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Review Article

Live Health Monitoring System Using IoT

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I N F O

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A B S T R A C T

This article explains about the idea in the field of health in order to save the peoples those who are in danger due to sudden heart attack by designing a wearable device which can sent the notification to the doctor or to his/her guardian when he/she is in danger with the help of Internet of Things. The paradigm of healthcare is evolving with the integration of cutting-edge technologies. This article introduces a transformative Live Health Monitoring System utilizing the Internet of Things (IoT) to address the imminent threat of sudden heart attacks. The cornerstone of this innovation is a wearable device equipped with a pulse oximeter sensor, designed to detect critical health indicators. In the event of abnormal readings, the ESP32 SIM800L module seamlessly communicates with healthcare providers or guardians, leveraging the power of IoT. The proposed system aims to significantly reduce mortality rates associated with sudden cardiac events, providing real-time health monitoring that empowers individuals to proactively manage their well-being. Through the amalgamation of advanced sensors and IoT connectivity, this initiative marks a pivotal step towards personalized, accessible, and immediate healthcare interventions.

Keywords: Health Monitoring, Heartbeat, Blood Pressure, Pulse Rate, Doctor.

Introduction

Health is the one of the important factors for any individual living in this world. This article mainly addresses the death which may occur due to sudden heart attack. In this article a sensor named pulse oximeter is used to detect the blood pressure rate of the individual if the value of blood pressure rate reaches its abnormal value, ESP32 SIM800L module automatically sends the information about the individual's condition to the individual's doctor or to his/her guardian. In an era where technology seamlessly intertwines with daily life, harnessing its potential to safeguard human health has become imperative.[1] This article delves into a groundbreaking initiative — the "Live Health Monitoring System Using IoT." The focus is on addressing the alarming frequency of sudden heart attacks through the ingenious integration of wearable technology and the Internet of Things (IoT).[2] By introducing a wearable device armed with a pulse oximeter sensor, this system strives to detect critical health indicators in real-time. The ESP32 SIM800L module serves as the orchestrator, facilitating instantaneous communication with medical professionals or guardians in the event of health emergencies.[3] In the labyrinth of advancing technologies, the amalgamation of health monitoring, IoT, and wearable devices stands as a beacon of hope, promising not only to mitigate the risks associated with sudden heart attacks but also to revolutionize the way we perceive and respond to health crises. This article unfolds the intricacies of this innovative system, presenting a comprehensive exploration of its objectives, methodology, and the pivotal role played by each major component in the pursuit of saving lives through proactive health monitoring.

Objectives

To reduce the death rate of the people due to sudden heart attack.

To make this project a wearable device by the patient.

Methodology

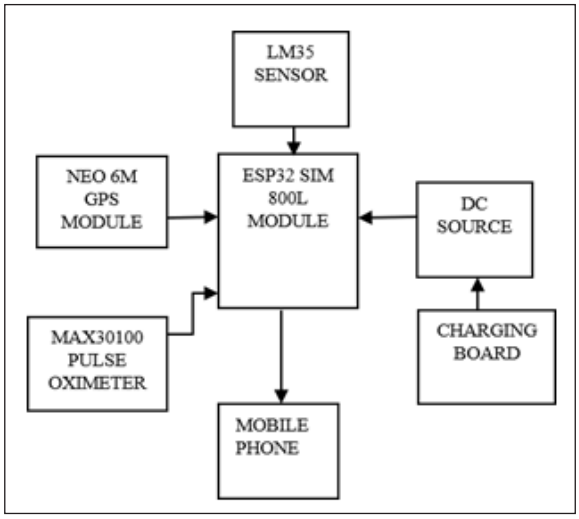

Figure 1. Block Diagram of the Proposed System

Major Components

- **ESP32 SIM800L MODULE:** ESP32 SIM800L MODULE is also known as TTGO-T-CALL MODULE. This module can connect to the internet at any time without using any WI-FI router. Here it is a combination of ESP32 development board and the SIM800L GSM/GPRS MODULE so the board can connect to the internet with the SIM card data plan which is fixed in the GSM MODULE.[4] It acts as the brain of the project as this board will send the notification/alert to the patient's guardian/doctor if any of the parameters reaches the abnormal value.

