DESIGN AND DEVELOPMENT OF REAL-TIME TELE-HEALTH MONITORING SYSTEM FOR COVID-19 PATIENTS

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ABSTRACT
In early 2020's we have faced the pandemic caused due to COVID-19 Virus. According to WHO report they are more than 75 crores conformed cases and 68lakhs deaths globally caused because of this virus. The COVID affected patients need to be isolated and it is very difficult during that situation to visit hospitals and check their vital health conditions like temperature, heart rate, SpO2 etc and to monitor these parameters in real time is difficult . To acknowledge this problem, we have come up with a solution by developing a real time tele-health monitoring system to overcome the problem of monitoring in real time and communicating via telephone. In this paper we have designed an IoT based system that measures health parameters of covid affected as well as normal patients and communicates through phone call or message when the health parameters goes beyond the predefined normal health parameter values.

INTRODUCTION
As we know from past two years, we are suffering with COVID-19 and this pandemic has affected people's health and lifestyle a lot. So due to this we were self-isolated and unable to go to outdoors and were requiredto maintain social distance. People who need to go to hospitals to check their health conditions are confinedto homes and it was difficult to know their health status. For this purpose, we developed this system real timetele-health monitoring system. This system is not only for COVID patients, it is also helpful for the people who are unable to go to hospitals frequently for health check-up and people who need to measure they vitalhealth conditions during COVID. It is real time device which monitors the patients' health conditions continuously and if the situation crosses beyond the normal health parameters it gives a message or call to the pre-defined number which is the given emergency contact. The measured temperature, SpO2 and heart beat is displayed on the LCD. Buzzer will sound when the health conditions goes beyond the normal health values. Speaker and microphone are connected to the SIM800l module so that the person can speak throughthe microphone and hear others voice from speaker when a call is connected, a buck converter is connected to SIM800l module as this module takes only 3.4-4.3 v as input to achieve that a buck converter is connected
.All the sensors and components are connected to Arduino UNO which is a microcontroller board and our program is dumped in the Arduino IDE .

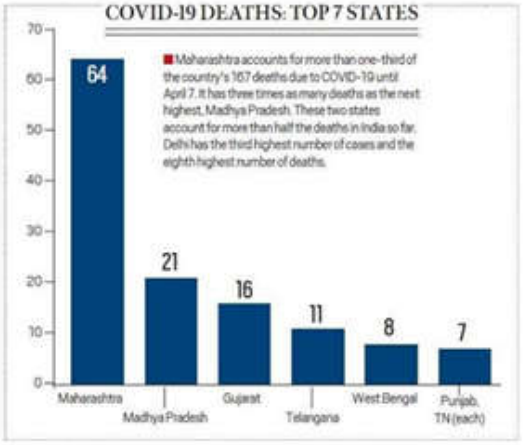

Figure 1: Flow chart of deaths in India

LITERATURE SURVEY

1. Md. Milon Islam, Ashikur Rahaman, Md. Rashedul Isla, “Development of smart health care Monitoringsystem in IoT environment”. This paper provides a healthcare system in IoT environment to monitor the health signs and room conditions also. The rate of success of this system is greater than 95%. It produces values similar to the actual data. It is very simple to design and use. It can perform tests even the patients are not in the hospital also. But this is bulky system to used as a wearable device.
2. M. A. Kumar and Y. R. Sekhar, "Android based health care monitoring system," This system consists oftwo sensors, Bluetooth module and Arduino UNO. Sensors are connected to the microcontroller. All the sensor values are obtained in analog form and gives to Arduino board. Analog values are converted to digital form by inbuilt ADC. These values are uploaded to the mobile through Bluetooth and if the values are increasing more than the threshold values it gives a warning. It can also upload to the cloud via androidapp and the conditions are observed by the remote doctor.

3. R. Kumar; M. Pallikonda Rajasekaran, “An IoT based patient monitoring system using raspberry Pi”, This paper monitors the temperature, heart rate and respiration conditions of a patient and send results tothe raspberry pi and monitors anywhere through internet source. It can reduce the patients money and waiting at the hospitals.

