International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 4 Volume No.6 Aug-Sept – 2022
DOI:10.46647/ijetms.2022.v06i05.002 ISSN: 2581-4621

IOT Based Health Monitoring System for Covid Patients

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ABSTRACT
The number of COVID patients is rising quickly in the midst of the present pandemic. For the doctors, it is quite demanding and requires a lot of patience to keep track of all the COVID patients. This system is employed to continually keep track of the patient's health in order to remedy this. The patient's temperature, heart rate and SPO_2 rate will be tracked by this system. As The corona virus and other viruses, as is well known, pose a threat to civilization and are hazardous. Our ability to monitor the patients health problems is made possible by this method. In this framework suggests, a few sensors, GSM and LCD are connected to Raspberry pi, nodeMCU, and Arduino Nano. When an aberrant condition arises, the system afterwards keep track of the patient's health and notifies the doctor, the patient's family, and an anybody else who needs to know via an android app.
Keywords: Raspberry pi, IOT, sensors, GSM , LCD, nodeMCU and Arduino Nano.

1. INTRODUCTION

One of the extremely contagious diseases is covid. People are currently dealing with a pandemic situation. People must be quarantined due to the outbreak. Since the number of cases is rapidly rising, the government will offer immunization programmes to boost public health. Since it is a contagious condition, treating the patient is difficult for the doctors and requires a lot of patience. Although the number of cases is rising quickly, there are fewer doctors available. We have specific covid-19 Quarantine clinics set up to handle covid patients in the current situation. Because covid is so contagious, it is crucial to keep patients under continual quarantine but doctors must also keep an eye on their well-being. Keeping tabs on the health situations of many individuals in quarantine is getting more challenging as there are more cases. The following are the major issue:

1. Doctors must frequently check on patient's health.
2. Just for monitoring purposes, the doctors are at danger for infection.
3. The doctors must keep track of a rising number of patients.

We are here to create an IOT based health monitoring system that addresses these problems by enabling the online remote monitoring of many covid patients. The heart beat sensor, temperature sensor and spo2 sensor are used by the system to monitor the patient's heartbeat, temperature, and rate of oxygen saturation respectively.

The system then connects to a wifi internet connection to transfer this data over the internet utilizing wifi transmission. Microcontroller based circuitry powers the entire system. The IoT Gecko platform (IoT development platform) uses IOT to send and receive the data of the covid patients in order to display the patient's data remotely. If the patient touches the IoT devices emergency help button, an alert is remotely sent if any abnormalities in the patient's health are found.

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It is expensive, monotonous and occasionally seen that patients are required to stay in the hospital for nothing more than routine physical condition monitoring. Medical professionals often check the vital indicators such as heart rate, body temperature and spo2 throughout these observations. Both at home and in the hospital, individuals find comfort in this arrangement. Delayed detection and a lack of trained aid are two of the main causes of this enormous number of deaths. In the medical industry, health monitoring system are quickly expanding.

2. RELATED WORK

Using smart healthcare IOT, numerous researchers have worked on health prediction. The aggregate network of linked devices is referred to as the "internet of things," and the technology that makes it possible for connected devices to communicate with one another and with the cloud is referred to as "internet of things". IoT aims to connect all conceivable things so they can communicate with one another online and give people a secure, comfortable existence. IoT makes our world as interconnected as possible. Nowadays we virtually always have access to internet infrastructure and may utilize it anytime we want. Devices for embedded computing would be subject to internet impact. MP3 players, MRIs, traffic lights, microwave oven, washing machines, dishwashers, GPS even heart monitoring implants or biochips are prominent examples of embedded computing systems.

In order to gradually automate these processes, IoT tries to provide advanced communication (via the internet) between the aforementioned devices, systems and services. Imagine a world where everything is connected to share information and communicate with one another via various applications and standard protocol domains. In a word, the goal of IoT is to link all potentially interoperable things to the internet in order to give humans a secure, comfortable life. According to a recent study, we will have more than 20 billion IoT- enabled gadgets by 2020. This is made possible by device control and less radio costs. However, these vast fields present difficulties, including the absence of IP addresses and the need for environment and protocol development that are useful and compatible.

3. EXISTING SYSTEM

Currently, the technology utilized for patient monitoring is a fixed monitoring system that can only be used when the patient is in bed. Only the intensive care units (ICU) of hospitals offer these enormous systems. It is the standard approach employed in hospitals. The ICU patient monitoring system is connected.

