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Arduino-Powered Heart Rate & Blood Oxygen Monitoring

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Abstract
In this paper, the Arduino-powered heart rate & blood oxygen monitoring is presented. A heartbeat sensor is an electronic device used to measure the heart rate, which indicates the speed of the heartbeat. Monitoring body temperature, heart rate, and blood pressure are essential for maintaining good health. To measure body temperature, thermometers are used, and a sphygmomanometer is used to monitor arterial or blood pressure. Heart rate can be monitored in two ways: by manually checking the pulse at either the wrists or neck or by using a heartbeat sensor. This project involves designing a heart rate monitor system using an Arduino and a heartbeat sensor. The principle of the heartbeat sensor, its working, and an Arduino-based heart rate monitoring system are explained using a practical heartbeat sensor. The work done & presented in this paper is the result of the mini-project work that has been done by the first sem engineering students of the college and as such there is little novelty in it and the references are being taken from various sources from the internet, the paper is being written by the students to test their writing skills in the starting of their engineering career and also to test the presentation skills during their mini-project presentation. The work done & presented in this paper is the report of the assignment / alternate assessment tool as a part and parcel of the academic assignment of the first year subject on nanotechnology & IoT.
Keywords: IoT, Nano

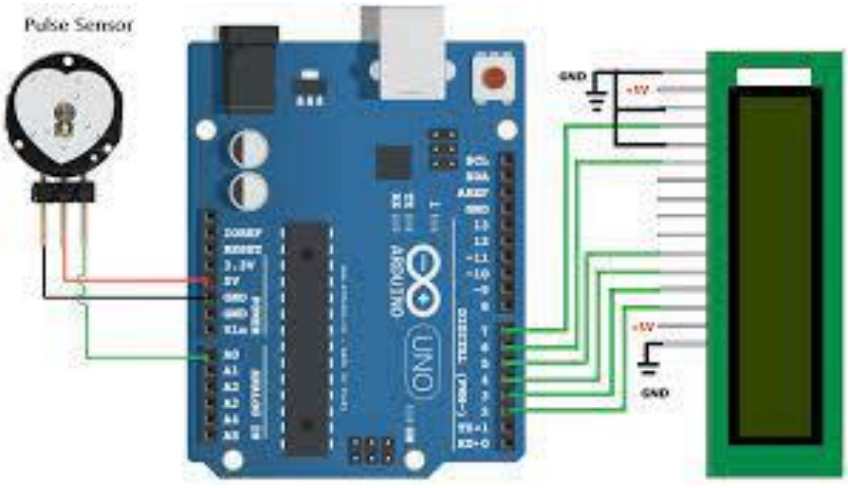

Fig. 1 : Circuit diagram

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1. Introduction

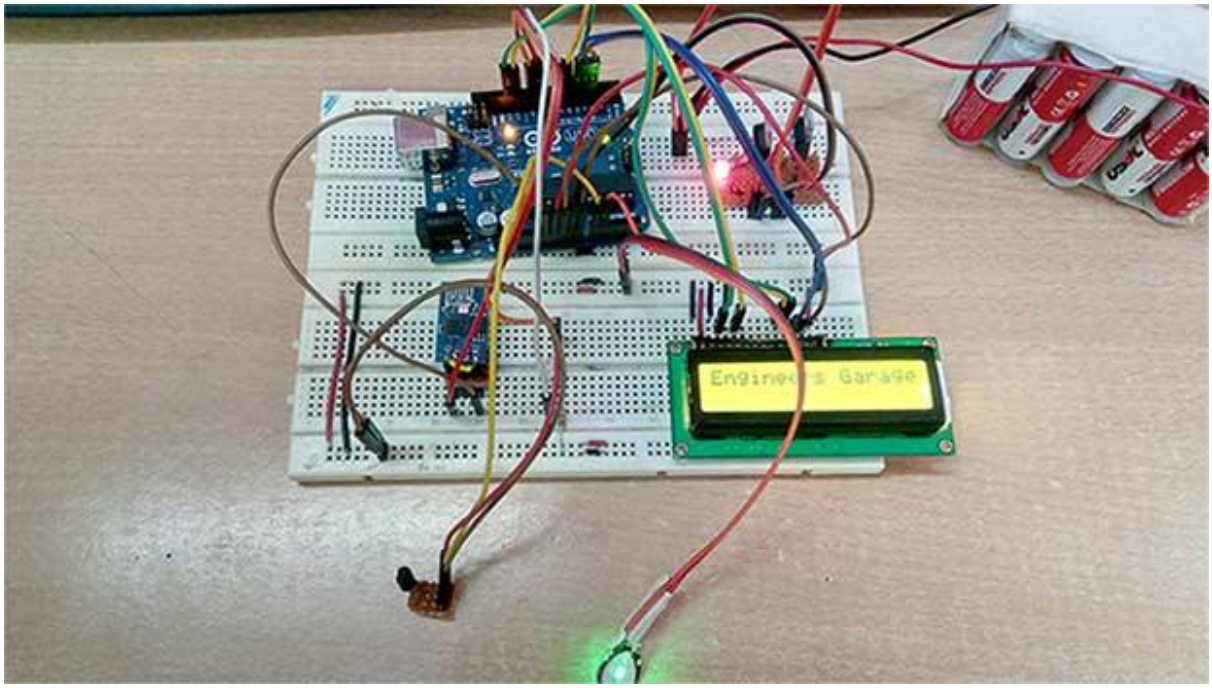

Fig. 2 : Experimental verification process

2. Design process

Monitoring vital signs such as heart rate and blood oxygen levels is crucial in healthcare settings, athletic performance analysis, and personal fitness tracking [1]. With the emergence of Arduino, an open-source electronics platform, the development of Arduino-powered heart rate and blood oxygen monitoring systems has become accessible and cost-effective. This paper introduces the concept of Arduino-powered heart rate and blood oxygen monitoring, highlighting its significance, functionality, and potential applications [2]. Traditional methods of heart rate and blood oxygen monitoring often require complex and expensive medical equipment, limiting their accessibility and practicality. However, Arduino, with its programmable microcontrollers and various sensor modules, provides an affordable and flexible platform for building custom monitoring systems [3].

3. Traditional methods

The Arduino-powered heart rate and blood oxygen monitoring system typically consists of an Arduino microcontroller, a pulse sensor, and an oxygen saturation sensor [4]. The pulse sensor detects the heartbeat by measuring changes in blood volume, while the oxygen saturation sensor measures the percentage of oxygen saturation in the blood. These sensors are non-invasive and can be conveniently attached to a finger, wrist, or earlobe. To demonstrate the components and functionality of the Arduino-powered heart rate and blood oxygen monitoring system, we can refer to the following diagram shown in the Fig. 1 & Fig. 2 respectively [4]. The diagram illustrates the primary components of the system, including:

