UNIVERSITI TEKNIKAL MALAYSIA MELAKA

IOT BASED BODY TEMPERATURE AND PULSE RATE MEASUREMENT

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

by

MUHAMMAD MUTHANNA BIN JUMADIL

B071510446

960706-12-5859

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

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Date:

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 Mechanical Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

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Supervisor: PN AZIEAN BINTI MOHD AZIZE

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Co-supervisor: TS. MOHD FAIZAL BIN ZULKIFLI

ABSTRAK

Projek ini adalah berdasarkan pemantauan suhu badan dan kadar denyutan menggunakan Arduino. Tujuan projek ini adalah untuk mereka bentuk peranti yang boleh mengukur suhu badan dan kadar denyut dalam masa nyata dan membangunkan aplikasi berasaskan android yang boleh memantau dan memberitahu tentang keadaan suhu badan dan kadar denyut seseorang. Mengukur setiap tanda penting pada tubuh manusia memerlukan teknik dan peralatan yang berbeza. Sistem ini bermula dengan mengukur suhu badan dan kadar denyutan menggunakan sensor suhu DS18B20 dan Pulse Sensor. Nilai pengukuran akan dipaparkan pada peranti melalui paparan diod pemancar cahaya organik (OLED). Nilai pengukuran juga akan dipamerkan dan dipindahkan ke aplikasi mudah alih melalui teknologi Bluetooth dan disimpan dalam pangkalan data. Perbezaan antara nilai kadar denyut sistem dengan nilai sebenar adalah 4.4% dan setiap satu saat nilai suhu akan dijangkakan meningkatkan sebanyak 0.01ºC jika peranti terdedah kepada cahaya matahari semasa memakainya. Aplikasi mudah alih mempunyai ciri yang boleh memberitahu tentang keadaan suhu badan dan kadr denyut seseorang yang memakai peranti tersebut. Akhir sekali, sistem ini membantu seseorang untuk memantau keadaan ahli keluarga mereka yang sakit yang ditinggalkan sendirian di rumah dalam masa nyata

.

ABSTRACT

This project is based on monitoring body temperature and pulse rate using Arduino. The aim of this project is to design a device that can measure body temperature and pulse rate in a real-time and develop android based application that can monitor and notify about condition of body temperature and pulse rate of a person. Measure each vital sign of human body will need different technique and equipment. This system starting with measure body temperature and pulse rate using DS18B20 temperature sensor and Pulse Sensor. The measurement value will be display at the device via Organic Light Emitting Diode (OLED) display. The measurement value also can be display and transfer to mobile application via Bluetooth technology and store into a database. The difference between pulse rate value of the system with actual value is 4.4% and every 1s the temperature value expects to increase 0.01ºC if the device exposes to sunlight when wearing it. The mobile application has a feature which can notify about the condition of a person who was wearing the device. Lastly, this system is helpful to a person to monitor their family members condition in real-time that is sick that left alone at home.

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DEDICATION

To my beloved parents

(Jumadil Bin Bariul and Nursiah Binti Maidin)

My beloved family,

(Mohd Qutaibah Bin Jumadil, Ummu Khadijah Binti Jumadil, Eifwatul Hanani Binti Jumadil, Muhammad Musaddiq Bin Jumadil, and Muhammad Fakhrulrazi Bin Jumadil)

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(Madam Aziean Binti Mohd Azize)

My lectures,

And all my beloved friends

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LIST OF ABBREVIATIONS

BPM	Beat Per Minute
OLED	Organic Light Emitting Diode
PC	Personal Computer
PWM	Pulse Width Modulation
LED	Light Emitting Diode
LCD	Liquid Crystal Display

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this chapter will explain more about the background of this project entitle IoT Based Body Temperature and Pulse Rate Measurement. The background consists the objective, scope of project and the problem statement.

1.1 Background Study

Body temperature is among the main vital sign that need to monitor to ensure safe and effective care. A body temperature is found in blood supplying organ which likely hypothalamus. A normal range of body temperature is 36°C-37.5°C. A body temperature can be measure through armpit, oral, anus or ear. There was correlation of the reading of the measurement that measure in at the different place. Nowadays, the were various measuring instrument of body temperature such as digital thermometer and digital ear thermometer.

Besides, body temperature a human pulse also been study. A human pulse is the pressure inside the artery caused by the blood that have been pump from the heart. Heart is a muscular pump that with every beat pumps blood around the body. The heart rate or pulse rate is the number of heartbeats per unit of times, usually expressed as beats per minute (bpm). Measurement of pulse can be manually or by using a sensor. A normal

human pulse rate for adult's ranges from 60 to 100 bpm which for resting condition. A well-trained athlete will not have the same pulse rate with normal human which will have lower pulse rate closer to 40 bpm.

Many researchers they design and implement a device that can monitor human vital signs. Veni Setyowati use a piezoelectric sensor to measure the pulse rate as her claims that by using today technology acoustic stethoscope need skill and quite environment (Setyowati and Muninggar, 2017). Mohamed Fezari use Arduino as to upgrade his previous work which monitor a heart rate, body temperature and blood pressure (Fezari, Rasras and Emary, 2015). He also uses the Xbee System to transmit the data from the devices to the PC.

