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Monitoring the Heart Rate and Body Temperature Based on Microcontroller

[1]Nur Hudha Wijaya, [2]Nia Maharani Raharja and [3]Iswanto

[1] Department of Electromedical Engineering, Vocational Program, Universitas Muhammadiyah Yogyakarta, Indonesia.

[2, 3] Department of Electrical Engineering, Universitas Muhammadiyah Yogyakarta, Indonesia.

Abstract

This research will discuss about health services in the field of diagnostic tools and life support system in the form of photopletysmograph. Systems designed a system capable of providing heart pumping activity information through a phenomenon known photoelectric so the user's health condition. Plus parameter measuring human body temperature to determine the temperature of the current condition of the user. In collecting the data pulse using a heart rate sensor (finger tip sensor). This system works to retrieve data from the bloodstream on the index finger during the 60s, the data will be displayed through the LCD. For parameter data retrieval body temperature using LM35 temperature sensor. Changes in heat sensor will be converted into electricity, which is translated into digital form by ADC 10 bits processed by a microcontroller ATMega 16 and displayed to the LCD. Results from ideal measurement error shows each parameter of heart rate and body temperature min <1.702% and <0.55%.

Keywords: Microcontroller, ATmega16, Finger Tip, LM35, LCD

INTRODUCTION

The diagnostic tool measuring heart rate is a medical device that will be used to help nurses and very useful to know the state of the patient's condition. The working principle of this diagnostic tool is to count the number of heartbeats in minutes. Then from the heart beat count will be determined whether the patient is in normal condition or not. Usually people who have arrhythmia abnormalities of heart disease, denyutannya will deviate from the range of values between 60-100 BPM.

Previous researchers have done studies to monitor the heart rate as is done by Single et al. [1]. Results of research conducted by Solo et al. a tool that is portable heart rate, making it easy to carry around. From previous studies it appears that the pulse portable tool can not be used for diagnostic tools, diagnostic tools shingga also extended body temperature measuring parameter is used to perform diagnostic patient body temperature. This parameter is laid or placed in an area of the body parts such as armpits, neck, or certain body parts. Because if placed on the body part that has a high heat, then the temperature will read more valid and accurate approach Physics precise measurements of the human body.

RESEARCH METHODS

Technical plan the first method used for this research is to make the block diagram. The function of the block diagram as a reference in making work flow system hardware. Determination of the proper block diagram will determine the desired results in the research ideas are achieved. Here is a block diagram that the author can be seen in Figure 1. From this figure looks systems using a microcontroller as a data processing center of the second input sensor. Microcontroller also used by previous researchers to control quadrotor as practiced by Prog et al. [2], [3]. Microcontroller used a 32-bit microcontroller, so as to control quadrotor that require a lot of algorithms can work quickly. Microcontroller also used by Chamim et al. [4] for data processing speed of the motorcycle. Microcontroller used an 8-bit microcontroller to process the rotation speed of the motorcycle. Microcontroller contained in quadrotor also used by Iswanto et al. [5] to process the sensor data in the form of a laser sensor quadrotor.