4. In the recent health awareness environment those usage of IOT innovation organization acquires accommodation of professionals and also patients, since they are connected to different medical fields. A sensor node needs to be arranged on the apparent of the patient body will gather the entire signal from those wireless sensor and also send them of the body sensor node. Those connected sensor nodes on the patientâ€™s body can make in the structure of a wireless body sensor network furthermore they have the capacity with sense those heart beat rate, temperature of surroundings. That basic focus to this system may be on transmitting the individualsâ€™ patientâ€™s health watching parameters through wireless communication in crucial conditions. We propose a secure IOT built health awareness monitoring and will check that saline level of the patient.

5. Patient‟s health monitoring and treating the diseases of patients at home accordingly by using those equipments present in medical devise such as ventilators, dialysis machine and patient monitor device. This device is expensively suitable and reasonable for patient at home which is liable to power outages. The earlier existing method allows patients to go to hospitals for monitoring DME report or by contacting hospitals through landlines, the cell towers, Ethernet or by the Internet. Now here were port here a new wireless system that utilize a radio ad hoc network to automatically report the patient‟s information and location, and the DME information and status to a nearby hospital when a power outage is detected.

6. Android based mobile data acquisition (DAQ) solution, which collects personalized health information of the end user, store analyze and visualize it on the smart devices and optionally sends it towards to the datacenter for further processing. The smart mobile device is capable to collect information from a large set of various wireless (Bluetooth, Wi-Fi, cloud, and GPRS) and wired (USB) sensors. Embedded sensors of the mobile device provide additional useful status information (such as: user location, magnetic or noise level, acceleration, temperature, etc.). The user interface of our software solution is suitable for different skilled users, highly configurable and provides diary functionality to store information (about sleep problems, can act as a diet log, or even can be used as a pain diary). The software enables correlation analysis between the various sensor data sets. The developed system is tested successfully within our Living Lab facility. Sensor data acquisition on the personal mobile device enables both end users and care givers to provide better and more effective health monitoring and facilitate prevention. The paper describes the internal architecture of the

software solution and its main functionalities.

PROPOSED BLOCK DIAGRAM

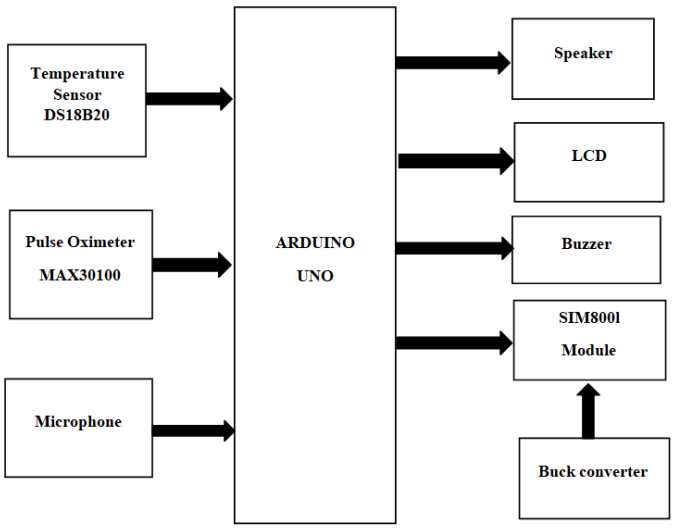

Figure 2: Block Diagram of the proposed system

HARDWARE REQUIREMENTS

Arduino UNO

Arduino UNO is a microregulator board grounded on ATmega328P. It has 14 digital input pins, 6 analog inputs, a USB connection, a power jack and a reset button. It needs everything demanded to support the microregulator, simply connect it to a computer with a USB string.

