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Design Of Heart Rate Monitoring Tools And Applications Based On Mobile Systems

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Abstract
The heart is one of the important organs owned by humans that functions to pump blood throughout the body and accommodate it again after cleaning the lungs. Heart rate beats per minute (bpm) is a parameter to indicate the condition of the heart, and the way to know the condition of the heart is to know the frequency of the heart rate. This heart rate monitoring tool is designed based on the NodeMCU ESP8266 and pulse sensor to detect heart rate. This study aims to make it easier to find out the heart rate in real time. The NodeMCU ESP8266-based heart rate monitoring tool has been designed with a pulse sensor to detect heart rate. The heart rate data from the monitoring tool will then be sent via a wifi network connection and displayed on the Smartphone.

Keywords: Heart rate, NodeMCU ESP8266, pulse sensor.

INTRODUCTION

With the development of technology in everyday life has been felt by everyone. Developments in the field of electronics occur all the time, starting from very simple things. Even the development of electronic technology can be developed in the medical field, especially in making measurements. Among other things, it can be used as a health control tool, healing aids and others. For the initial stage of a medical examination, a medical check-up is usually carried out before a person's illness is diagnosed. From the results of a medical check-up, it will be known whether a person is in good health or not. In general, the first medical check-up that will be carried out in the hospital is the heart rate. This is done because the heart rate in the human body is the main organ, where the function of the heart affects other important human organs.

Based on these conditions heart health in humans should really be considered. The thing that can be done early is to check the heart rate regularly. But in doing so can be said to be easy and difficult. If we use the manual method, we need careful calculations and previously have understood the basic principles in measuring heart rate. Heart rate is an important parameter used by paramedics to determine a person's physical and mental health condition. Because if the heart rate is abnormal, further efforts need to be made to avoid unwanted things.

RESEARCH METHODS

Research plan or design in a narrow sense is defined as a process of collecting and analyzing research data. In a broad sense as a research design includes the process of planning and implementing research. The preparation steps in the Design of Mobile System-Based Heart Rate Monitoring Tools and Applications are as follows:

1. Literature Study

The author examines the references obtained from several scientific works such as thesis journals and from books.

2. Literature Study

The library method, namely collecting data and information by reading references, e-books, websites, documents which include research that has been appointed, books, articles and journals

related to the object of research.

3. Consultation

Done in consultation with the supervisor to solve the problems encountered during the manufacture of software and hardware.

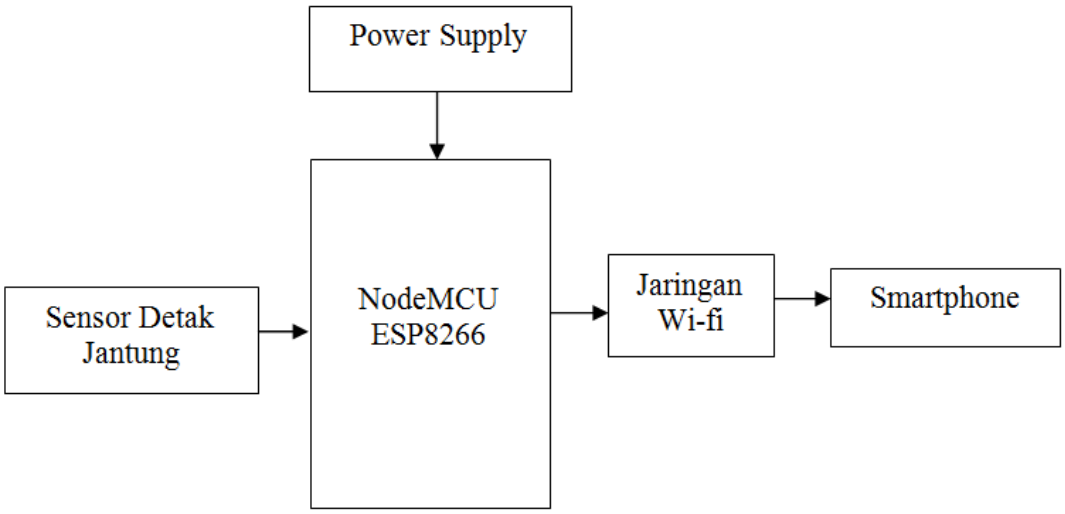
4. Testing Tool

This is done by conducting experiments, testing modules and integrating these modules with programs to control the system so that it becomes a unified whole and obtains maximum possible results.

