IoT Based Real Time Monitoring of Covid Infected Remote Patients

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Abstract- *Covid 19 forms a chain when trade an affected guy comes in contact with others. It's very troublesome for us to discover whether the person is bearing Covid or not. In this project, we are suggesting a wearable device that can monitor Covid 19 symptoms. The projected foundation resides of 4 sensors for cough rate, social distancing, body heat, cough rate, and minimum distance. In the early months of the Covid-19, there is no proper device to detect and monitor the affected ones, the only way to avoid covid is self-isolation and avoiding physical contact.*

Here is a linked use of the Internet of things accompanying the Medical area to confirm the security of each individual in this place pandemic time. The projected offers: 1) a cheap and minimal weight IoT node to monitor one's body temperature, heart rate, and rhythmically monitor cough rate; 2) a smartphone app to display the values and parameters.3) a tracking device system to alert the person to make proper social distancing and 4) a fog server that collects the information from the IoT sensors and update the details in a system to monitor the person.

Keywords- Patient Monitoring, Covid Detection, Symptoms Finder, Alert Message during Emergency, To findout Patient Location, GPS & GSM Module, Real Time Monitoring Using IoT

I. INTRODUCTION

In recent days, the Internet of Things (IoT) brings new opportunities in many applications, including smart cities and smart healthcare. This paper proposes a COVID 19 detection and monitoring system that would collect real-time symptom data from wearable sensor technologies with the help of the Internet of Things(IoT). Day by day the death rate of COVID patients was increasing rapidly. COVID 19 also causes respiratory problems, high fever, cough, throat pain, etc.

The evaluation of this disease hiding the basic symptoms and possibilities of affecting another person. As it is highly transmittable this disease might spread at an exponential rate which takes the lives of thousands of people,So it is necessary to identify and monitor the covid affected person before spreads. Unlike other diseases covid can't be found with one symptom such as fever. So scientists have said that the covid-affected patients will have three main symptoms such as high fever, cough, and an increase in heart rate. So to find all of these symptoms in a person we must have a device to detect all of these symptoms.So it is easy to identify COVID affected people and make themself's self quarantined

After that, it is necessary to monitor them. So these sensors are connected with IoT to get the heart rate, temperature, and cough rate in a system. If the condition is critical, then a message will be sent to their caretaker.

II. RELATED WORKS

Internet of Things (IoT) is a creative technique used to get information and monitor the COVID-19 pandemic situation. This Internet of Things(IoT) can be used to handle challenges during pandemic lockdown-like situations. IoT would help to provide an automatic and transparent treatment to the affected patients during the pandemic situation. The fixed healthcare system is useful to monitor the patients, by making an interconnected network. This technology helps to increase the chances of finding and monitoring the patients and reduces the readmission rate in the hospital.The IoT can help to provide a remote diagnosis for the disease before hospitals for more efficient treatment. For example, the blood glucose level is continuously monitored by using IoT devices for Diabetic patients; Those blood glucose data will be sent to doctors who are taking care of them. If there is any risk for them, then an alert message will be sent to the doctors.

There is an IoT e-health system that works on Wireless Sensor Networks (WSN) used for firefighters. Many IoT devices can be controlled through an app on a smartphone, so smartphones do play a large role in IoT technology. The thermostat can be communicated by using the smartphone.This study helps to find and cure the infected person in the early stages.The sensors and mini-computer processors in the IoT device help to collect the data from the sensor.

III. PROPOSED METHODOLOGY

In this article, the proposed COVID system offers the following:1) a cheap and minimal weight IoT node to monitor one's body temperature, heart rate, and rhythmically monitor cough rate; 2) a smartphone app to display the values and parameters.3) a tracking device system to alert the person to make proper social distancing and 4) a fog server that collects the information from the IoT sensors and update the details in a system to monitor the person. This system mainly consist of combination of three modules.These modules comine to form our system.

IV. MODULES

A.Temperature Sensor

The temperature sensor is an electronic device that measures the temperature of the surroundings and converts the input signal into electronic data to monitor, and record the temperature changes. There are different types of temperature sensors. Some require direct contact with the physical object that is being monitored to record the temperature(contact temperature sensors) while others indirectly measure the temperature of an object (non-contact temperature sensors). The infrared (IR) sensors are usually Non-contact temperature sensors. The IR energy emitted by an object is detected remotely and sends a signal to a calibrated electronic circuit which determines the temperature of the object.

