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Heart Rate Detecting System Using LoRa Modules

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ABSTRACT

Cardiac disorders are on the rise all around the world in the present day. The majority of heart attacks lead to death before the patients receive care. The traditional healthcare approach is passive, in which patients contact healthcare services on their own. This has resulted in several drawbacks. As a result, the victim may fail to contact an emergency service, and the victim may go unconscious while experiencing cardiac arrest. Heart rate monitoring becomes a crucial aspect of maintaining heart health due to a lack of clinical care at the appropriate time.A pulse sensor is attached to the Arduino-Uno in this project, which is used to detect the heart rate condition and communicate the data using the LoRa transmitter module that is connected to it based on abnormality conditions of a patient. The data will be collected by a LoRa receiver module, which will be present at the receiver end, which may be the doctor's office or a patient's relative. The abnormality message will be displayed on an LCD display by the LoRa receiver module by triggering the buzzer that is attached to the setup, which will produce an alert at the receiving end, allowing them to respond quickly.

KEYWORDS: Embedded Systems, Pulse Sensor, LoRa Module

1. INTRODUCTION

Cardiac disorders are a major contributor to health concerns. These issues are growing more frequent these days as a result of people's poor diets, stress, and restlessness. People nowadays are so preoccupied with their hectic activities that they are unaware of all of these heartfelt concerns. They didn't even have enough time to think about it. Due to a lack of awareness, the number of unexpected deaths from cardiac arrest has increased.To address all of these issues, we created the "Heart Rate Detection System Using LoRa Module" project. In which we will monitor the stated person's heart rate using a pulse sensor (Heart Beat). If the heartbeat is fast or slow in this circumstance, the LoRa Module will communicate information to the doctor directly.

2. LITERATURE SURVEY

The paper [1] Rajalakshmi.S S.Nikilla, "Real Time Health

Monitoring System using Arduino "describes a method that focuses on developing a prototype model for a real-time patient monitoring system. With the use of biosensors, the proposed technique measures physical characteristics such as body temperature,heart rate, and oxygen level monitoring. With wired communication technology, there are a variety of ways accessible for the ICU patient's health monitoring system. The patient's health is continuously monitored in the unique system, and the collected data is communicated over Wi-Fi wireless sensor networks. The embedded CPU analyzes the patient's input, and the results of all the parameters are saved in the database. Any abnormalities felt by the patient will be reported to medical personnel.The sophisticated ARDUINO microcontroller is used to implement the system, and simulation results are obtained.The paper [2] C. K. Das, M. W. Alam and M. I. Hoque, "A Wireless Heartbeat And Temperature Monitoring System For Remote Patients" This paper describes the design and implementation of a low-cost wireless heartbeat and temperature monitoring system based on a microcontroller. The majority of monitoring systems in use today operate in an offline mode, however it is critical that a system be built that allows patients to be watched remotely in real time.The paper is made up of sensors that measure a patient's heartbeat and body temperature and are controlled by a microcontroller. Both readings are shown on the LCD monitor. The measured data is sent to a remote location via a wireless connection. The temperature sensor monitors the temperature while the heartbeat sensor counts the heartbeat for a certain interval of time and estimates Beats per Minute. Both data are delivered to the microcontroller for transmission to the receiving end. Finally, the data is shown on the receiving end's LCD. The constructed system is a heart beat sensor, with Arduino Uno controlling the action and the GSM module controlling the connection. The pulse oximeter monitors the patient's heart rate in real time. The photo-detectors of pulse oximeters are situated next to each other. When a finger is placed on the reflecting technique, the light is reflected back to the sensor. The volume of blood in the finger increases with each heartbeat, resulting in increased light reflection back to the sensor. The microcontroller sends an automated message to the patient's doctor or family when the continuously measured heart rate falls below or above the given limit, using the standard GSM module that is interfaced to the controller unit. Doctors can also access the updated patient's record from the database, allowing them to deliver the necessary therapies to the patient.

3. METHODOLOGY

LoRa Sx-1278

Long Range is what LoRa stands for. It's a low-power, long-range wireless platform that's become the standard for Internet of Things (IoT) networks all around the world. LoRa is a spread spectrum modulation technique evolved from CSS technology (chirp spread spectrum). Semtech was the first business to introduce LoRa.

In project the LoRa Modules is used to transmit and receive the data in offline mode

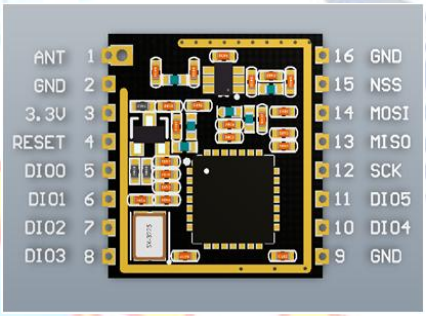


Fig1. LoRa Sx-1278

Arduino-Uno

The Arduino Uno is an open-source microcontroller board designed by Arduino.cc and based on the Microchip ATmega328P microprocessor. The board has digital and analogue input/output (I/O) pins that can be used to connect to different expansion boards (shields) and other circuits.

Fig2. ARDUINO UNO

This microcontroller is used to collect data from the hardware components linked to it in this project.

Pulse Sensor

The Pulse Sensor is an Arduino-compatible heart-rate sensor. Students, artists, athletes, makers, and game and mobile developers can use it to quickly incorporate live heart-rate data into their work.

Fig3. Pulse Sensor

The data of the person whose fingertip is placed on this sensor is collected using a pulse sensor.

Liquid Crystal Display [16*2]

LCD 162 stands for Liquid Crystal Display, which is a flat panel display technology used in computer monitors and televisions, smartphones, tablets, and other mobile devices. Each pixel has a blue, red, and green sub-pixel that may be turned on and off.