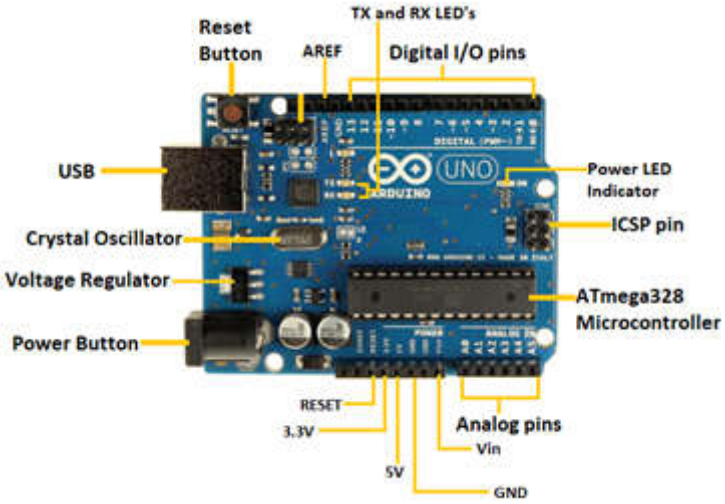

Figure 3: Arduino UNO

SIM800l Module

SIM800l module is a miniature gsm modem which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Operating voltage of this chip is from 3.4v - 4.3v. It has total 12 pins and a VCC supplies power to the module. It needs an external antenna to connect to a network. An external power source like DC-DC buck converter or lithium battery is used for this module to work.

Figure 4: Sim800l Module

DS18B20 Temperature Sensor

The DS18B20 is one type of temperature sensor and it supplies 9 to 12 bit reading of temperature. It can done through a one-wire bus protocol which means it used one data line for communication. It does not require external power supply, as it get directly from the data line. This sensor operating voltage is 3.0v to 5.5v.

Figure 5: Temperature sensor

MAX 30100 Pulse Oximeter

MAX30100 is a device which uses to monitor the heart rate and also used as pulse oximeter. It consists of a Light emitting Diode(LED) and an IR sensor. It has a signal processing unit which is used to improve the quality of the output signal. Its operating voltage is 1.8v to 3.3v.

Figure 6: Pulse Oximeter

LCD Screen

The term LCD stands for liquid crystal Display. It is a kind of electronic display module used in a numeric range of applications like different kinds of circuits and devices. The main advantage of using this LCD is, it is economical and easily programmable. It can easily display the special characters also.