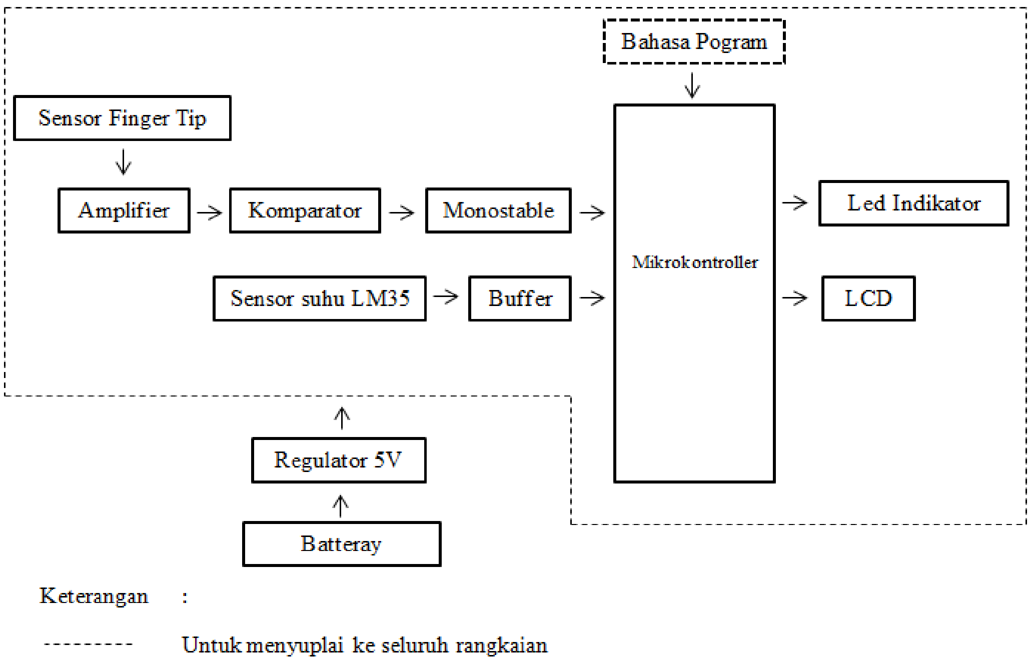

Figure 1: Description Is Placed Right Below The Figure

Contraction of the heart pumps blood when the cause throbbing artery can be felt at several places, including the fingers. Because the blood pulsing past, light captured by the photodiode / LSD would make up the signal. The intensity of light that can be captured by LSD depend on the volume of blood in the finger. So when the heart contracts, will change the intensity of light captured by LSD. When the heart contracts, the blood volume will increase so that the blood becomes more concentrated. This will affect the resistance of LSD. LSD resistance will grow large, so that the voltage Vout passed into the greater, and vice versa.

Finger sensor
Infrared LEDs emit light passes through the finger and captured by the photodiode. Illustration placement on the fingers look on as shown below:

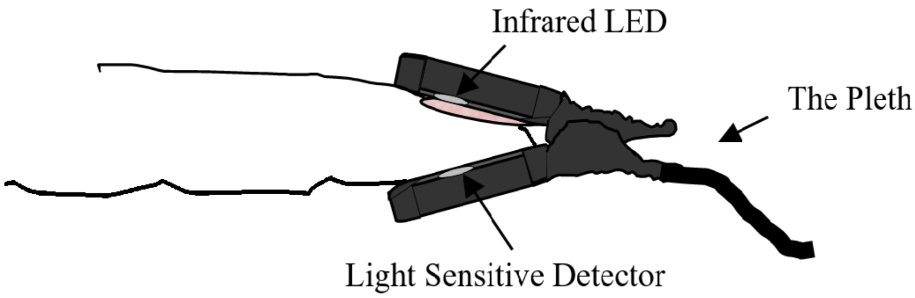

Figure 2: Description Is Placed Right Below The Figure

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Non-inverting amplifier
This circuit serves amplifies the voltage obtained from the reflection of infrared light captured by LSD. To get a big gain or big gains can be determined from R1 and R2.

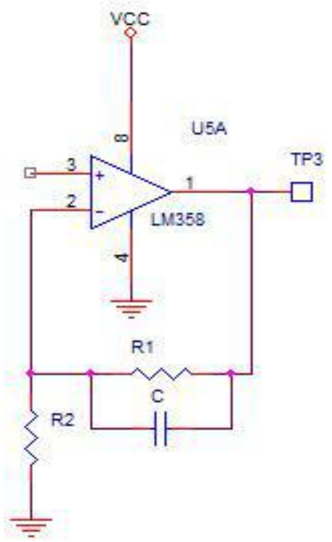


Figure 3: Description Is Placed Right Below The Figure

Comparators

The comparator is a circuit that is used to sense or detect the condition in which a time-varying signal has reached the threshold voltage value (threshold). This comparator can be used to sense and detect the condition of an electrical signal when it reaches or exceeds a certain voltage level that has been defined previously.

