Heart rate monitoring system based on website

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Abstract. Heart rate monitoring system based on Internet of Things is a device to monitor the heart rates through the website. The prototype designed using a pulse heart sensor that is attached to the finger, the Wi-Fi ESP 8266 module read the sensors and displayed in the LCD and the data obtained can be sent to the website. The data is sent to the databases to find out the record that can be accessed any time using smartphone by opening a web that is already available. So, the users can find when data recorded from the results of testing that has been done. Testing was done by taking 10 samples with a comparison between prototype and oximetry as a control, and the results are not too significant.

1. Introduction

Many research of heart rate monitoring system wrote by Fachrul Rozie and friends, Electrical Engineering Department, Tanjungpura University, it’s about Design and Implementation Monitoring System Heart Rate Base on Android to show heart rate real-time data and continue on the smartphone android using Bluetooth [1].

Another research is Design and Implementation Heart Rate Monitoring Application Using Finger Test Based on Android wrote by Marti Widya Sari and Setia Wardani, about detection of heart rate using pulse sensor by finger test. Project board pulse sensor stuck on finger, node sensor read heart rate, send heart rate record to the node coordinator which is connected to the monitoring application [2].

Monitoring of heart function, accurate diagnosis of cardiac conditions, and prevention of heart disease are important goals [3]. From related paper talking about heart rate monitoring system they recommended to develop remote monitoring system to make easy knowing.

This Research is about heart rate monitoring system based on website system that is planned to give information about condition of heart rate only on website.

2. Literature review

Heart is the hollow organ in one’s cast that pumps blood through the body, every one contraction siclus called one heart rate. BPM (Beat Per Minute) is to count heart rate of someone on one minute. It’s one of someone health indicators. Because of that, heart rate detection of someone is very important to know whether the heart is well or not [2].

On account of heart rate information especially heart disease, so needed monitoring system, which is served to collect data process and analyze by the aim to maximize resources. It’s usually data real-time collection. There are three process of heart rate monitoring system.
The first is beginning by collecting data such as network traffic, hardware information, etc. And then analyze the data and the last show the data [4].

The research goal is display heart rate monitoring in website, using module ESP8266. NodeMcu is a very good Wi-Fi module for IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module [5].

3. Implementation

3.1. Hardware design

Diagram block is made to monitor heart rate.

Sensor pulse part of input system monitoring which has function to detect heart rate stuck on the finger. This sensor could detect heart rate on the forefinger by connecting heart rate data from sensor with programme on the microcontroller to get BPM. Next sensor reading data is accepted by ESP8266 using pin analogue (A0), fitur analogue to digital conventer (ADC), processed to be BPM (Beat Per Minute). After data processed, it will send to the internet to be saved on the server which has been fixed and it will show on LCD. The data on LCD showed the result of heart rate got by examining. Web will show the result of data from each examining process. Server web could be accessed by internet or handphone connected to the internet.

3.2. Software design

Software design is to definite each execution’s channel from software heart rate system in which ESP8266 played to find wifi net connection, sensor will read, and then send to the data base, after inputting data it could be showed on web php, browser/smartphone. Flowchart system on figure 3.
Modul ESP8266 is part of modul wifi, in order to be functioned to send data to the internet. It needed configuration to the access point to connect to the internet. ESP8266 must be connected with ssid and password access point. After connecting with password access point, ESP8266 processed sensor from pulse heart sensor in the from analogue data. ESP8266 will send data to the database my sql by method http request GET/POST.

After data saved, the next process is show the data from database MySQL which is processed by php as programme web service. Grafict and table are showed on the web. It can be opened on smartphone/browser. If the data do not save in the database, it caused by many factors of internet connection, such as down server. The programme will go back to the process before to configure the internet.

3.3. Website design

The function of website is a history of heart rate people before and after took sport. In this design, software which is used is PHP and MySQL. PHP is programming of script server side which is designed to develop web. Also, it can programming data web processed, MySQL as saved the data. Notepad ++ as coding editor. Figure 4. Showed of part of menu home on website.
4. Result

4.1. System measurement

The function of system measurement is to measure each of heart rate monitoring system, such as pulse heart sensor system, LCD Nokia 5110 system, and modul wifi ESP 8266.

Measurement by stuck on the finger into the pulse heart sensor, modul wifi ESP 8266 will read the data and showed on a character using LCD Nokia 5110, the data send by database from to be known the record of data, and it could be accessed by smartphone, by opening website.

When the heart pumps blood through the body, from each heartbeat made pulse waving (such as shock waving). Which is move on artery spread into network of blood vessels which is sensor pulse is fastened. It has function to measure IBI (Inter Beat Interval). BPM (Beat per Minute) comes from each beat rate 10 times. When microcontroller ESP 8266 is on and walk by sensor pulse connected to pin analogue 0, continue (every 2 ms) to read sensor value based on measurement of heart beat. BPM value is [6].

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BPM = \frac{60000}{\text{average IBI}} \quad (1)
\]

Defining of heart beat value per minute (BPM = beat per minute) by this sensor, made 60000 ms rate of 10 IBI (Inter Beat Interval). IBI is interval between one point to the next point that is 50% of P (peak) minus T (thesaurus) when on grafict became the highest form [7].

Heart rate testing obtained the result as follow table 1.

| No | Pulse Heart Sensor (BPM) | Oximetri (BPM) | Error Ratio (%) |
|----|--------------------------|----------------|-----------------|
| 1  | 80                       | 90             | 11.1            |
| 2  | 98                       | 91             | 7.6             |
| 3  | 82                       | 94             | 12.7            |
| 4  | 94                       | 98             | 4               |
| 5  | 95                       | 95             | 0               |
| 6  | 94                       | 94             | 0               |
| 7  | 98                       | 95             | 3.1             |
| 8  | 94                       | 95             | 1               |
| 9  | 94                       | 95             | 1               |
| 10 | 94                       | 95             | 1               |

From table 1 above, we can see that the device is still is not stable because error tolerance value at the component used so that reading process is often variable. Beside that it is caused by the patients condition who are not relax when measuring process. This device has been made and can do well. The research device can make different the measuring result between one patient with the other with the error value 4.15% and accuration 95%.

4.2. Measurement of modul wifi ESP 8266

Modul wifi ESP 8266 reads pulse heart sensor which is stuck on the finger, the data showed on character form using LCD Nokia 5110. Besides that, the data is send in database form to be known to the record. Could be accessed whenever by smartphone by opening website.

4.3. Web measurement

When the sensor works, to know heart beat on LCD Nokia 5110, the data on the web showed to be record from data measurement. The result of web measurement is on figure 5 and 6.
5. Conclusion
This prototype is designed to use pulse heart sensor which is stuck on the finger, modul wifi ESP 8266 reads sensor which is showed on character form using LCD and data could be sent to the web. Besides that, those data sent in database form to be known the record. It could be accessed whenever using smartphone by opening web. So, we can get more about data record from the result of measurement.

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