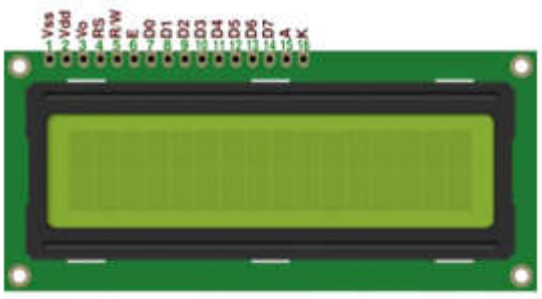

Figure 7: LCD Display

HARDWARE IMPLEMENTATION

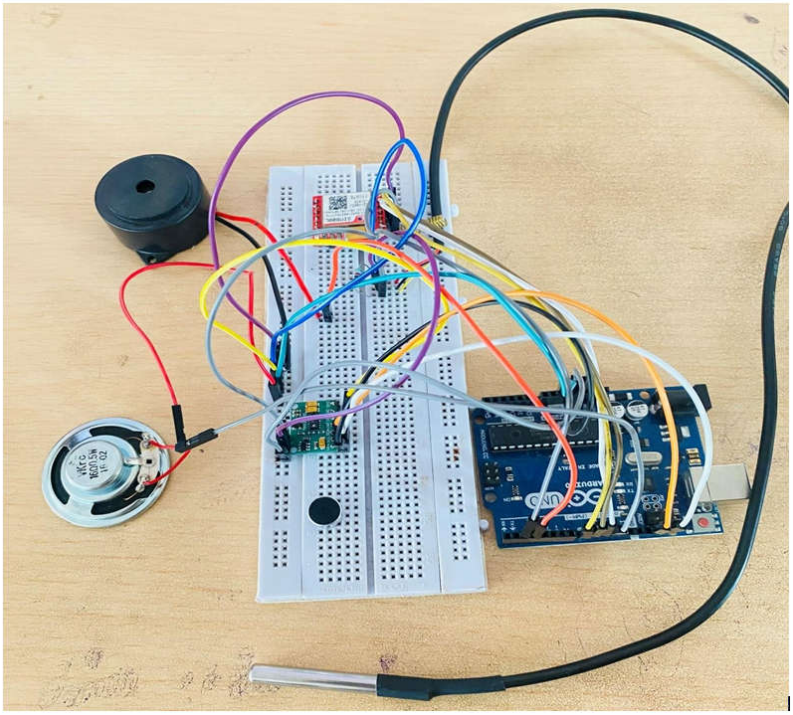

Figure 8: Hardware implementation

METHODOLOGY

In this system we are using DS18B20 Temperature sensor, MAX30100 pulse oximeter and Microphone as inputs and SIM800l, speaker, LCD and Buzzer as outputs. Temperature sensor is used to measure the temperature and pulse oximeter is used to measure heart rate and SpO2 levels. These are interfaced with Arduino UNO to measure the health parameters like temperature, Heart rate and SpO2 etc. The values will be displayed on the serial monitor as well as LCD. If the temperature and heart rate increases beyond the pre -defined values it can send message and call to the doctor and family members and the buzzer will give the warning alarm and when the call is connected we can speak through microphone and hear others voice through speaker.

FLOW CHART DESCRIPTION

The main objective of this system is to monitor the health parameters of a patient. It can be done in the following steps:

1. Firstly, the temperature sensor and pulse oximeter sensor will take the readings from the patientbody.
2. The normal human body temperature is between 36.1°c and 37.2°c. If the readings are increases or decreases beyond that values the buzzer gives a warning alarm and readings displays on LCD.
3. Similarly for pulse oximeter, the normal heart rate is 60 to 100 Bpm. If it reaches beyond the limitsthe buzzer will gives an alarm sound and readings will displays on LCD.

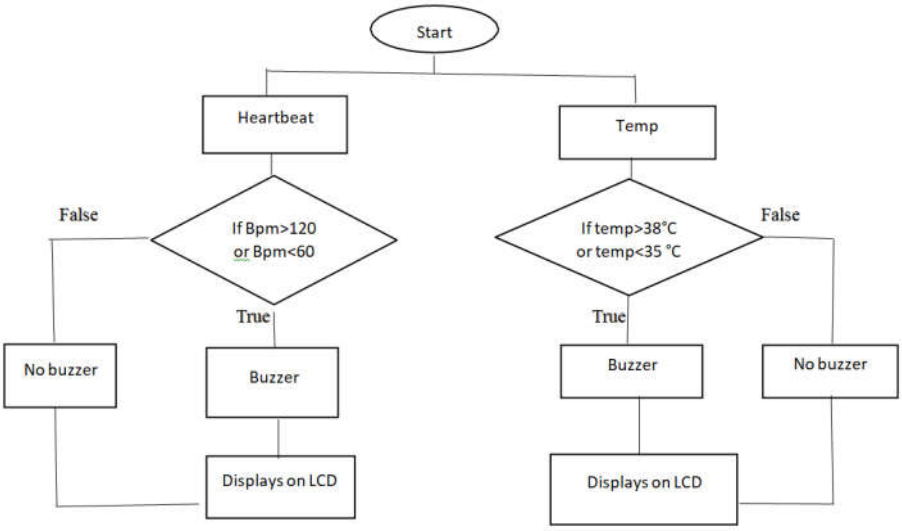

Figure 9: Flow chart

RESULTS

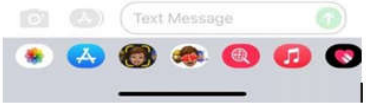

Figure 10: output

Figure 11: output through call

Figure 12: serial monitor output

CONCLUSION

The developed system will help the people who are unable to go to hospitals and check their health conditions like temperature, heart rate and SpO2 frequently or in case of Covid. This work is concentrated on developing the low-cost device which can be monitored continuously. It also provides real-time alert to the doctors and family members i.e. it can send and receive messages and calls through SIM800l module and displays on LCD when the health conditions goes critical or beyond the normal human temperature values.

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