4. Arduino details

Arduino Microcontroller: The Arduino board serves as the central processing unit, responsible for gathering data from the sensors, executing programmed instructions, and displaying or transmitting the results [5].

Pulse Sensor: The pulse sensor detects the user's heartbeat by illuminating the skin with infrared light and measuring the changes in light absorption caused by blood circulation [6].

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Oxygen Saturation Sensor: The oxygen saturation sensor employs photoplethysmography (PPG) to estimate the oxygen saturation level in the blood. It measures the absorption of light at different wavelengths to determine the amount of oxygen-bound hemoglobin [7].
Display Unit: The Arduino-powered system can include a display unit, such as an LCD screen or LED indicators, to provide real-time readings of heart rate and blood oxygen levels [8].
Data Output: The system can be programmed to transmit data wirelessly via Bluetooth or store the data on an SD card for later analysis and monitoring [9].
The Arduino microcontroller acts as the brain of the system, receiving signals from the sensors, processing the data, and presenting the results in a user-friendly format. With the flexibility of Arduino's programming environment, developers can customize the system to incorporate additional features like data logging, graphical interfaces, or integration with other devices [10].
Arduino-powered heart rate and blood oxygen monitoring systems find applications in various contexts. In healthcare, these systems can be used for continuous patient monitoring, home health monitoring, or telemedicine applications [11]. In sports and fitness, they enable athletes and enthusiasts to track their heart rate and oxygen saturation levels during workouts, helping optimize performance and ensure safety. Additionally, these systems can be utilized for personal health monitoring and wellness management, allowing individuals to track their vital signs regularly and detect any potential abnormalities [12].

5. Conclusive remarks

In conclusion, the Arduino-powered heart rate and blood oxygen monitoring system offers an accessible and cost-effective solution for real-time monitoring of vital signs. By leveraging Arduino's microcontrollers and sensor modules, it enables accurate and non-invasive measurement of heart rate and blood oxygen levels [14]. The illustrated diagram showcases the key components of the system, emphasizing its potential applications in healthcare, sports, and personal wellness. Continued advancements in Arduino technology and sensor capabilities will contribute to further improvements in accuracy, usability, and integration of these monitoring systems [13].

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