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SMART BLOOD OXYGEN AND HEART RATE MONITORING WITH AUTOMATIC DATA SAVING SYSTEM

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Abstract:

The goal of this study is to develop a portable heart rate monitoring device that is easy to use and can provide reliable blood oxygen levels. Its architecture was simple and user-friendly, and it was able to compete against other medical equipment. The device is built using a MAX30100 sensor, which is capable of producing high accuracy. Although it can only monitor the heart's signs, it can be used by anyone who wants to move around. This paper discusses the various use cases for this type of system, which are usually found when the end-user requires mobility and size.

Key words:***Arduino UNO, OLED Display, Bluetooth Module, MAX30100 sensor.***

I.INTRODUCTION

The covid-19 worldwide pandemic had an unprecedented impact on humanity. People must maintain excellent health at this trying time and regularly check their vital signs. Even yet, we are aware of how expensive and difficult COVID-19 patient medical care is. Following the essential instructions and keeping an eye on our blood oxygen saturation are the most straightforward and efficient ways to prevent getting impacted. Due to the fact that it integrates the enormous biological processes, oxygen gas is essential for human life. The covid-19 damages the lungs, making it impossible for the patient to create blood that is oxygenated. Finding the blood's oxygen saturation level is therefore necessary and crucial. The pulse oximeter has been around since the beginning of the 1930s. By applying this idea, blood oxygen levels can be determined non invasively. A few medical devices are used to fill the gaps left by routine diagnostic and common tests since medical care is not universally accessible or affordable. One of those is using a pulse oximeter; pulse oximetry is a simple and unobtrusive test that determines your oxygen immersion level or the amount of oxygen in your blood. It can swiftly detect even subtle variations in how efficiently oxygen is being delivered to the extremities, particularly the legs and arms, which are farthest from the heart. Regular blood oxygenation testing aids in the early detection of many dangerous disorders, including hypoxia. Today, health risks are rising and endangering the lives of millions of people. Around 8 million people perish away yearly as a result of a dynamic increase in cardiovascular diseases that can be linked to hypertension. Additionally, among the main causes of death are acute respiratory infections, which affect 142 out of every 1000 live births.

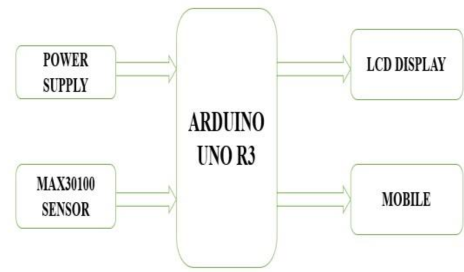
II. LITERATURE REVIEW

Every single known life depends on oxygen, which is a chemical found in the environment of the earth. The significance of oxygen is often significantly bigger. When examining our lives, oxygen acts as the fuel for each cell to carry out its own task so that the body as a whole can work more effectively. Therefore, an essential factor in the body's effective operation is the level of oxygen in the blood. The patient's health status is assessed by measuring the oxygen content in the blood. Now that the cost of healthcare services has increased, middle class and poor people in most developing nations are under more pressure to pay for effective and efficient healthcare as well as their daily expenses. The Internet of objects' application is not just limited to connecting objects; it also integrates the ideas of telecommunication and information technology to improve medical services by allowing diverse devices to communicate and exchange user data. IoT allows for the transmission of information or data from one location to another in order to detect ailments, arrange for the right meds and equipment, and generally enhance patient health conditions—even in remote areas. By managing chronic diseases with fewer hospital stays (i.e., hospital crowding), shorter travel distances, and shared physicians and professionals, this technology enables people spread out over a large area range to obtain healthcare services over a long distance and to curtail its cost.

III. PROPOSED SYSTEM

Our goal is to create a secure smart health monitoring system to track the patient's health indicators. The device allows a doctor or other healthcare professional to remotely monitor the patient's most crucial health indicators. The public may watch this as well.

A.



System Architecture:

The circuit connections shown in the above schematic include those for the Arduino Uno, MAX0100 sensor, Bluetooth module, and OLED Display, all of which are linked to the computer.

B.Arduino UNO:

The Arduino Uno R3 microcontroller board is built on a removable dual inline package (DIP) ATmega328 AVR microprocessor. There are 20 digital input and output pins supplied. (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). It may be programmed using the simple Arduino computer code. Because of its extensive support network, the Arduino is a reasonably straightforward way to begin working with embedded electronics. The Arduino Uno R3 is the third and most recent model.

The ATmega328P is the basis for the Arduino Uno microcontroller board. It has a 16 MHz ceramic resonator (CSTCE16M0V53-R0), six analogue inputs, fourteen digital input/output pins (six of which can be utilized as PWM outputs), a USB port, a connector for power, a header for ICSP, and a reset button. It consists of everything necessitate to support the microcontroller; to use it, just plug in a USB cable, an AC-to-DC converter, or a battery. The Italian term "uno," referring to "one," was selected to symbolize the Arduino Software. (IDE) Version 1.0.

C. MAX30100 Sensor:

The Max30100 is a sensor capable of pulse oximetry and heart rate monitoring. It combines two leds, a photodetector, improved optics, and low-noise analog signal processing to detect pulse oximetry and heart rate signals. The Max30100 can be shut down by software with little standby current while keeping the power source connected at all times. The Max30100 is powered by 1.8v and 3.3v power supply.