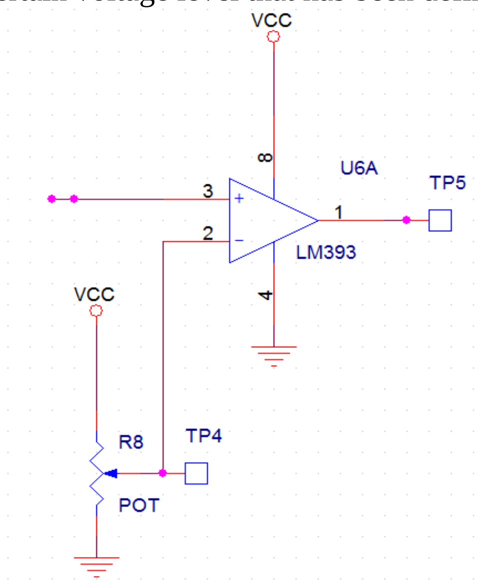


Figure 4: Description Is Placed Right Below The Figure

Comparator circuit has a differential amplifier on the input side. The output is a driving level to reach a state that can switch its value. A most simple comparator circuit has a voltage signal that is worn directly on one of the terminal masukanya, while others charged in the terminal input reference voltage

Monostable circuit

This monostable circuit logic function that gets to the microcontroller into the 5V and 1V output. When monostable trigger input, it will produce a voltage of 5V or high, the lack of a stress trigger will then generate an output voltage of 1V or low. To calculate the frequency of long monostable circuit.

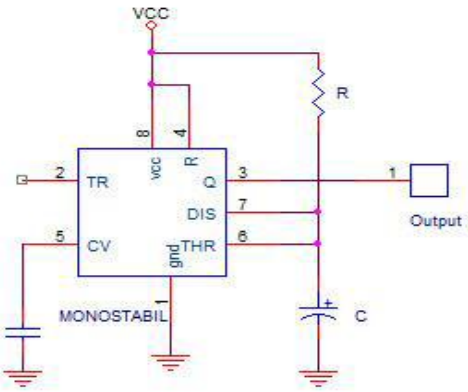
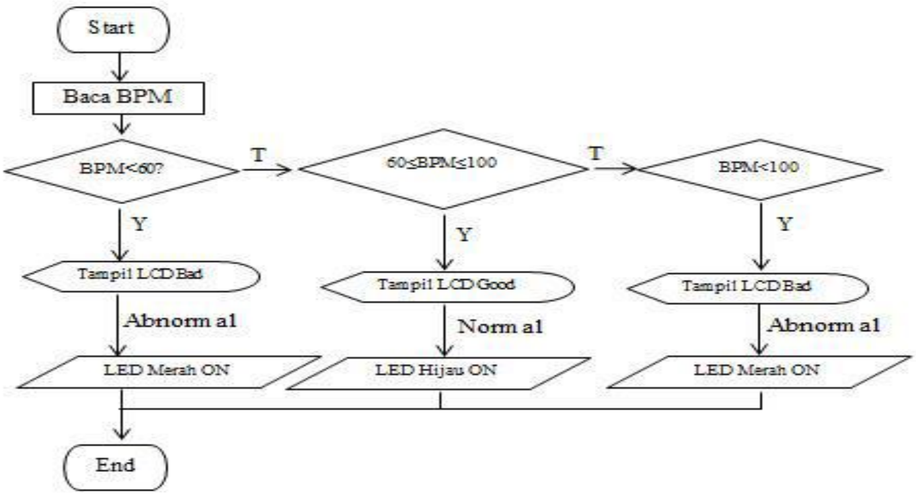


Figure 4: Description Is Placed Right Below The Figure

Technical plan the second method used for this research is to create a flow chart. Flow charts are used to design an algorithm for measurement of temperature and heart rate. To determine the patient's heart rate and temperature is normal or abnormal use fuzzy decision tree algorithm. Fuzzy algorithm is widely used by previous investigators for decision support in path planning as practiced by Iswanto et al using fuzzy algorithms for path planning quadrotor [6] and fuzzy decision tree for path planning [7]. In addition to supporting the decision, fuzzy algorithm used by Iswanto et.al [8] to control altitude quadrotor.



