Heart Attack Detection and Heart Rate Monitoring System Using IOT

Mr. P. Obula Reddy[1], C. Aswani[2], K. Bhavani Shankar[3], G. Nandhini[4], D. Venkata Swapna[5]
Assistant Professor[1], UG Student[2, 3, 4, 5], Department of Electronics & Communication Engineering,
Sai Rajeswari Institute of Technology, Proddatur, Andra Pradesh,516360.
obulreddy455@gmail.com[1], cherukuriaswini147@gmail.com[2],
lovelyshankar266@gmail.com[3],gudimenandhini433@gmail.com[4],swapnareddyd2022@gmail.com[5],

ABSTRACT

Now a days numerous persons are mislaying their life owing to heart attack and shortage of medical attention to patient at correct stage. Hence, in this project we are implementing heart rate [1] monitoring and heart attack recognition system using IoT. The patient will carry hardware having sensors with android application. The heartbeat sensor [6] will allow checking heart beat readings and transmit them over the internet. The user may set the high and low level of heartbeat limits. Once these limits are set the system can start monitoring the patient's heartbeat and as soon as the heart beat readings goes above or below the limit set by the user.
The system will send an alert about high or low heartbeat as well about chances of heart attack [5].

KEYWORDS

Heart Rate Sensor, Monitor, Detector, IoT, Android Smart Phone.

I. INTRODUCTION

Healthcare monitoring is a crucial aspect of modern medical systems, particularly for individuals with chronic illnesses and elderly patients requiring continuous observation. Traditional healthcare monitoring [4] methods rely heavily on hospital visits and manual check-ups, which may lead to delays in detecting critical health conditions. To address this issue, a Smart Health Monitoring System is proposed to provide real-time tracking and analysis of vital health parameters [2].

The system integrates multiple biomedical sensors, including a pulse sensor for heart rate monitoring, a Galvanic Skin Response (GSR) sensor for stress detection [8], and a temperature sensor for tracking body temperature. When the heart rate exceeds a predefined threshold (100 BPM), the system triggers an emergency response by activating a GPS and GSM module, which sends real-time [2] location coordinates and an alert SMS to an authorized mobile contact. Simultaneously, an audible buzzer is activated to alert nearby individuals, ensuring immediate attention.

An OLED display is incorporated into the system for real-time visualization of physiological data, allowing users to monitor their health status instantly.

II. PROBLEM STATEMENT

Heart disease, particularly heart attacks, is a leading cause of mortality worldwide. Many fatalities occur due to delayed medical attention and the lack of continuous monitoring. Traditional heart monitoring methods require hospital visits and are not feasible for real-time tracking in daily life.

This project aims to develop an IoT-based Heart Attack Detection and Heart Rate Monitoring System [1] that provides real-time heart rate monitoring and detects abnormal patterns that may indicate a heart attack. The system will consist of wearable sensors [3], a microcontroller, and a cloud-based platform to analyze heart rate data. If an abnormality is detected, it will send instant alerts to healthcare providers and emergency contacts, improving response time and potentially saving lives.

III. METHODOLOGY

The methodology for heart attack detection and heart rate monitoring using IoT involves several key steps, integrating sensors, microcontrollers, and cloud-based data processing. First, wearable or implantable biosensors, such as ECG and pulse sensors, continuously monitor the user's heart rate and other vital parameters.

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These sensors are connected to an IoT-enabled microcontroller, like Arduino or Raspberry Pi [2], which processes the data in real-time.

The collected data is transmitted wirelessly via Wi-Fi or Bluetooth to a cloud server or mobile application for further analysis. Advanced algorithms, including machine learning models, analyze the heart rate variations and ECG patterns to detect abnormalities indicative of a heart attack. If irregularities are detected, the system immediately triggers alerts, sending notifications to the user, caregivers, and medical professionals through SMS, emails, or dedicated apps. Additionally, GPS integration can help locate the affected individual, ensuring timely medical assistance. The continuous monitoring system not only provides early heart attack detection but also assists in long-term health tracking, making it an effective tool for remote healthcare and preventive cardiology

IV. BLOCK DIAGRAM

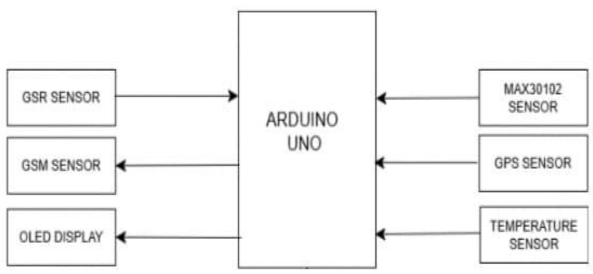


Fig: Block Diagram

V. COMPONENTS USED

1. ARDUINO UNO

The Arduino UNO is a widely used open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits The board features 14 Digital pins and 6 Analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

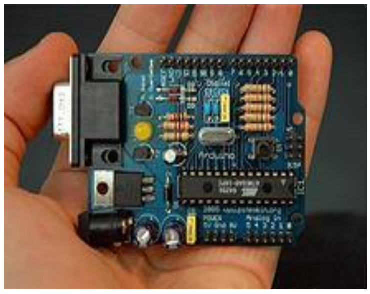


Fig: ARDUINO UNO

2. GSR SENSOR

The Galvanic Skin Response (GSR) sensor, also known as an Electrodermal Activity (EDA) sensor, is used to measure changes in the skin's electrical conductance due to physiological responses such as stress, anxiety, or emotional arousal. The sweat glands in the skin are controlled by the autonomic nervous system (ANS), and changes in sweat levels directly impact the electrical resistance of the skin.

