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Design of Measuring and Monitoring Device based on Microcontroller and Android

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***Abstract*— Heart health is an important thing to monitor, because the heart is an important vital organ and is prone to disturbances, especially for the elderly. Such as stroke, arrhythmia and other heart diseases. Usually a heart rate detector is only owned by people who work as health workers and health agencies, and if someone who has heart disease such as stroke and arrhythmia wants to check his heart health, he must come to a doctor or health agency. Therefore, a measuring device and monitoring of heart rate are made on a regular basis. This heart rate measuring and monitoring device is based on a microcontroller and android with a periodic database-based monitoring system. By using the MAX 30100 sensor which has an average error of approximately 3% with a difference value of more than 3 bpm with existing standard measuring instruments.**

***Keywords*— Heart, Microcontroller, Sensor MAX 30100, Android**

I. INTRODUCTION

Human needs are currently getting higher, for example in the health sector such as heart health. The heart is a vital organ where when there is damage or disturbance it can create diseases such as cardiovascular or heart attacks.

To check the heart rate, normal or abnormal, someone needs a tool called a Pulse Oximeter, this tool is very easy to operate and easy to carry. Now many heart rate measuring devices use electronic components, so they can be used easily, but tools on the market cannot record the results. test and must be written manually in a book and at any time can be lost.

From this came the idea to make a heart rate monitoring device. This tool utilizes the Hearth Rate Sensor (MAX 30100) which is run with a microcontroller and is connected to a database to store measurement results and the android application is used as monitoring test results, with this tool the test results will be stored safely in the database and will not be lost.

II. METHOD

This study aims to design an android-based heart rate monitoring system using NodeMCU ESP8266 as a microcontroller. This research includes several stages including: Research Design, Product Test, Variables and Variable Operational Definitions, and Data Analysis Methods.

A. *Product Design*

Product design is a necessary process in planning and implementing product manufacturing to suit the conditions of the product to be made by the researcher. In this paper, the researcher describes the design drawings, application design, application block diagrams, device wiring and tool flow diagrams.

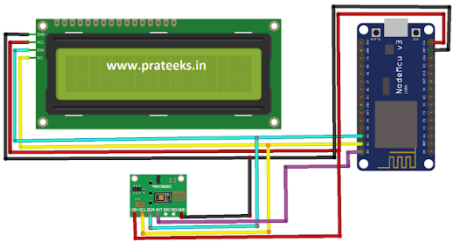

Figure 1. Wiring diagram

Figure 1 there are several main components such as NodeMCU ESP8266 as a microcontroller, Max 30100 as a BPM detection sensor and Lcd i2c as the output of the tool process.

The following is an image of the interface on the android control application which is designed to make the application using Kodular software, which can be accessed via a browser using the internet network.

The researcher makes a flowchart of the tool or flowchart that aims to provide an overview of the process of the tool that will be made by the researcher so that it is easy to understand. The flowchart can be seen in the following figure.

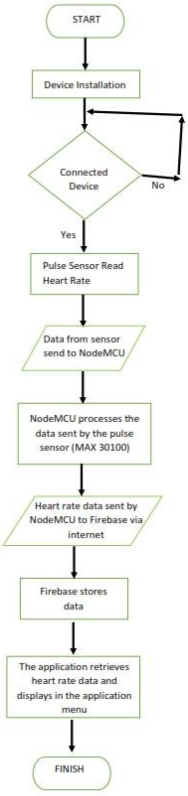

Figure 2. Flowchart

From the figure 2, it is a little explanation that after the BPM sensor tool has succeeded in measuring the average BPM, it will then be displayed on the LCD and NodeMCU will send data to the web server and the Android application will retrieve data from the web server when it will display the history of the check.

B. Product test

Testing of the tool is carried out to see the response of the density of the sensor input to the density of blood circulation which is read by the BPM sensor in the body. The value detected by the sensor will be conversion into a pulse voltage value that follows the pulse of blood flow.