Specifications:

- Local sensor accuracy (Max) (+/- C):0.5
- Operating temperature range (C) :40 to 110, 0 to 100, 0 to 70
- Supply voltage (Min) (V) :4
- Supply voltage (Max) (V) :30
- Supply current (Max) (uA):114
- Interface type :Analog output

B. Cough rate Sensor

The main symptom of COVID is cough. So this cough rate sensor is used to detect the cough rate of the person. There will be no indication of a mild cough. But if the cough is severe, the cough rate sensor indicates the cough signal data and send it to the system database.

Specifications:

- Operating voltage range: 4-12V
- Operating current (Vcc=5V): 4-8mA
- Voltage Gain (VS=6V, f=1 kHz): 26dB
- Microphone sensitivity (1Khz): 52-48dB
- Microphone Impedance: 2.2KΩ
- Microphone Frequency: 16-20Khz
- Microphone S/N ratio: 54dB

C. IR Sensor

The IR sensor senses the nearby object. So when a person comes near to the infected person,automatically senses and alerts the person to maintain social distancing. The working of this IR sensor is simple when a person comes near the sensor,the Infrared light from the LED reflects the object, and the receiver detects the signal. And thus whether the person is maintaining a proper social distancing or not is identified. So these Sensor helps to monitor the patient social distance in timely manner. Suppose it's detect it's to be send the emergency alert for affected person.

Specifications:

- The operating voltage is 5VDC.
- I/O pins – 3.3V & 5V.
- Mounting hole.
- The range is up to 20 centimeters.
- The supply current is 20mA.
- The range of sensing is adjustable.
- Fixed ambient light sensor

D. Heart rate sensor

The principle of photoplethysmography is used in the heartbeat sensors. The change in volume of blood through any organ of the body is measured which causes a change in the light intensity through that organ (avascular region). In the main application where heart pulse rate is to be monitored, the timing of the pulses is more important. The rate of heart pulses decides the flow of blood volume is decided by and since light is absorbed by the blood, the signal pulses are equivalent to the heartbeat pulses.

Specifications:

- This is a heart beat detecting and biometric pulse rate sensor.
- Its diameter is 0.625.
- Its thickness is 0.125.
- The operating voltage ranges +5V otherwise +3.3V.
- This is a plug-and-play type sensor.
- The current utilization is 4mA.

E. Arduino UNO

The Arduino Uno is a microcontroller board grounded on the ATmega328 sheet. It contains 14 digital input/output pins (out of which 6 can be utilized as PWM outputs), a 16 MHz ceramic resonator,6 analog inputs, a power jack, an ICSP header, and facilitation for USB connectivity, and a reset button. It is designed to assist that support the microcontroller in every possible way.

Specifications:

- USB Programming Facilitated by the CH340G.
- Input voltage - 7-15V.
- 0-5V outputs with 3.3V compatible inputs.
- 14 Digital I/O Pins (6 PWM outputs).
- 32k Flash Memory
- 16MHz Clock Speed.

F. Node MCU

ESP8266 offers an entire and self-contained Wi-Fi networking solution, allowing it to either host the application or to dump all Wi-Fi networking functions from another application processor. When ESP8266 hosts the appliance, and when it's the sole application processor within the device, it's able to boot up directly from an external flash. It has an integrated cache to boost the performance of the system in such applications, and attenuate the memory requirements.

Alternately, serving as a Wi-Fi adapter, wireless internet access may be added to any microcontroller-based design with simple connectivity through the UART interface or the CPU AHB bridge interface.

Specifications:

- SDIO 2.0, SPI, UART
- 32-pin QFN package
- Integrated RF switch, balun, 24dBm PA, DCXO, and PMU
- Integrated RISC processor, on-chip memory, and external memory interfaces
- Integrated MAC/baseband processors
- Quality of Service management

G. GPS Module

The Global Positioning System (GPS) may be a satellite based navigation system that has location and time information. The system is freely accessible to anyone with a GPS receiver and unobstructed line of sight to a minimum of four of GPS satellites. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites.