In the conventional approach, patients are expected to be in hospital beds. Physiological data are used to monitor the patient via this system. Two or more observations will be manually recorded, with the results being analysed before the state of the patient in question is changed with a course of treatment

In a hospital, a nurse or a doctor must physically go from one patient to another for a health exam, making it challenging to continuously assess their condition. As a result, unless the nurse or doctor immediately assesses the patient's health, any critical conditions cannot be easily detected. These specifications have led to the widespread establishment of ICUs in hospitals. The following uses of computers are almost widespread in such units are

- To regularly or constantly collect physiological data, such as blood pressure readings.
- To compile, store and report data.

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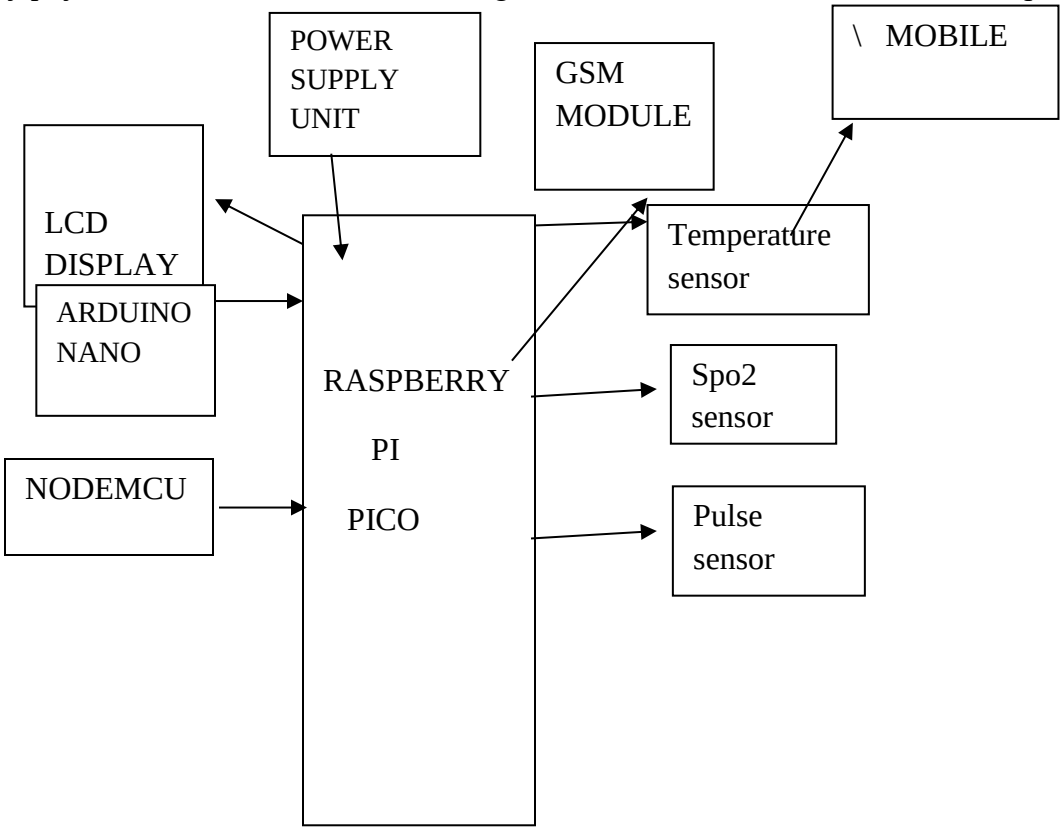
- To transmit data between distant places and data-producing equipment (e.g.., laboratory and radiology departments).
- To combine and correlate data from several sources.
- To offer clinical alerts and advice based on several data sources.
- To serve as a tool for making decisions that medical personnel can utilize to organize the care of seriously ill patients.
- To assess the severity of a patient's condition in order to classify them.
- To evaluate the outcomes of ICU care in terms of both clinical and financial efficiency.

4. PROPOSED SYSTEM

This device would continuously track vital body functions including heart rate, temperature and spo_2 and compare them to a predetermined value set. If these numbers exceeded a certain threshold, it would automatically notify the parties involved. The monitoring system's main goal is to keep an eye on the patients, and the message is sent to the doctor who needs to know. For COVID patients, this system is appropriate. The covid patients are either in hospital beds or residencies.
When a patient is hospitalized, the system keeps track of all their bodily activities as well as metrices like heart rate, body temperature and spo_2 rate. If the patient in question moves, the ICU director and the concerned doctor will receive messages. If a patient is living in a facility and makes any physical movement, an alarm message will be sent to the home nurse and the patient's family.