RESULTS AND DISCUSSION

A. Circuit Block Diagram

The block diagram of the designed system is as shown in the figure below.



Block diagram functions

The functions of each Block diagram are as follows:

1. The power supply functions as a source of electrical power to turn on the tool system.
2. NodeMCU ESP8266 functions as a processor, receiver and sender of data on the device system.
3. The heart rate sensor functions as an input to the body's heart rate reading sensor
4. Wifi network serves as a communication medium between the device system and the smartphone
5. The smartphone functions as an output display of the heart rate sensor readings on the smartphone

B. NodeMCU circuit ESP8266

This circuit serves as the control center of the entire existing system. NodeMCU is basically an extension of the ESP 8266 with e-Lua based firmware

Figure.1 NodeMCU circuit ESP8266

C. Voltage Stabilizer Circuit (Regulator)

This circuit serves to provide voltage supply from the battery throughout the existing circuit. The output of this regulator circuit is 5 volts. In the circuit below the 12 volt battery is connected to a 100 nf capacitor, then connected to the input voltage regulator ic 7805 to get a 5 volt dc output, this 5 volt dc output will serve to supply the NodeMCU ESP8266 system.

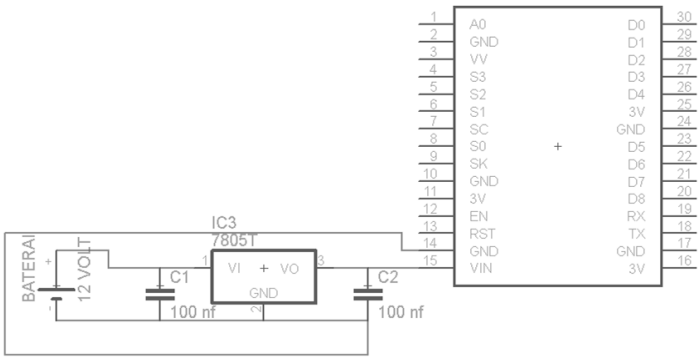


Figure.2 Voltage Stabilizer Circuit (Regulator)

D. Pulse Sensor Circuit

In this circuit, the sensor input is connected to the PORTB.A0 NodeMCU ESP8266, namely as sensor reading data that enters the microcontroller, it will be processed and calibrated.

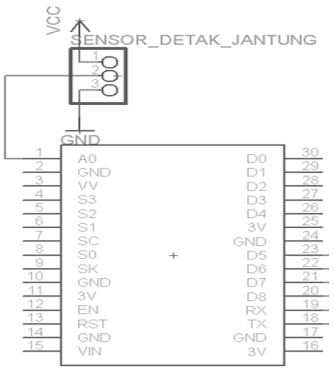


Figure.3 Pulse Sensor Circuit

E. Flowchart

In making a tool there are several things that need to be considered, namely how to design a system that will be implemented on the tool. In system design, it is necessary to make a flowchart of the system.:

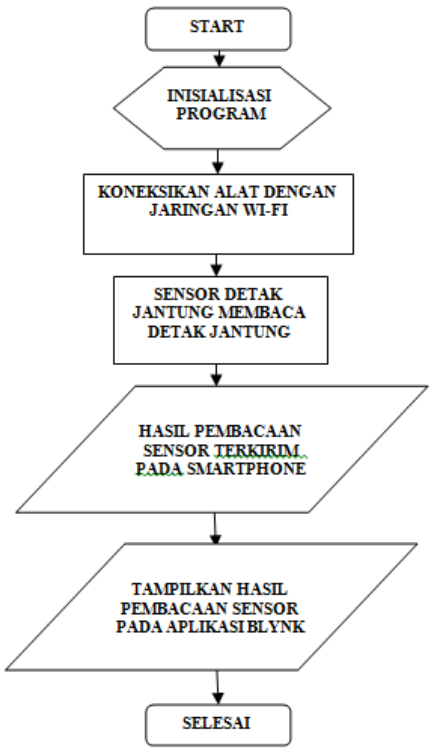


Figure.4 Flowchart

F. NodeMCU Circuit Testing ESP8266

To find out whether the NodeMCU ESP8266 Microcontroller circuit has worked well on the device, then a test is carried out by giving a command program to the Microcontroller by inputting data from the computer into the Microcontroller. In doing the installation, first connect the computer to the downloader via a USB cable to the microcontroller circuit.

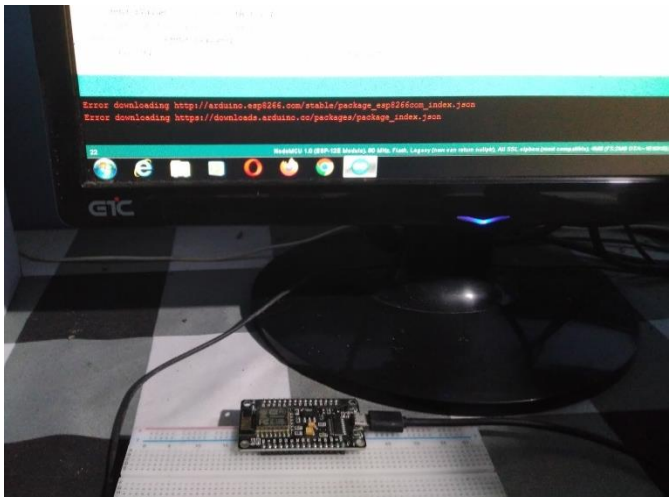


Figure.5 NodeMCU Circuit Testing ESP8266

G. Device Testing Tool

Tool testing is done by entering the program into the NodeMCU ESP8266 microcontroller, then testing four people with 2 conditions, namely 2 people in normal conditions and 2 people in conditions after exercise and the results can be seen in the table below:

Table 1 Tool Testing Data

NO	Data	Test Results (bpm)	Condition
1	Person 1	76	Normal
2	Person 2	79	Normal
3	Person 3	141	After Sports
4	Person 4	145	After Sports

From the test results, it can be seen that the heart rate value of people who are in normal conditions has almost the same value and is in accordance with the supporting theory, which ranges from 60-100 beats per minute (bpm) and the condition of the heart rate of people who after exercise has a higher value. that is above 100 bpm

Figure.6 Device Testing Tool

H. Programming on System Tools.

The programming of the tool system is carried out using the Arduino programming language, the programming of the tool system is as follows:

```
#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>
char auth[] = "iccuekb3HMhz1v59_rdgtrRBVuPA5Hzh";
char ssid[] = "Si_Waway";
```

```
char pass[] = "123456789";
#define PIN_UPTIME V6
BLYNK_READ(PIN_UPTIME){
 Blynk.virtualWrite(PIN_UPTIME, millis() / 1000);
}
BlynkTimer timer;
void myTimerEvent()
{
  int analogValue = analogRead(A0)/10; //reading the sensor on A0
  //float millivolts = analogValue/10; //3300 is the voltage provided by NodeMCU
 // float celsius = millivolts;
  Blynk.virtualWrite(V5, analogValue); //sending to Blynk
  Serial.println(analogValue);
}
void setup()
{
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
  timer.setInterval(1000L, myTimerEvent);
}
void loop()
{
  Blynk.run();
   timer.run(); // Initiates BlynkTimer
```

CONCLUSION

From the results of the design of the tool to the testing and discussion of the system, the author can draw conclusions, including:

1. NodeMCU ESP8266 functions as a controller, data receiver, and data processor as well as a WI-FI signal receiver that can be connected to Android.
2. The android smartphone functions as a display of the readings of the device using the WI-FI communication system.
3. The heart rate sensor in the device system functions as an input to the body's heart rate reading sensor.

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