GPS is nowadays widely used and also has become an integral part of smartphones.The GTPA010 module is simple to use, having RS232 similarly as a USB interface. It operates over a 3.2 to 5V supply range thus enabling interfacing with microcontrollers with 3.3V also as 5V. The module outputs GPS data in NMEA0183 format. Each message string starts with '$' and then the message identifier. Each parameter is separated by employing a comma so the message are often parsed with the assistance of the commas.

Specifications:

- Maximum navigation update rate: 5Hz
- Default baud rate: 9600bps
- EEPROM with battery backup
- Sensitivity: -160dBm
- Supply voltage: 3.6V
- Maximum DC current at any output: 10mA
- Operation limits: Gravity-4g, Altitude-50000m

H. GSM Module

A GSM module or a GPRS module could be a chip OR gate which will be accustomed establish communication between a mobile device or a machine and a GSM or GPRS system.

The modem (modulator-demodulator) may be a critical part here.These modules incorporates a GSM module or GPRS modem powered by an influence supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. A GSM modem may be an avid modem device with a serial, USB or Bluetooth connection, or it will be a movable that gives GSM modem capabilities.

Specifications:

- Quad-Band 850/ 900/ 1800/ 1900 MHz
- Weight: 3.4g
- GPRS multi-slot class 10/8
- GPRS mobile station class B
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)

- Dimensions: 24*24*3mm
- Compliant to GSM phase 2/2+ , Class 4 (2 W @850/ 900 MHz) , Class 1 (1 W @ 1800/1900MHz)
- Operation temperature: -40°C to +85 °C

I.Buzzer

An Arduino buzzer is also known as a piezo buzzer. it's basically a small speaker that you just can connect to an Arduino. It will make the sound a tone at a frequency you set. The buzzer produces the sound-supported reverse of piezoelectricity. It is mainly used as an output device in an electronic circuit. Output in an electronic system is where power or information leaves the system. within the case of the buzzer, power is leaving it through means of audible sound, and is that the main reason a buzzer is an output device

J. Step Down Transformer

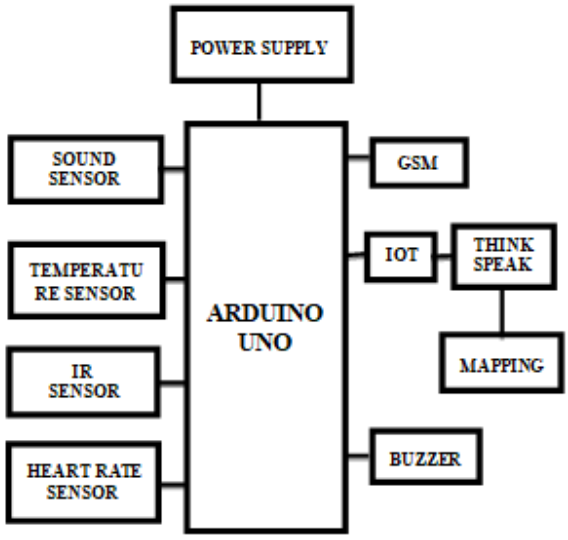
A step-down transformer is one type of transformer that converts the low current and high voltage from the primary side of the transformer to the low voltage and high current value on the secondary side of the transformer. The reverse of this transformer is known as a step-up transformer.

It transforms electrical energy (from primary side windings) to magnetic energy (in the transformer magnetic core) and again to the electrical energy (on the secondary transformer side). A wide variety of electrical systems and transmission lines use a step-down transformer.

Specifications:

- Primary: 240 VAC, 6.25 Amps
- Copper turning building
- Secondary: 110 VAC, 14 Amps Integrated RISC processor, on
- Transformer, 1.5 KVA, 1 PH, 60 Hz, 19272-1
- Copper transportbars are 1/8″ x 5/8″ accompanying individual dent.
- Open core and coil: 7.5″H x 7.5″W x 7.5″D