1.2 Problem Statement

Health issues are increasing at very high pace day by day. A vital sign of human body needs to be monitors to ensure that our body in a good condition. There are many ways to measure vital sign of our body either in a manual way or by using an equipment. However, to measure each vital sign will need a specific technique and equipment. Other than that, some of people are worried with their family members such as their mother or father that are sick left alone in the house. Asking them about their vital sign and condition every time would not be practical as they also need a privacy. A people that are sick might have this behaviour: fatigue, depression, cognitive disturbances, appetite changes, sleeping disorders, hyperalgesia, anhedonia and social withdrawal (E. Shattuck, 2015). Therefore, a system that can measure and monitor multiple vital sign at one time at different location with would be good.

1.3 Objective

The aim of the project is to design and develop a device that can measure human body temperature and pulse rate. This general objective can be broken down into a specific objective that would together achieve the overall aim of this project as follows:

1. To design a device that can measure a body temperature and pulse rate in a real-time.
2. To develop a mobile application that can monitor the body temperature and pulse rate of a person.
3. To analyse the system performance of the system design

1.4 Scope of Project

The scope of the project is divided into two parts which is hardware and software. Firstly, the hardware is consisting of Arduino Nano ATmega328, OLED display, pulse sensor, temperature sensor and Bluetooth module. The Arduino Nano ATmega328 is the microcontroller for this system that control the operation that have in the system. Then, the OLED display will display the measurement value of pulse rate and body temperature that taken by the pulse sensor and temperature sensor. The Bluetooth module is used for the communication between the mobile application and the device.

Secondly, the software which is an android application that will be develop by using the MIT App Invertor. The application will display the measurement value of the body temperature and pulse rate.

1.5 Report Structure

This report is cover by five chapters. The first chapter start with the introduction, problem statement, objective and scope of project. The literature review is discussed in Chapter 2 and project methodology in Chapter 3. The result and collection of data will be discussed in Chapter 4. In Chapter 5 will be the summary of this project with some recommendation. Here are the main chapters for this project

1.5.1 Chapter 1

This chapter are covered the background of the overall operation, the problem statement that happened before this. The aim of the objective of this project is to solve the problem statement. Besides, the scope of work is limitation of project to prevent future problem.

1.5.2 Chapter 2

This chapter are covered the research, find and read relevant topics from the sources such as reference book, internet and journal to get deeper knowledge and information for the project. Research on the same system that already in the market to know the characteristics of the system will provide understanding in this project.

1.5.3 Chapter 3

This chapter explains more about the work flow of the development of this project from the beginning of the project until the end of the project. The flow chart is used as to visualize the work flow of this project. The purpose is to have a guideline while conducting this project.

1.5.4 Chapter 4

This chapter focuses on the result and the findings of the study, the results is obtained after following the methodology in the Chapter 3. It will discuss briefly on the project findings in this chapter.

1.5.5 Chapter 5

This chapter will summarize for the outcomes of this project. Besides, it will discuss several recommendations for future improvements and development.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter cover about research, find and read relevant topics from the sources such as reference book, internet and journal to get deeper knowledge and information for the project. Research on the same system that already in the market to know the characteristics of the system will provide understanding in this project.

2.1 Human Body Temperature

Body temperature represent the balance between heat production and heat loss (Marieb, 2010). Body temperature is the one of the four main vital signs that must monitored to ensure safe and effective care. Core body temperature is found in the blood supplying organs for example brain (hypothalamus) and organs in the abdominal and thoracic cavities. Core temperature may be affected by natural component and, to lesser degree, surrounding factors. Peripheral temperature is recorded in tissues each as the skin, where surrounding factors and a lack of insulting connective tissue affect temperature.

2.1.1 Types of Instruments Used in Measuring Body Temperature

In order to obtain body temperature, there were various method and instrument to measure body temperature.

2.1.1.1 Digital Thermometer

Digital thermometer usually was used to measure temperature in oral (mouth), rectum (rectal) or (armpit). Digital thermometer was used in oral if the patient was able to hold the thermometer under the tongue which usually excludes small children or people who unconscious or to prevent coughing, weakness, or vomiting. If the temperature were taken after a patient drink a hot/ cold drink, the results were not able to be taken because the mouth temperature need to be return to its normal value. To measure an armpit temperature, patient need to hold a few second the thermometer under their armpit to obtain an accurate measurement. To obtain an accurate measurement of temperature, the thermometer needs to be hold within 30 second or longer to the place where it wants to be taken. The digital thermometer needs to be contact with body parts since it uses thermistor probe as its sensor.

Figure 2.1: Digital Thermometer

2.1.1.2 Digital Ear Thermometer

Dr. Theodor H. Benzinger was invented the ear thermometer or tympanic thermometer in 1964 to measure body temperature near to the brain. Since the hypothalamus located at the brain that control the human body temperature. The ear thermometer has a projection that contains the infrared probe that used to place in the ear canal. After a button been press, the reading of the temperature displayed on the lcd. The reading of the temperature can be done in within a second.

Figure 2.2: Digital Ear Thermometer