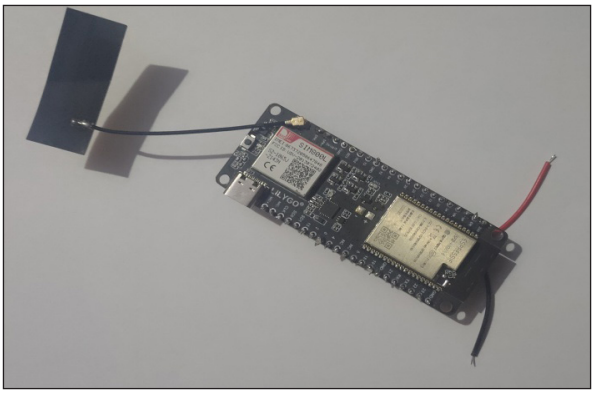

Figure 2. ESP32 SIM800L Module

MAX30100 PULSE OXIMETER: Pulse Oximeter is a device used to measure the blood oxygen level as well as the blood pressure or the heart rate. The sensors detect and calculate the blood oxygen level and the blood pressure level on the way light passes through finger. It is one of the non-invasive methods for monitoring a person oxygen saturation as well as the blood pressure. Pulse oximeter is one of the important sensors which is being used here in this article.[5] It is used to measure the heart rate or the blood pressure per minute value of the patient, there are certain limits for the heart rate to be, if the patient's body violates the limit, then the patient will be in danger. Similar to that of the heart rate there are certain limits for oxygen level in the blood too. If it violates then the person will suffer from chronic diseases like asthma, etc. MAX30100 sensor will send the values of oxygen level and heart rate to the ESP32 SIM800L module which acts as the microcontroller will detect all those values and if it finds any abnormal values, the ESP32 will notify that to the SIM800L module so the SIM800L module will send the notification to the patient's guardian or to the patient's doctor.

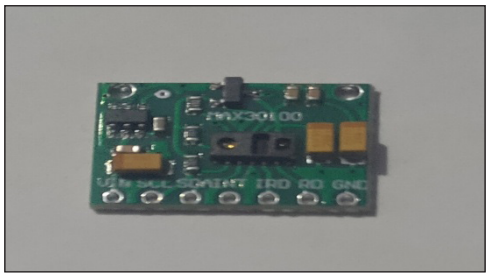

Figure 3. MAX30100 Pulse Oximeter

NEO 6M GPS MODULE: GPS module is mainly used to track the patient's location in order to give him the medical assistance as soon as possible, if he is affected by any of the diseases. It mainly checks its location on the earth and provides the latitude and longitude of its location as the output. Here NEO 6M GPS module is used, it can track up to 22 satellites on 50 channels. Operating voltage of NEO 6M GPS module is 2.7V ~3.6V, Operating temperature is -40oC~85oC, the supply current is 45mA and the Navigation sensitivity is -161dBm.It is mainly used for its excellent performance even in the challenging environment.6 If any notification is need to be sent, GPS module will send the latitude and longitude to the ESP32 board which in turn sent latitude and longitude to the SIM800L board so the notification will send to the patient's guardian/doctor along with the latitude and longitude so they can reach him/heras soon as possible.

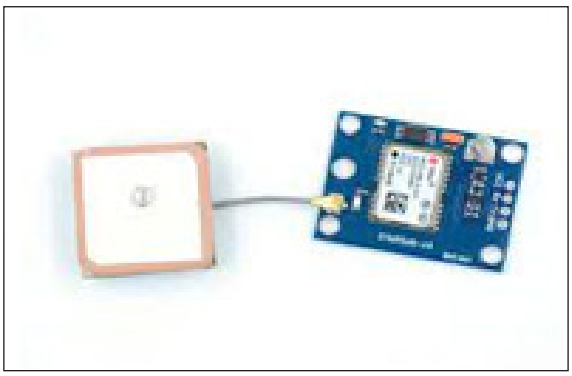

Figure 4.NEO 6M GPS Module

LM35 Temperature Sensor LM35 is integrated device which is used to measure the Temperature of the body. The output of the LM35 sensor is the voltage which is linearly proportional to the temperature in centigrade. The operating range of LM35 sensor is -55oC to 150oC. The sensitivity of the LM35 temperature sensor is 10mV per degree Celsius. It is very much useful in detecting the ambient air temperature as well as the localised body temperature. LM35 sensor sends the analog value of temperature to the ESP32 board where the ESP32 board converts the analog value into the digital value using the Analog to Digital Converter (ADC) and reads the value. If the temperature reaches the abnormal value notification will be sent to the concerned person.

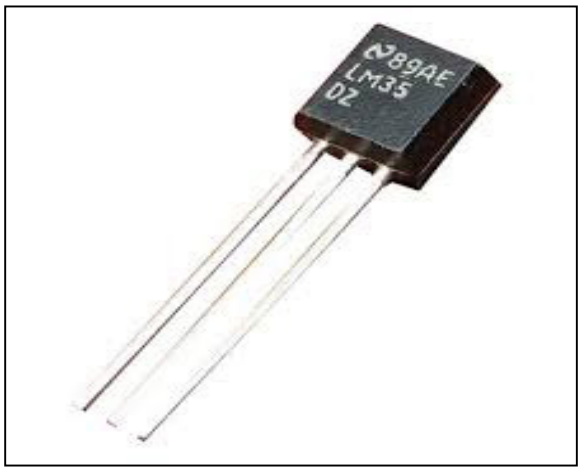

Figure 5. LM35 Temperature Sensor

Figure 6.7V 600mAh Lithium Polymer Battery

BATTERY

3.7V Lithium Polymer (Li-Po) battery is used to power the entire the system. It is a rechargeable battery which can be charged using the 5V charger. For charging, A separate charging circuit board is used. The battery is very thin, light weight and powerful. The capacity of the battery is 600 mAh. Lithium polymer is mainly used for its long-life cycle, safety, good charging and discharging characteristics.