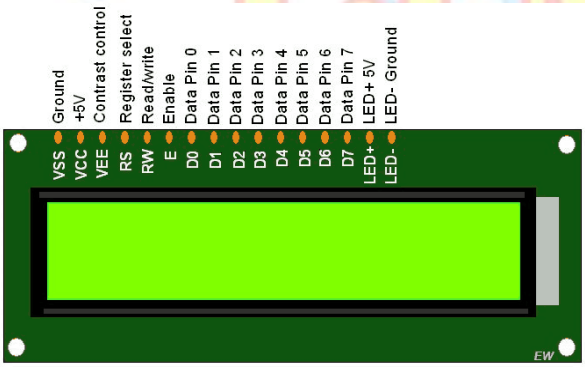
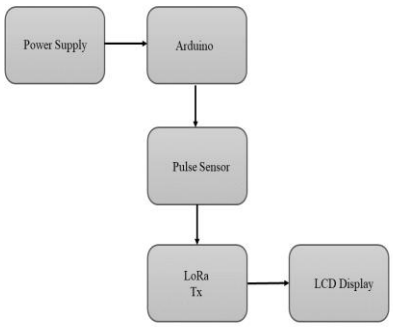


Fig4. LCD{16*2}

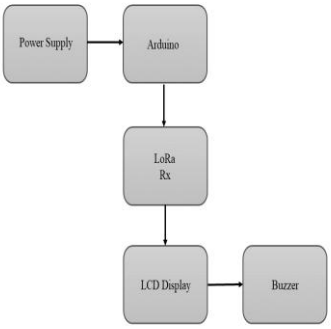
The received pulse rate from the Arduino is shown on a liquid crystal display.

4. BLOCK DIAGRAM

Transmitting Side:

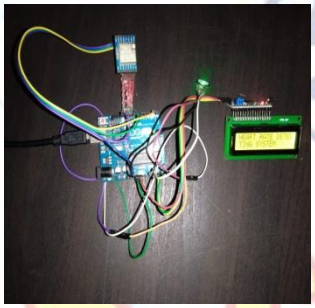


Receiving Side:

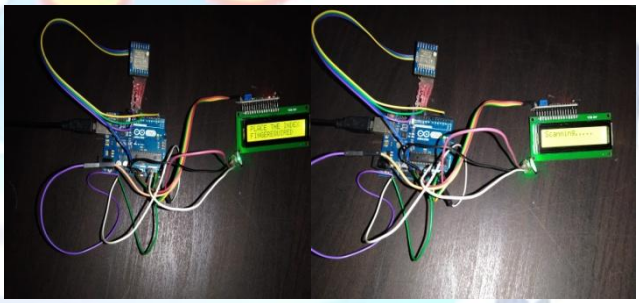


5. RESULTS

Initial Message:

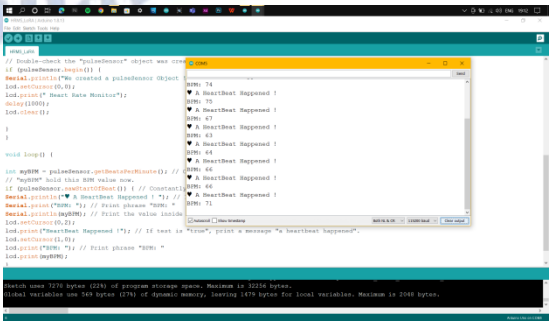


When a user first turns on this gadget, it will display the messages listed above.



Following the initial message, the user will be asked to place his or her finger on the pulse sensor in order for the user's bpm to be calculated.

Heart rate detection using pulse sensor and serial monitor:

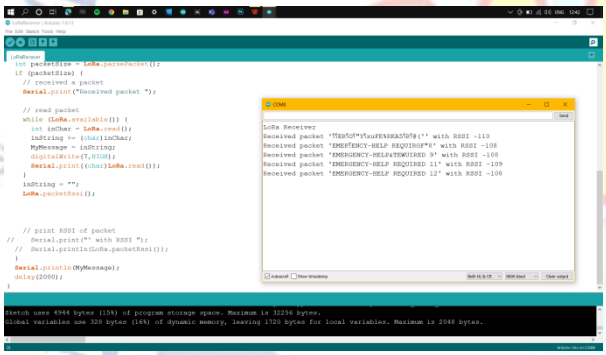


computing a person's beats per minute (bpm) using a pulse sensor and watching the bpm in a serial monitor as displayed.

LCD Displaying emergency message in Abnormal Condition:

Here we observe whenever the heart rate falls below 60 beats per minute or rises above 105 beats per minute, the Arduino triggers the LoRa module on the transmitting side, which sends alert signals to the LoRa module on the receiving end.

LoRa Receiving from transmitter in emergency time:



If you look at the receiving side on the serial monitor of the Arduino IDE programme, it will look like this.

6. FUTURE SCOPE AND CONCLUSION

Every day, we are exposed to a wide range of real-life situations. Every day, at least one news article involving medical difficulties, such as fatal heart attacks, is published. As a result, we created and simulated a low-cost, easy-to-use heart rate monitor. If deployed, the technology will be portable, and there will be no need for on-site medical workers to monitor each patient's HR at any time. The proposed system, which analyzes various heart rate data, includes an infrared sensor and a photodiode. The goal of this suggested system is to provide the controller and user with faster and more precise data, enabling for the monitoring of the patient's health.After the system is set up, the pulse sensor will begin sensing heart rate measurements and will display the person's heartbeat on the LCD screen. The data will also be broadcast via the LoRa module. It is possible to assess whether or not a person is healthy by comparing their heartbeat to a fixed point in the system. Following these settings, the device will begin monitoring the patient's heart rate and will alert the user if any irregularities are discovered

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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