

**POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ
SHAH**

**HEARTBEAT AND BODY
TEMPERATURE MONITOR USING
ARDUINO**

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JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2021/2022

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This report submitted to the Electrical Engineering Department in fulfillment of the requirement for a Diploma in Electrical Engineering

JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2021/2022

CONFIRMATION OF THE PROJECT

The project report titled " HEARTBEAT AND BODY TEMPERATURE MONITOR USING ARDUINO" has been submitted, reviewed and verified as a fulfills the conditions and requirements of the Project Writing as stipulated

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"I acknowledge this work is my own work except the excerpts I have already explained to our source"

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DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE :	HEARTBEAT AND BODY TEMPERATURE MONITOR USING ARDUINO
SESSION:	SESI 2 2021/2022

1. I am, **NUBASHINI A/P RAMU (08DEU19F2013)**

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2. I acknowledge that 'The Project above' and the intellectual property therein is the result of our original creation /creations without taking or impersonating any intellectual property from the other parties.

3. I agree to release the 'Project' intellectual property to 'The Polytechnics' to meet the requirements for awarding the **Diploma in Electrical Engineering** to me.

Made and in truth that is recognized by;	
NUBASHINI A/P RAMU (Identification card No: - 011116-08-1142)	 NUBASHINI A/P RAMU
In front of me, PN NAAGAJOO THI A/P ADIN NARAINA As a project supervisor, on the date: PN NAAGAJOO THI A/P ADIN NARAINA

ACKNOWLEDGEMENTS

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ABSTRACT

Heart rate means the number of heartbeats per unit of time, usually expressed as beats per minute (bpm). Heart rate can vary according to the demand of muscles to absorb oxygen and excrete carbon dioxide changes, such as during exercise or sleep. It also varies significantly between individuals based on fitness, age and genetics. Body temperature means measurement of the body's ability to generate and get rid of heat. It is one of chief indicators of normal functioning and health. More than 2 million people are at high risk of having heart attack. It would be helpful if there was a way for these people to monitor their heart. So that is the way our project focuses on how we can overcome this problem and find a solution. This project aim is individuals can be always updated with their health conditions and people could be aware with health so as not to get worse. With the development of technology, in this project we can digitally sensing body temperature and heart rate using Arduino. Mainly Arduino is used because it can sense the environment by receiving input from variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. Heartbeat and Body Temperature Monitor using Arduino will detect the heartbeat using the MAX30102 Pulse Sensor and body temperature using LM-35 sensor. The microcontroller on the board is programmed using the Arduino programming language. Pulse sensor is used for sensing heart rate while LM-35 is used for sensing the body temperature. Sensor end will show the readings in BPM (Beat Per Minute) on the LCD connected to it. The body Temperature will be displayed on serial monitor along with BPM readings. This monitoring system is successful in displaying the heartbeat and body temperature rates.

Keywords: Arduino, Microcontroller, Heart rate, Body temperature, LCD, Pulse sensor, LM-35 sensor