Table 1.Components Specifications

Components	Size in mm
ESP32 SIM 800L MODULE	78.83 x 28.92 x 8.06
NEO 6M GPS MODULE	Antenna – 25 x 25 x 7 GPS Board – 22 x 30 x 4
MAX 30100 PULSE OXIMETER	19 x 14.5 x 3
LITHIUM BATTERY	42 x 25 x 8 VOLT: 3.7v CAPACITY: 600mAh
CHARGER CIRCUIT BOARD	25 x 19 x 6
LM35 SENSOR	19.4 x 2.54

Proposed System

We mainly focus on health as health plays a major role in every one's life. If your health is good, you can do whatever you want. ESP32 SIM800L is the microcontroller cum GSM module being used here in this project. The sensors are MAX30100 pulse oximeter and LM35.In addition NEO 6M GPS module is also used in this project. If a heart patient travelling or utilizing public transport let, we assume that he is not well as his heart rate reaches the abnormal value. If he wore the proposed system it will automatically sends the information about his abnormal heart rate value to his/her guardian/doctor with his/her current location so he/she can get the medical assistance as soon as possible thereby his/her life is being saved. Annually 7 lakh SCD (sudden cardiac death) cases occur in India.[7] This proposed system will surely reduce the SCD cases in India. Oxygen level in the blood should be maintained if it reduces below the permissible levels the patients may suffer from chronic diseases like asthma, etc. Blynk app is used for monitoring the values of heart rate, temperature as well as the oxygen levels using mobile phone. Blynk app can also track the patient's location using the map which is available in the blynk application.

Novelty of the Work

- A portable device which can be carried along with patients every time.
- Live monitoring of the patients and the results can be seen at any instant.
- GPS module helps to find the patient's location at any instant.

- Individuals can self-monitor themselves rather visiting hospital often.
- Notification will send to the patient's doctor if there is any abnormal change in heart rate.
- ESP32 SIM800L module helps us to connect to the internet at any time.

Table 2.Normal and Abnormal Values of Heart Rate and Oxygen Level

Parameters	Normal range	Abnormal range
Heart rate during resting period (for non-athletes)	60-100 bpm	Above 100 bpm Below 60 bpm (results in Bradycardic)
Heart rate during workout period (for non-athletes)	Maximum limit=220-age Let we assume age is 20 so the maximum limit is 200 bpm	For the person of age 20, above 200 bpm is danger
Oxygen level in the blood	94% - 100%	Below 90% is danger
Temperature	98.6°F	Above 100°F is danger

The above table describes the range of adults those who are above the age of 12. For athletes the bpm level can range between 30-40 bpm because regular exercise strengthens their heart muscle which allows it to pump a greater amount of blood with each heartbeat. Normally in human body temperature changes depends upon the age, condition of atmosphere, and health status.[8] Normally human body temperature slightly from persons to persons. Temperature above 100°F is the case where one should look into.

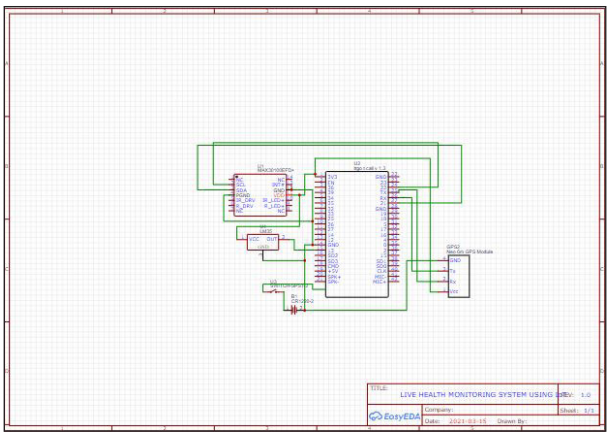

Figure 7.Hardware Circuit

Hardware Circuit

The above hardware circuit is designed with the help of software name EasyEDA. All the major components were used to in the above diagram to design the proposed system.

Project Outcomes

1. A wearable device which continuously monitor the individual and sends the information to the doctor if he/she is not well.
2. To reduce the death rate which occurs due to the sudden heart attack.
3. This project will make the patients to feel more safer even he/she is not in the hospital.

Conclusion

If this idea gets converted into a project, it will save lot more peoples those who are in danger mainly due to heart related diseases. This will also make the people to feel more safer even if they are not in hospital. This necessary health kit is useful for us to monitor ourselves rather visiting hospitals often.

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