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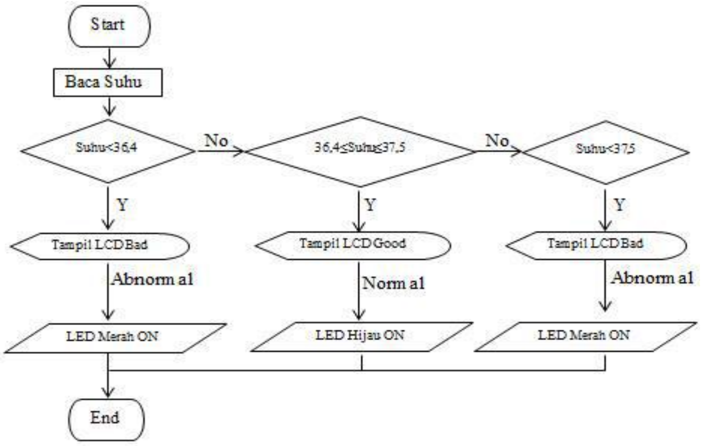

Figure 4: Description Is Placed Right Below The Figure

The work process flow chart BPM flow and temperature:
When the sensor is installed in the well in accordance with the procedure and then press the start button the finger tip sensor will count the number of heartbeats for 60 seconds. If you have not reached it will repeat until the time is fulfilled. If you've reached 60 seconds it will be recalculated by the micro, if rate <60 then a heart condition tasteless in an abnormal position, if no then processed by the rules of> = 60 and <= 100 if yes, then the condition of the heart in normal circumstances then if no value span> 100 then yes it is in a state of abnormal heart conditions and then be displayed on the LCD. The red LED turns on when the condition of the heart rate abnormal condition while the green LED turns on when normal conditions.
Then the temperature sensor will measure the temperature when the process of calculation of BPM is ongoing until the time limit is not specified, and the temperature calculated results are in accordance with the following provisions if <36 ° C, the temperature conditions in abnormal circumstances, if no go into further calculations with the rules of> = 36.4 ° C and <= 37.5 ° C if yes then condition the body temperature under normal circumstances then if no, go to the next stage with the rules of> 37.5 ° C if yes then the condition of the body temperature in an abnormal state and then proceeds which has been determined will be displayed on the LCD. The red LED turns on when the temperature conditions under abnormal circumstances and green LED turns on when the condition under normal circumstances.

ANALYSIS AND WAYS OF WORKING

Light emitted by the infrared by heart rate sensor is captured by a photodiode / LSD after passing the fingers. Because of the influence of blood flow will cause the signal. Signals that arise will be amplified by an amplifier to be readable. After that signal will be processed by the circuit block filter circuit to eliminate noise signals intervene. Then the signal is passed to a comparator to get the value of the output of the desired voltage to perform the voltage comparison. After the voltage that will be processed by the monostable circuit. Monostable function for triggering the signals came in and drown if no incoming signal. Then the output of the monostable circuit will be enumerated dala microcontroller for processing data back. In addition to finger tip signals, analog signals from the sensors LM35 also processed. To menyestabilkan then given a series of voltage buffer, after which the data is processed by a microcontroller. Both of these signals are displayed by the LCD and identified by the Program is already made to determine normal or abnormal signals obtained by displaying a red LED and a green LED.

CONCLUSION

After making process and learn from literature planning, testing tools, and data collection, the writer can conclude several things:

1. The detector heart rate and body temperature to function properly after the comparison of data obtained through experiments by several patients with the same medical instrument that has a worthy standard used by the calibration of medical devices.
2. Can work well and will get the data calculations are accurate and stable if the condition of the patient is in a quiet, comfortable or relaxed. This is due to the condition of the patient does not calm it will affect the data collection so that the values obtained will be inaccurate or not in accordance with the desired result.
3. After the measurement is done by means of comparison that has been calibrated values obtained an average error of measurement, that is equal to 1,702% of the data for the BPM and body temperature measurement data is 0.55%..

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