ABSTRAK

Kadar jantung bermakna bilangan degupan jantung per unit masa, biasanya dinyatakan sebagai denyutan seminit (bpm). Kadar jantung boleh berbeza-beza mengikut permintaan otot untuk menyerap oksigen dan mengeluarkan perubahan karbon dioksida, seperti semasa senaman atau tidur . Ia juga berbeza-beza antara individu berdasarkan kecergasan, umur dan genetik. Suhu badan bermakna pengukuran keupayaan badan untuk menjana dan menghilangkan haba. Ia adalah salah satu petunjuk utama fungsi normal dan kesihatan. Lebih daripada 2 juta orang berisiko tinggi mengalami serangan jantung. Ia akan membantu jika ada cara untuk orang-orang ini untuk memantau hati mereka . Jadi itulah cara projek kami berfokus pada bagaimana kita dapat mengatasi masalah ini dan menemukan penyelesaian. Matlamat projek ini adalah individu boleh sentiasa dikemas kini dengan keadaan kesihatan mereka dan orang ramai boleh sedar dengan kesihatan supaya tidak menjadi lebih teruk. Dengan perkembangan teknologi, dalam projek ini kita boleh secara digital merasakan suhu badan dan kadar jantung menggunakan Arduino. Terutamanya Arduino digunakan kerana ia dapat merasakan alam sekitar dengan menerima input dari pelbagai sensor dan boleh menjejaskan persekitarannya dengan mengawal lampu, motor, dan penggerak lain. Degupan jantung dan monitor suhu badan menggunakan Arduino akan mengesan degupan jantung menggunakan Sensor Nadi dan suhu badan menggunakan sensor LM-35. Mikropengawal di papan diprogramkan menggunakan bahasa pengaturcaraan Arduino. Sensor nadi digunakan untuk mengesan kadar jantung manakala LM-35 digunakan untuk mengukur suhu badan deria. Hujung penderia akan menunjukkan bacaan dalam BPM (Beat Per Minute) pada LCD yang disambungkan kepadanya. Suhu badan akan dipaparkan pada monitor bersiri bersama-sama dengan bacaan BPM. Sistem pemantauan ini berjaya memaparkan kadar denyutan jantung dan suhu badan.

Kata kunci: Arduino, Mikropengawal, Kadar jantung, Suhu badan, LCD , Sensor Nadi, Sensor LM-35

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LIST OF SYMBOLS

Ω - ohms

$^{\circ}\text{C}$ - Degree Celsius

A - Ampere

V - Volt

LIST OF ABBREVIATIONS

LCD – Liquid Crystal Display

Bpm – Beats per minute

IC – Integrated Circuit

HRM – Heart Rate Monitoring

CHAPTER 1

1 INTRODUCTION

1.1 Introduction

More than 2 million people are at high risk of having heart attack. It would be helpful if there was a way for these people to monitor their heart rate. So, we have a problem. That is the way my project focuses on how we can overcome this problem and find a solution. Heart rate means the number of heartbeats per unit of time, usually expressed as beats per minute (bpm). Human's heart pounds to pump oxygen-rich blood to muscles and to carry cell waste products away from tissues.

Heart rate can vary according to the demand of muscles to absorb oxygen and excrete carbon dioxide changes, such as during exercise or sleep. It also varies significantly between individuals based on fitness, age and genetics. That means heart must beat faster to deliver more oxygen-rich blood. During exercise routines, the heart rate gives a strong indication of how effective that routine is improving health. Normal heart rate of a resting person is about 70 bpm for adult males and 75 bpm for adult females. So, a heart rate monitor is simply a device that takes a sample of heartbeats and computes the beats per minute so that the information can easily track heart condition.

Body temperature means measurement of the body's ability to generate and get rid of heat. It is one of chief indicators of normal functioning and health. The nature of the human body is to keep its temperature within a narrow, safe range in spite of large variations in temperatures outside the body.

Moreover, body temperature is an independent determinant of heart rate, causing an increase of approximately 10 beats per minute per degree centigrade. Patient healthcare factors, especially heart examination and body temperature are fundamental parameters for medical personnel in diagnosing disease, maintaining the safety of the soul, and the patient's physical condition.

However, the problem that occurs in health services is the limited medical personnel will need a long time in checking the status of the patient and require adjustment of examination schedule along with the increasing number of patients, the retrieval of patient data that is still conventional, and equipment used still using the cable media. This problem takes time for medical personnel to provide diagnostic results and rapid health administration services.

To solve the problem, I propose heart rate monitoring system and wireless-based body temperature using Arduino as storage media and data delivery. This study aims to relieve the burden of medical personnel in monitoring patient health, shorten the time in taking patient data, reducing the occurrence of misdiagnosis, supporting the application of health services involving various disciplines, reducing patient administration costs, and realize the development of low carbon in the development process.

