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DEVELOPMENT OF HAJJ & UMRAH HEARTBEAT, HEART RATE AND BODY TEMPERATURE USING MIOT

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Abstract: Hajj is one of the ritual duties of a Muslim, which is one of the most extraordinary experiences in the life of a Muslim. For example, Hajj is an annual pilgrimage to Mecca in Saudi Arabia. The Hajj is a show of the unity and adherence of the Muslim m to Allah Ta'ala. Pilgrims have always been recorded every hour during the Hajj or Umrah. In addition, we also have been shocked by the pandemic Covid-19. This project design is in the shape of a wearable device that will apply to the wrist. Commonly, the pilgrim's health was diagnosed at a late stage by the medical center at the airport, which already had multi-complication such as high Fever (hyperpyrexia). Other than that, due to the increment of causes related to pilgrims performing Hajj and Umrah such as MersCoV or Covid-19 Virus with different variant types, each of the Covid-19 variants has its side effect will include traveler that traveled to infection region. Arduino, Circuito.io, Multi-sim, and Proteus have as the software to design and simulate the circuit. All the data will be display on pilgrim's and Mutawwif's smartphones by using Blynk Apps. The regular reading of heart rate/heartbeat for an average person will be 60 bpm to 120 bpm. In an emergency, the pulse rate can help determine if the heart is pumping enough blood. Pulse rate helps to find the cause of symptoms such as an irregular or rapid heartbeat (pulse), fainting, dizziness, chest pain, or shortness of breath. This project will solve the problem that pilgrims commonly face. This wearable device has three main inputs: a heart rate/Heartbeat, Sp02, and an infrared body temperature sensor as precaution data. Other than that, this project will reduce the number of cases that happen to pilgrims. This wearable device can also be a step precaution by using it while performing Hajj and Umrah. This device will help Mutawwif a lot in monitoring pilgrim's health monitor without any obstacles. As nowadays, the implementation of IoT giving positive changes and convenience to its consumers.

Keywords: Heart Rate/Heartbeat, Body Temperature, Sp02, Hajj & Umrah, Pilgrims & Mutawwif

1.0 INTRODUCTION

Production of this project is because most of the Jemaah of Hajj and Umrah are elders. Therefore, most of the elders need to be monitor because of their health problems. Refer to Malaysian health static [2]. Moreover, during Hajj and Umrah, it would be hard for Mutawif to monitor all the pilgrims one by one because the number of Jemaah will be so large. Therefore, this project will help the Umrah, or Hajj agency monitor the pilgrim's heart rate and body temperature as an early precaution.

Nowadays, there is a lot of smart watch that has a lot of functionality for our healthy lifestyle, for example, Apple Watch Series 6 from Apple. This Apple watch has Pulse Rate, ECG, SPO2, etc. that can be our medical assistant and can detect our heart condition [1]. However, Apple offers a very high price from RM1,749 and can reach up to RM3,499 [1]. Not everyone can afford the Apple Watch, especially the group of elders. Older people find it challenging to spend a lot of money on small things like the Apple Watch.

In addition, technology can help the elderly when performing Hajj and Umrah due to IoT implementation using Blynk Apps. This method will connect with Node MCU to get information on Heart rate & Heartbeat, and temperature that will help the elderly while abroad to perform Hajj and Umrah. These three conditions are

essential to monitoring perfect body health. So, this device can help those pilgrims and Mutawwif to present or avoid any further complications such as respiratory distress.

2.0 LITERATURE RIVIEW

To obtain and reach the entire target based on the objective accordingly, data and information gathering from various sources are crucial. This step is because to make sure all the project functionalities will have functioned as planned. Therefore, the first step of creating this device is to do some background research and literature review. All the data from this chapter come from journals, articles, books, websites, thesis, and lastly, from the supervisor and lecturer.

In literature review will summarize important data and result from selected journals to implement and support this project. For heart rate/heartbeat journals, the research suggests the best place to measure human body pulse and give information on pulse rate according to age range. Most of the journal provides information on how strong Heartbeat is as a wearable device parameter to detect an arrhythmia on the heart condition [7]. For body temperature journals, the most accurate to verify any person has high body temperature is at 38°C [3]. Lastly, most suitable microcontroller is ESP32 to stick with compact design and offers more GPIO (General-Purpose Input/Output) on the device for the health monitoring device [4]. The primary parameter would be heartbeat and heart rate monitoring. For the best part, the only difference between all the journals to be used is the second parameter for pilgrims and another user as their health monitoring wearable device.