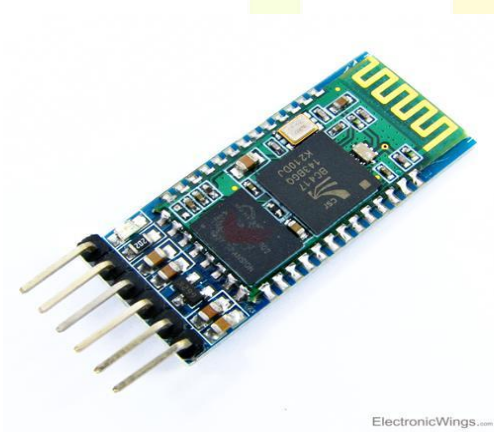
D .OLED Display:

An OLED is a solid-state semiconductor device that is between 100 and 500 nm thick, made up of two electrodes, a conducting layer, and an emissive layer. OLEDs are double charge injection devices that need a constant flow of both electrons and holes to power electroluminescent material positioned in between two electrodes. In the two-layer OLED, holes are injected from the anode in the HOMO band while electrons from the cathode are injected in the LUMO (conduction band). (valence band). Electron-transport layer (ETL) and hole transport layer (HTL) are used in place of the conductive layer in three-layer OLEDs. (H TL).

E. HC-05:

Bluetooth serial modules enable all serial-capable devices to interact with one another over Bluetooth.

F.MIT APP Inventor:

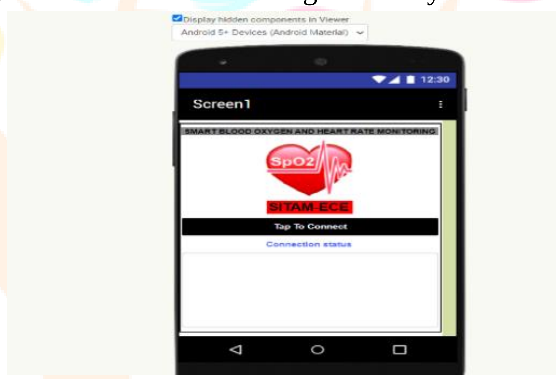


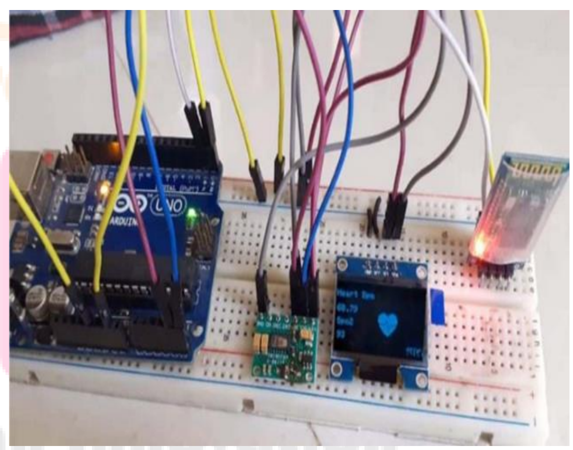
The design editor and the blocks editor are the two primary editors found on the MIT App Inventor user interface. The drag-and-drop interface of the design editor, also known as the designer (see Fig. 3.1), is used to arrange the components of the application's user interface. (UI). Using colour-coded blocks that fit together like jigsaw pieces to represent the software, app developers may graphically lay down the logic of their apps in the blocks editor (see Fig. 3.2). App Inventor offers a mobile app for developers to utilise called the App Inventor Companion (or simply "the Companion") that allows them to test and modify the behaviour of their apps in real-time.

This makes it simple for anybody to create a mobile application and immediately begin to iterate and test.

IV. RESULTS AND DISCUSSION

Using the MAX30100 sensor to integrate a smart blood oxygen and heart rate monitoring system with automatic data saving in MIT App Inventor has a number of potential advantages, including enhancing patient healthcare outcomes, enabling remote monitoring of vital signs, and boosting healthcare delivery effectiveness. The MAX30100 sensor is a small, low-power sensor that has a high degree of accuracy for measuring blood oxygen saturation and heart rate. Healthcare practitioners and patients may monitor these vital signs in real-time and receive warnings if any anomalies are found by connecting this sensor with an app created in MIT App Inventor. The outcome is illustrated below.





V. CONCLUSION

The suggested system employs the MAX30100 sensor module and the MIT App Maker platform to continuously monitor blood oxygen levels and heart rate. It is a cost-efficient, reliable, and user-friendly smart monitoring system. Data is automatically saved to Files by the system, making it simple to retrieve and analyse data. Potential uses for this system include healthcare, athletics, and fitness..

VI. FUTURE SCOPE

The suggested system employs the MAX30100 sensor module and the MIT App Maker platform to continuously monitor blood oxygen levels and heart rate. It is a cost-efficient, reliable, and user-friendly smart monitoring system. Data is automatically saved to Files by the system, making it simple to retrieve and analyse data. Potential uses for this system include healthcare, athletics, and fitness a complete health monitoring system. The information gathered by this system from the patient end may also be transferred to the cloud, where it can subsequently be accessible by the doctors from a distance. In order to transform the system into a user-friendly remote health monitoring system for patients, it may be integrated into an IoT platform. Acknowledgements The authors acknowledge the help of the SMDP-C2SD project at the University of Calcutta, financed by Meit Y, the Government of India, and UGC UPE II, "Modern Biology Group B:Signal Processing Group," for providing research resources.The project "Cytomorphic CMOS Circuit Model-ing and Ultra-Low Power Design of P53 Protein Pathway for Synthetic Biology Applications," funded by West Bengal Higher Education, Science and Technology and Biotechnology (Sci. & Tech.), provided some infrastructure support, and the authors are grateful to Antara Chaudhuri, a student at the Institute of Radio Physics and Electronics, for her kind assistance in this work. In order to carry out our study, the authors of the paper would like to express their gratitude to all of the student volunteers and the professors at the Institute of Radio Physics and Electronics at the University of Calcutta. There are no competing interests.

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