Medical professionals use heart rate for tracking of patient's physical conditions. Individuals, such as athletes, who are interested in monitoring their heart rate to gain maximum efficiency from their training also use it. To justify my project, any detected sensor data will receive by Arduino and perform data processing in beats per minute (bpm) and Degree Celsius (°C). Results of sensor data processed Arduino module will be displayed on the LCD.

1.2 Background Research

In this project, the idea turned up when the number of deaths caused by heart attacks are increasing. Other than that, this project is mainly designed for individuals to be always updated with their health conditions. Heartbeat and Temperature Sensor Using Arduino willlet the people to save time and energy by monitoring themselves without going to medical centers. In this project, MAX30102 Pulse sensor is used for sensing heart rate while LM-35 is used for sensing the body temperature. Here I added temperature sensor also since body temperature is one of the vital signs.

1.3 Problem Statement

One of the increasing popular public concerns is human health. Anything else becomes meaningless if one gets sick or dead. For this reason, people spend a lot of money to keep sound health. Unfortunately, people always find that it is too late to receive serious medicalcare when things are non-invertible.

If early actions can be taken in time, then lots of patients can be cured. However, access to many medical equipment is inconvenient and expensive. Heart rate and body temperature are the most vital ones among the most notable indexes of the human health, and they have the advantage of easy access. Moreover, unlike the X-ray, the measurement of heart rate and body temperature has no effect on human health itself.

There are some devices in the current market which can provide raw medical measurement data to patients and doctors, but the patients may not interpret the medical measurement into meaningful diagnosis since they have little medical background. On the other hand, if raw medical data is delivered to the doctor, it kills much time and may cause trouble, but in emergencies time can never be

wasted. It is tough to share data over a large area within a short period. Most of the products available in the current market have these major drawbacks with limitation in flexibility and portability.

1.4 Research Objectives

The main objective of this Project is people could be aware with health so as not to get worse. More specifically the principle objective of this research are:

1. To design monitoring system to let the individuals self-monitor themselves without going to medical centers to save time and energy.
2. To develop the sensors which can sense the heartbeat and body temperature in real-time by using MAX30102 Pulse sensor and LM-35 sensor.
3. Individuals can be always updated with their health conditions to get keep on track with their health updates.
4. To evaluate the design and weakness of previous heartbeat and body temperature monitor which has already been sold in the market.

1.5 Scope of Research

1. This Project is focusing the monitoring device that could be used to detect the heartbeat anomalies of physically challenged individuals without hands.
2. The emphasis is the LM-35 temperature sensor used in this project can measure temperature from -55 degree Celsius to +150 degree Celsius.
3. The main controller used in this project is Arduino UNO.
4. For the software, this project used Proteus and Arduino IDE.

1.6 Project Significance

There are various instruments available in the hospitals to keep track of the internal body changes, but many of them have limitations regarding to maintenance, cost, size of instruments, and mobility. This project is so significant because it is small in size, cost effective, very easy to use, highly efficient performance, portable and light in weight. It uses Arduino to help both the patient and the concerned doctor to take an appropriate action. It is beneficial in terms of cost. It saves time and is very helpful to patients who lives alone. It offers a freedom of movement to patients. It has a low power consumption though the stability of its wireless data communication is still to be enhanced. Moreover, it prevents users from getting into any sored of serious health issues due to the lack of heart rate monitoring. Then, this monitoring system give some awareness to the people and educate them with a basic knowledge of the importance of monitoring their heartbeat rate.

1.7 Chapter Summary

Briefly, the proposed device helps us by detecting the heart rate and body temperature of a person. This could reduce the wastage of time and energy. Since it is a quick process of monitoring, there is no harmness and it is 100% safe. In this chapter, I am able to describe the background research which made me to conduct this project. Then, I can clearly see the problems existed and the important objectives of this project.