As additional, there is also brilliant suggestion from the industrial supervisor (Ust. Hj. Abdullaah bin Feisal). Development of this project is very important because nowadays all Muslims people are stuck due to the pandemic that limit their movement. The government also did not allow the people to travel outside Malaysia. This wearable device development will give more impact to fight the pandemic. This device can support the healthcare department to track any abnormal health condition. By that, this is the reason of making the survey question and getting answer from Muslim society. The result of the survey question will answer how significant of this project. The best part is most of the society know how important health monitoring wearable device nowadays. From the result survey is where development of this product is referred.

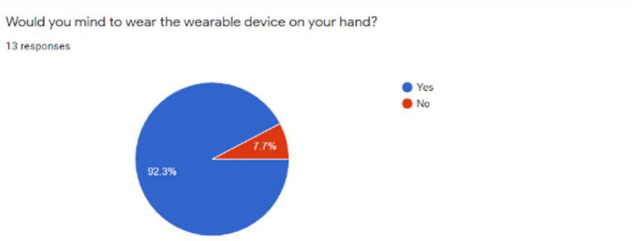

Figure 1: Survey Question 1

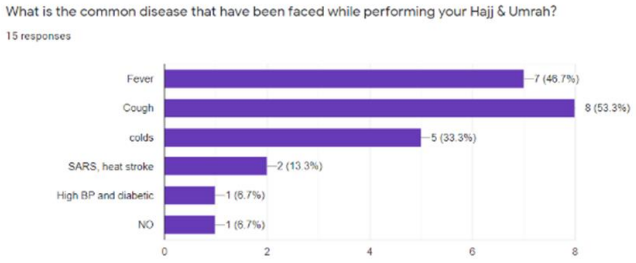

Figure 2: Survey Question 2

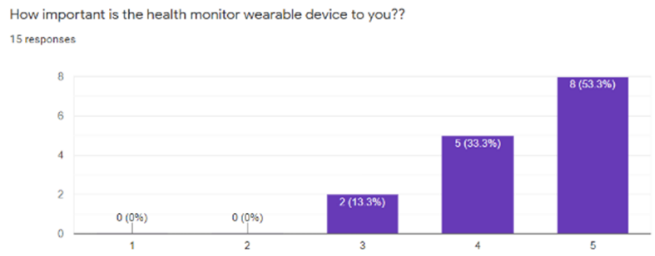

Figure 3: Survey Question 3

3.0 METHODOLOGY

Block diagrams is where to show how the project works. The flow of method and process manipulation of the component will be explained in discussion.

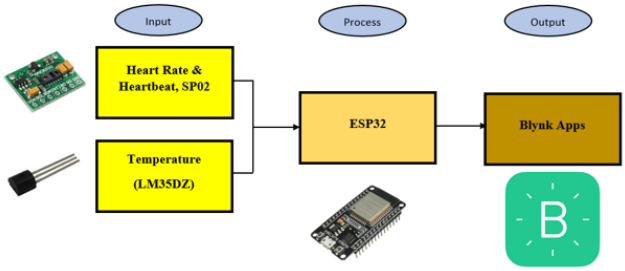

Figure 4: Block Diagram

Refer to Figure 4, and the block diagram will start with the input. This project uses two inputs: Sensor MAX30100 (Heartbeat/Heart Rate and SP02) and LM35DZ (Body Temperature). Next, follow up with a process that has ESP32 as the microcontroller. Lastly, the heartbeat/heart rate, Sp02, and body temperature data will be display on the user's smartphone via Blynk Apps.

For the project's input, there will be two inputs that are MAX30100 (heartbeat/heart rate and SP02 sensor) and LM35DZ (Body Temperature Sensor). First, the temperature sensor (LM35DZ) will be placed underneath.

For the process and output of the project, ESP32 is the microcontroller. The microcontroller acts as the brain of the project itself. All the data received from the three inputs will be processed and to the user's smartphone. The coding in Arduino Software will decide the outcome output. There will be four information that is: -

1. Heart Rate/Heartbeat
2. SP02
3. Body Temperature
4. Data graph

For the output, all data will be display on Blynk Apps Not forget the notification sent to pilgrims and Mutawwif that is heart rate/heartbeat over 90bpm [1] and for the temperature is over 38°C [3].

