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Design of an IoT based Heart Rate Monitoring System for Cardiovascular Patients

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Abstract: The Pulse Rate Monitoring system is designed using the Internet of Things with the goal of monitoring the heartbeat of the patient to screen for the risk of heart disease. Health monitoring is vital to us to ensure our health is in good condition. One of the fundamental parameters for this system viable is the pulse rate. In this paper, I describe the model of a low-cost pulse rate monitoring system from fingertips using the Bluetooth technology. The whole design is included several sections such as the Pulse Rate module, mobile application, and Bluetooth module. The Heart Rate (HR) module gets pulse signals by a painless strategy called Photoplethysmography from the patients and sends them remotely to a computer or mobile application via the Bluetooth module.

Keywords: Internet of Things (IoT), Pulse monitor, and cardiovascular disease.

I. INTRODUCTION

This paper proposes a pulse rate observation system utilizing the Internet of Things (IoT). These days treatment of heart-related disease requires regular as well as long-term observation. IoT is exceptionally valuable in this viewpoint as it replaces the traditional health monitoring systems with a more productive plan, by giving basic data regarding the state of the patient accessible by the caretakers and doctors. Moreover, the health specialist accessible at the clinic can screen the pulse rate of the patient on the computer or mobile through the constant observation system.

II. PROPOSED SYSTEM

In this prototype I use the pulse rate sensor with Arduino and Bluetooth (HC-05) module, the pulse rate sensor is attached to the patient finger, and it collects the pulse rate and afterward sends the vital value to the mobile application by means of Bluetooth. Early acknowledgment of the disease is extremely important in preventing more health complications in the future.

There are three situations in which the pulse rate is shown:

1. **Low heartbeat:** The low pulse rate is shown when the pulse per BPM (Beats Per Moment) is >40 & <60. The low pulse rate might prompt unexpected health issues this shows that the patient requires the health specialist's help.

2. **Normal heartbeat:** The ordinary pulse rate is somewhere in the range of > 60 & < 100 which shows that the patient has a normal pulse rate with no difficulty.

3. **High heartbeat:** The high pulse rate is somewhere in the range of >100 & <150 which demonstrates the patient has a high pulse rate that could bring about the heart-related diseases.

The above readings are shown in the mobile application through Bluetooth.

Fig. 1 System overview

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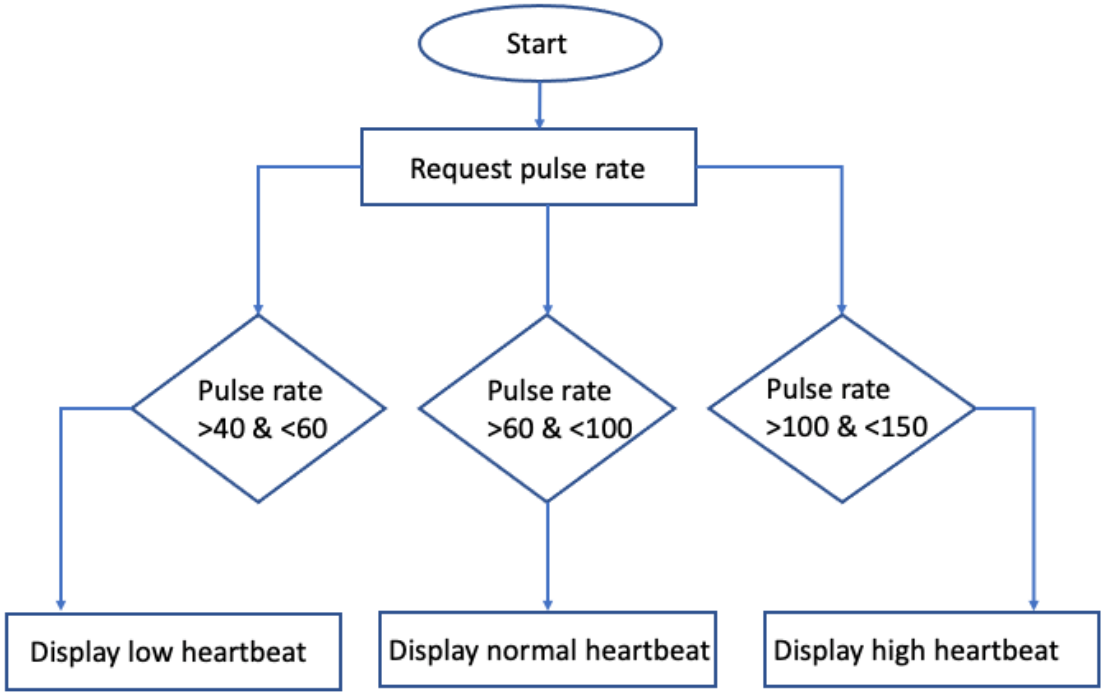

Fig. 2 Algorithm

Pulse Sensor: It is an Open-Source pulse rate monitor which is considered a PPG gadget used to screen the painless pulse. It gauges the real-time heartbeats and computes BPM with the guiding algorithm carried out by Arduino. The typical working voltage is +5V or +3.3V and power utilization of 4mAmp. The sensor has different sides, one side comprises a LED with a surrounding light sensor and the opposite side contains hardware that enhances the signs and removes the noise.

Arduino Processor: Arduino-UNO is micro-controller in view of Atmega328, having 14-digital In-Out pins of which 6 are for PWM yield, 6 are for analog information. It works at 16 MHz, with a USB, Power jack, Reset button.

HC-05 Bluetooth: HC-05 is an SPP - Serial Port Protocol. It was picked for its capacity to improve the circuit configuration and send collected information to a mobile application because of its support with the Arduino. What's more, it was picked over the HC-06 module since it can work as both master as well as slave modules as opposed to only a slave on account of HC-06. The HC-05 has 6 Pins, 4 of them are programmable IO lines. While the 3 others, one is GND, and the other is for VCC.

Blynk: is an SDK with iOS & Android applications to control Raspberry Pi, Arduino, and other similar kits over the Internet.

III. CONCLUSION

An IoT-based human pulse rate observation and control framework is designed. This framework utilizes the support of a heartbeat sensor for information obtaining. A human's pulse is collected as analog signals and processed by the microcontroller. The processed information is sent to the IoT device for additional analysis and perception. From the outcomes got, it was found that the heartbeat rate of low if >40 and <60, medium if >60 and <100, and high if >100 and <150. Besides, this exploration paper presents a methodology that is adaptable, dependable, and secured for a pulse rate observation and control framework using sensors organization and IoT technology.

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