By analyzing this resistance, the GSR sensor provides insights into mental and emotional states, making it an essential component in healthcare monitoring systems

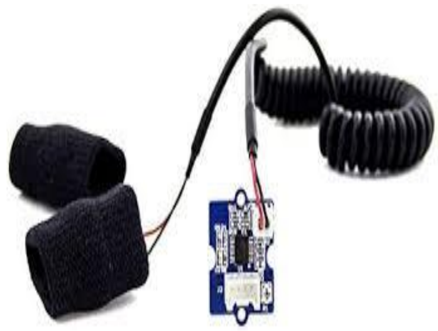


Fig: GSR SENSOR

3. MAX 30102 SENSOR

The MAX30102 is an integrated pulse oximeter and heart rate sensor module designed for real-time monitoring of blood oxygen levels (SpO_2) and heart rate (BPM). It is widely used in wearable and IoT-based healthcare applications due to its high accuracy, low power consumption, and non-invasive measurement capability. This sensor utilizes

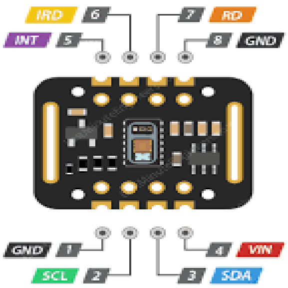


Fig: MAX 30102 SENSOR

4. TEMPERATURE SENSOR

The LM35 is a precision analog temperature sensor that provides an output voltage linearly proportional to the surrounding temperature. It is widely used due to its high accuracy, low power consumption, and ease of interfacing with microcontrollers like Node MCU and Arduino.

Fig: TEMPURATURE SENSOR

5. GSM MODULE

The Global System for Mobile Communications (GSM) is a family of standards to describe the protocols for second-generation (2G) digital cellular networks as used by mobile devices such as mobile phones and mobile broadband modems. GSM is also a used in GSM. 2G networks developed as a replacement for first generation (1G) analog cellular networks. The original GSM standard, which was developed by the European Telecommunications Standards Institute (ETSI), originally described a digital, circuit-switched network optimized for full duplex voice telephony, employing time division multiple access (TDMA) between stations.

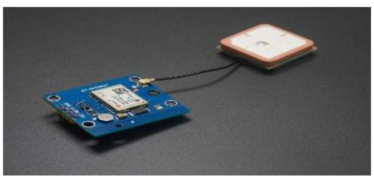


Fig: GSM MODULE

6. GPS MODULE

Global Positioning System is an earth-orbiting-satellite based system that provides signals available anywhere on or above the earth, twenty-four hours a day, which can be used to determine precise time and the position of a GPS receiver in three dimensions. GPS is increasingly used as an input for Geographic Information Systems particularly for precise positioning of geospatial data and the collection of data in the field.

Fig: GPS MODULE

7. OLED DISPLAY

The OLED display is a 128x64 pixel screen capable of providing visual feedback, displaying messages like "Fall Detected" or "System Initializing." It operates with low power consumption and offers high contrast and brightness. Communication: I2C or SPI interface. Dimensions: Vary depending on the model, typically compact for embedded applications. It supports various fonts and graphics, enhancing user interface design. Resolution: 128x64 pixels, offering clear and crisp display quality.

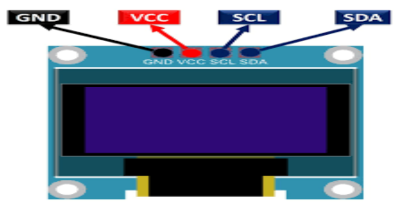
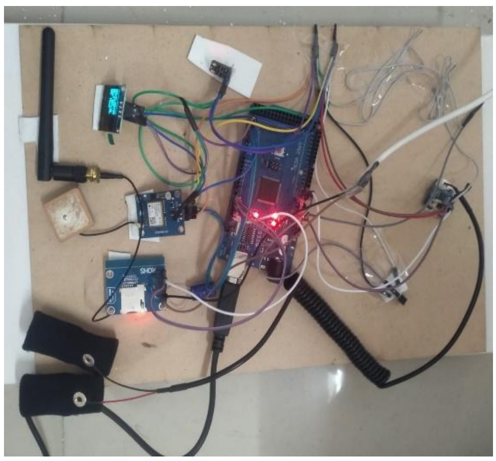


Fig: OLED DIPLAY

RESULT:



CONCLUSION:

The Smart Health Monitoring System presented in this study is an efficient and portable solution for real-time health tracking and emergency alerting. The integration of biomedical sensors, GPS, GSM, and OLED display enables continuous monitoring of vital health parameters, particularly heart rate, stress levels, and body temperature. The system successfully detects abnormal physiological conditions and promptly triggers an emergency alert through SMS communication and GPS tracking, ensuring timely medical intervention.

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