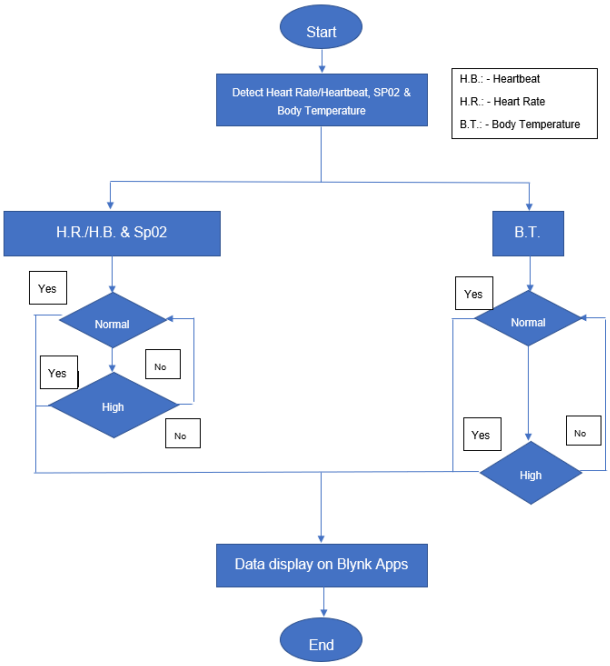

Figure 5: Flow Chart

Refer to Figure 5. The flow chart will start by detecting each data (Heartbeat/Heart Rate, Sp02, and Body Temperature). The first two parameters that have been measure using MAX3100 are heart rate/heartbeat and Sp02. Its breakout operates from 1.8V and 5.5V [9]. The device has two LEDs, one will be emitting red light, and the other will be emitting infrared light. After collecting data, the flow continues to process the data into ESP32 to link with Blynk Apps for displaying all the data. If the reading reach 90bpm [2], Blynk apps will notify Mutawwif and pilgrims via notification in their smartphones.

Lastly, body temperature data measurement that measured by using LM35DZ. The temperature sensor utilized is the LM35DZ. The interpreted output voltage may produce a temperature value of Celsius. Apart from that, the output is proportional to the temperature. All the flow is the same for heart rate/heartbeat and Sp02. The only difference is data that need to set for the notification is over 38°C [10].

For all the data displayed will remain normal after each the data reach the limit that have been set for each main parameter (heart rate/heartbeat & body temperature). After the data from each sensor is collected, ESP32 will process all the data and transmit it to display on pilgrim's and Mutawwif's smartphone via Blynk Apps.

4.0 RESULT AND DISCUSSION

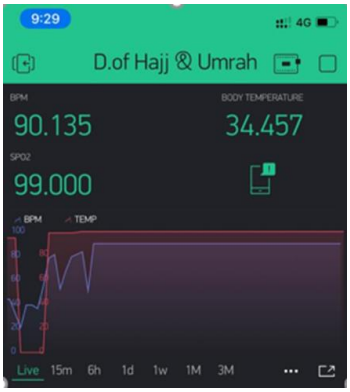

Figure 6: Blynk Apps Result Display

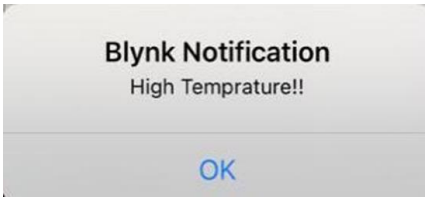

Figure 7: Blynk Apps Notification on smartphone

Based on figure 6, this is the output from the Blynk apps. First, on the top left corner, there will be a display of heart rate/heartbeat. Next, At the middle right, will be the Sp02 measurement. Then, at the top right corner will be the body temperature. Lastly, at the bottom of the display will be a graph that mirrors the data collected (purple)BPM and (red) Temperature. Extra, for the middle right, will be only

for the notification purpose of the Blynk Apps as shown in figure 7.

