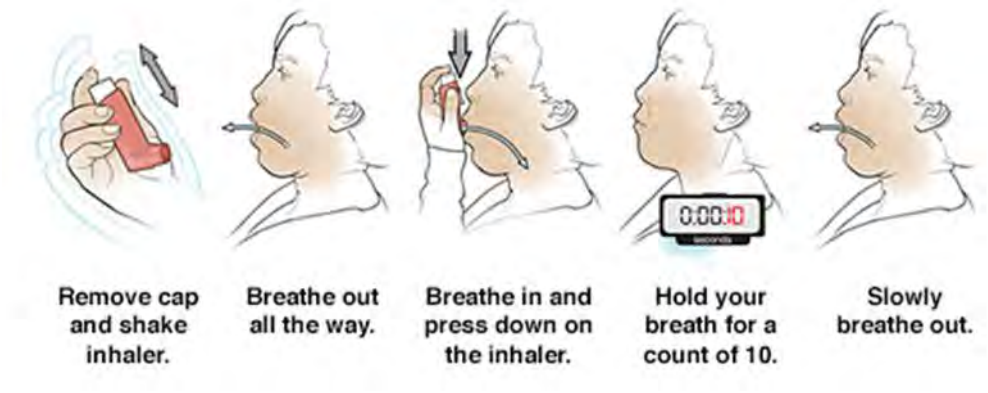

Figure 1-1: The correct step to use an inhaler

From there, the idea for development of Inhaler Physiological Monitoring System pop up so that the monitoring patient's condition without nurse help or when the patients are at home can be done. Furthermore, a recent complete assessment of current inhaler devices has underlined important monitoring aspects that are anticipated to enhance the experience of patients with disruptive respiratory diseases and assist them in managing their situation more effectively. Thus, indicating the assessment of inhaler technique as one of the most promising fields for further study.

Figure 1-2: Existed monitoring meter dose inhaler product on the market