V. SYSTEM ARCHITECTURE



VI. SOFTWARE REQUIREMENTS

A. Arduino IDE

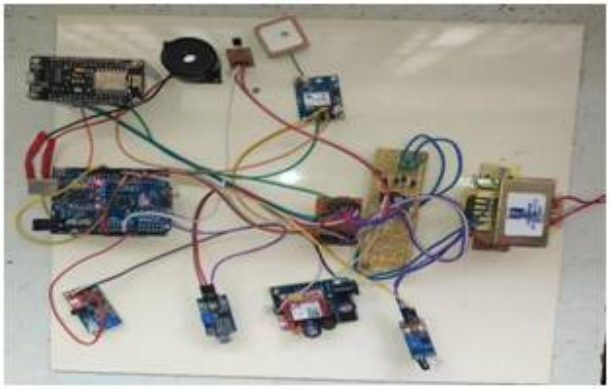
Arduino is an open-source platform used to build electronics projects.Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and software, or IDE (Integrated Development Environment) which runs on your computer.The IDE application is supported in various operating systems such as Mac OS X, Linux, and Windows. C and C++ are the languages that are supported in Arduino IDE.

Most programmable circuit boards need a separate piece of hardware(Called a programmer).But Arduinodoesn't need that.A simple USB cable is used to load new code onto the board.

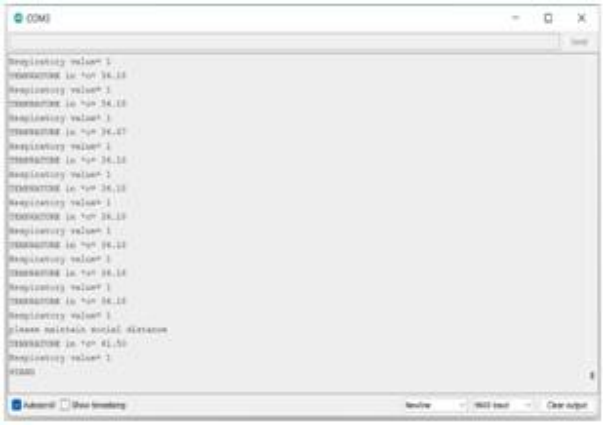
VII. EMBEDDED C

- Embedded C is the most preferred programming language in the software field for developing electronic gadgets.
- Each processor employed in an electronic system is associated with embedded software.
- Embedded C programming plays a vital role in performing specific functions by the processor.
- In day-to-day life, we used many electronic devices such as cell phones, washers, cameras, etc.
- The working of these devices is based on microcontrollers that are programmed by embedded C.

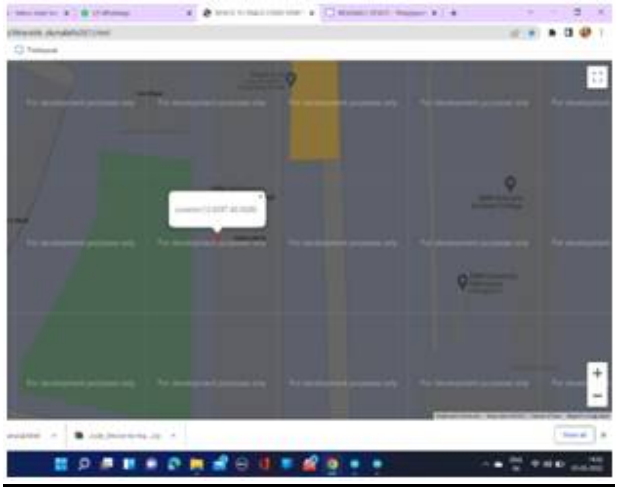
VIII. HARDWARE IMPLEMENTATION



IX. OUTPUT & RESULTS



Sensors Output (Temperature, Cough Rate, Heartbeat, GSM



Mapping Location using GPS Module

X. APPLICATIONS

- To monitor the patient remotely.
- To reduce the direct contact between doctors and patients
- Send the SMS during an emergency
- Restrict the patient in isolated places and track the status in a very timely manner.
- To find the patient location in the critical situation (home quarantine
- This kit also helps to observe the conventional(Regular)Patients in hospitals.

XI. CONCLUSION

- The research describes a low-cost and adaptable Medical gadget concept for detecting and tracking COVID 19 symptoms.
- The most basic arrangement, which simply requires headphones and mobile phones, is capable of identifying respiratory disorders.
- The concept may be expanded to include additional sensors for monitoring heart rate, temperature, and oxygen saturation, sending messages(GSM), and Location finder(GPS).
- The method produced good and consistent results, and it might be considered one of the viable alternatives for symptom identification during COVID-19.

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