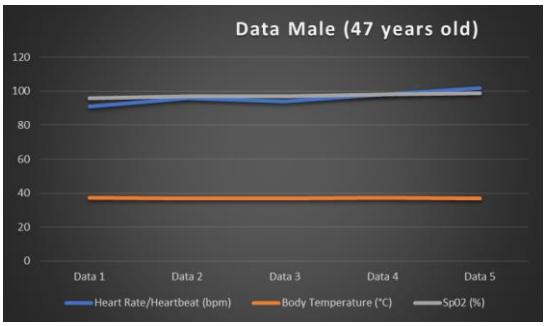

Figure 8: Male Data Graph

Table 1: Data Based on Figure 8

MALE (41 YEARS OLD)

DATA	1	2	3	4	5
HEART RATE/HEARTBEAT (BPM)	91	96	94	98	102
BODY TEMPERATURE (°C)	37.2	36.8	37.0	37.1	37
SP02	96	97	98	98	99

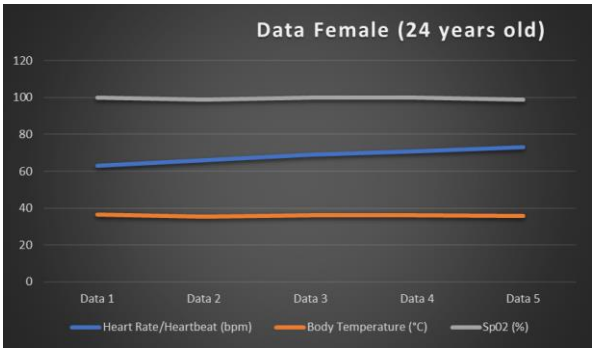

Figure 9 Female Data Graph

Table 2: Data Based on Figure 9

FEMALE (24 YEARS OLD)

DATA	1	2	3	4	5
HEART RATE/HEARTBEAT (BPM)	63	66	69	71	73
BODY TEMPERATURE (°C)	36.5	35.4	36.1	36.0	35.7
SP02	100	99	100	100	100

Based on data all collected in the table and graph, data accuracy is between 3% to 0%. An accuracy formula has been used is: -

- Percent accuracy = (VA - VO)/VA X 100 = (VO - VA)/VA X 100. [11]

Example accuracy conclusion for Body Temperature: -
- (35.7 - 35.2) / 35.7 X 100 = 1.401%

The measurement is made is comparing data between LM35DZ and InfraRed temperature. For Heartbeat/heart rate the measurement is made based on comparison between sensor MAX30100 and heart rate module.

The regular reading of heart rate/heartbeat for an average person will be 60 bpm to 120 bpm [8]. In an emergency, the pulse rate can help determine if the heart is pumping enough blood. Pulse rate helps to find the cause of symptoms such as an irregular or rapid heartbeat (pulse), fainting, dizziness, chest pain, or shortness of breath [7]. It can consider a high pulse rate when reading is over 120 bpm [2].

For Sp02 measurement, the data collected to compare the amount of oxygen-carrying hemoglobin in the blood to the amount of non-oxygen-carrying hemoglobin. Oxygen saturation is critical in the management and comprehension of patient care. Because hypoxia can have a wide range of acute negative consequences, this situation happens on individual organ systems, oxygen regulated throughout the body. The brain, heart, and kidney are examples of these [5].

Lastly, for body temperature, Fever is one of your body's earliest responses to infection, and it is frequent in disorders such as influenza and COVID-19. Even if you are healthy, monitoring your body temperature can help detect disease early and let you know if you are fit to go to work or school. The hypothalamus, a part of your brain, constantly changes your body temperature to ensure an optimal environment for your body functions [3]. When your immune system senses the existence of a virus in your body, it sends a signal to the hypothalamus, which causes Fever. This heated and hostile environment weakens the virus and increases your immunological response. A fever of more than 38 °C may suggest that your body is fighting an infection [10]. You can notice subtly higher temperatures by frequently monitoring your body temperature and knowing what is typical for you.

5.0 CONCLUSION

As for the conclusion, research and development are essential parts of doing this project. Both parts play a vital role in clarifying the suspensibility in achieving this project's target objective. Besides that, it also references essential guidance in the process of finishing this project.

This project will solve the problem that pilgrims commonly face. Other than that, this project will reduce the number of cases that happen to pilgrims. This wearable device can also be a step precaution by using it while performing Hajj and Umrah. This device will help Mutawwif a lot in monitoring pilgrim's health monitor without any obstacles. As nowadays, the implementation of IoT giving positive changes and convenience to its consumers. Therefore, Telemedicine nowadays is a game-changer in healthcare industries. Extra, this wearable device also wallet friendly. This method will not waste money on expensive health monitors that can offer the same parameter. Therefore, it is achieving the objective successfully.

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