Experiment and system analysis aims to determine the performance of the tool is working well or not. From the results of the experiment, there will be comparisons obtained, the comparison data will be used as reference material to determine the results of the performance of the tool made by the researcher.

III. RESULT AND DISCUSSION

A. Product Result

Product results, with this tool patients with heart disease (arrhythmia, weak heart, etc.) do not have to go to a hospital or health agency to check the condition of their heart health.

Figure 3. Product Result

C. Data Presentation

Presentation of data, based on experimental tools made by researchers, then the presentation of the data obtained get some data which is described as follows:

Table 1 Results of Testing Research Tools with Existing Tools (Mixio)

Number	Name	Age	Gender	Research Tools	Existing Tools	Differens
1.	Yusuf	13	Male	90 Bpm	92 Bpm	2 Bpm
2.	Adi	21	Male	93 Bpm	96 Bpm	3 Bpm
3.	Ratna	32	Female	96 Bpm	92 Bpm	4 Bpm
4.	Eko	41	Male	99 Bpm	96 Bpm	3 Bpm
5.	Andi	54	Male	90 Bpm	95 Bpm	5 Bpm

Table 2 Tool Testing with Conditions Before and After Activities

Number	Name	Age	BPM before light exercise	BPM after light exercise
1.	Yusuf	13	93	107
2.			99	103
3.			94	105
4.	Ratna	32	97	102
5.			92	104
6.			94	99
7.	Andi	54	91	103
8.			95	101
9.			97	107

D. Data Analysis

In Figure 4 there are 2 candles, namely candel values from test results which show the difference in test results before and after carrying out activities for children aged 13 years.

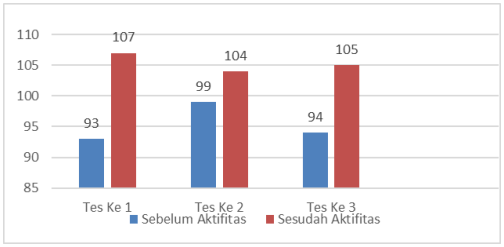

Figure 4. Test Result of 13 years old

In Figure 5 there are 2 candles, namely candel values from test results which show the difference in test results before and after carrying out activities for 32 year old children.

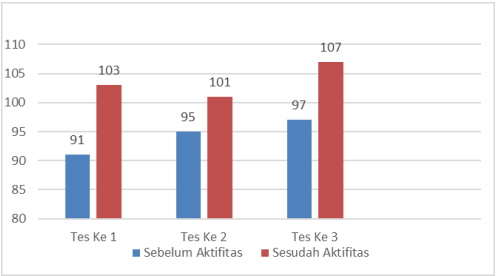

Figure 5. Test Result of people age 32 years before / after activities

In Figure 6 there are 2 candles, namely candel values from test results which show the difference in test results before and after doing activities for people aged 54 years.

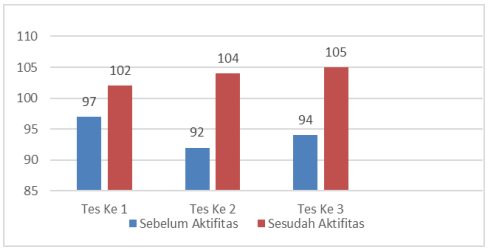

Figure 6. Test Result of people age 54 years before / after activities

IV. DISCUSSION

Researchers used the MAX 30100 heart rate sensor, in previous studies many used a heart rate sensor called the Pulse Heart Rate Sensor, but this time researchers used a heart rate sensor called the MAX 30100 which he said was more accurate.

V. CONCLUSION

Based on the research of the Final Project, there are things that can be concluded in this Final Project, namely:

The aim of the researchers in making this heart rate monitoring tool is so that the general public can check their heart health independently at home without having to come to a health agency.

From the research and testing of the heart rate monitoring device, it can be concluded as follows:

1) This BPM monitoring tool uses several devices, namely Arduino as a microcontroller, and pulse heart rate sensor as a sensor, and kodular as an android application, and firebase as a web server.
2) From the test results, this tool has good accuracy, which is about 5% of the tools that have been used and tested.

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