Block Diagram of Proposed System

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5. WORKING PRINCIPLE

The following explanation will describe how the framework functions generally:

In the suggested framework, the sensors continuously capture the data and transmit signals as inputs to the raspberry pi pico through the GPIO pins. When an abnormal state arises, the spo2, pulse and temperature sensors detect it and sends the high value to the raspberry pi pico. When it receives a high value, it will send an alarm message. The device monitors a patient's whole bodily activity while they are in the hospital, as well as metrics like heart rate, body temperature, and spo2 rate. The ICU director and the concerned doctor will be notified if the patient moves. The home nurse and the patient's family will receive an alert whenever a patient who is living in a facility moves in any way. Through the GSM MODULE, the alert message will be sent.

6. HARDWARE DESCRIPTION

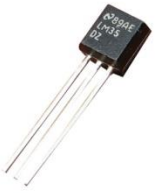
6.1 Raspberry pi pico

In comparison to earlier models, the Raspberry pi pico is significantly different. It is the first device to utilize the RP2040 "Pi Silicon,"a proprietary System on Chip (SoC) created by the Raspberry Pi team and equipped with a twin core Arm Cortex M0+ running AT 133 MHz, 264 KB of SRAM, and 2MB of flash memory for storing files.

Programming languages supported by the pico and third-party RP2040 boards include MicroPython, CircuitPython,C/C++ and Arduino. Even better, the Pico has Piper Play, a Python version built on blocks.The Pi Foundation's official supported languages are MicroPython and C/C++,although a related called CircuitPython has several advantages,like built-in-support for USB HID, which lets you use your pico as a keyboard,mouse or joystick that a PC can recognise any earlier models.

6.2 TEMPERATURE SENSOR

A temperature sensor is a gadget, such as a thermocouple or an RTD (Resistive Temperature Detector), that measures temperature and transmits the information in readable form as an electrical signal**.**The output of precision IC temperature sensor. LM35 is propotional to the temperature (in degree celsius).



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6.3 PULSE SENSOR

A pulse sensor is a plug-and-play sensor that records heart rate information**.** This sensor connects directly to an Arduino board via jumper cables and clamps onto the earlobe or fingertip. An open-source monitoring tool can be used to track the pulse rate in real-time.

6.4 SPO_2 SENSOR

A pulse oximeter is a medical device that produces a photoplethysmograph by monitoring changes in blood volume in the skin and the oxygen saturation of a patient's blood indirectly (as opposed to directly through a blood sample). It is frequently connected to a medical monitor so that staff members may constantly monitor a patient's oxygenation. For home blood-oxygen monitoring, there are now portable, battery-powered pulse oximeters. A pulse oximeter uses the SpO2 Sensor to perform pulse oximetry, a test that determines how much of the blood's oxygen-carrying haemoglobin molecules are actually carrying oxygen. By measuring the amount of red and infrared light absorbed by the blood, the SpO2 sensor determines the oxygen saturation. The ratio of the absorption of red light to that of infrared light varies with the concentrations of oxy HbO2 and deoxy Hb present.

6.5 ARDUINO NANO

A compact Arduino board called the Nano is built around an ATmega328P or ATmega628 microcontroller**.** The Arduino UNO board has the same connection. A sustainable, compact, reliable, and adaptable microcontroller board is referred to as the Nano board. In comparison to the UNO board, it is modest in size. The Arduino (IDE), which is available for a number of platforms, is used to arrange the Arduino Nano. Integrated Development Environment is referred to in this sentence (IDE).

The Arduino IDE and micro USB are the tools needed to get our projects running on the Arduino Nano board. On the aforementioned laptop or desktop, the Arduino IDE programme needs to be installed. The Arduino Nano board receives the code from the computer via the tiny USB.

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6.6 NODEMCU

NodeMCU is a development board and open-source Lua-based firmware that is specifically designed for Internet of Things (IoT) applications. It has hardware based on the ESP-12 module and firmware that runs on Espressif Systems' ESP8266 Wi-Fi SoC.

There are open source prototyping board designs for the NodeMCU open source firmware. Node and MCU are combined to form the moniker "NodeMCU" (micro-controller unit). In a strict sense, "NodeMCU" only refers to the firmware and not the related development kits.

6.7 LCD DISPLAY

A type of flat panel display known as an LCD (Liquid Crystal Display) operates primarily using liquid crystals. Since they are frequently used in cellphones, televisions, computers, and instrument panels, LEDs offer a wide range of applications for consumers and enterprises When compared to the technologies they replaced, such as light-emitting diode (LED) and gas-plasma displays, LCDs represented a significant advancement.

Compared to cathode ray tube (CRT) technology, LCDs permitted screens to be far thinner. As opposed to LED and gas-display displays, LCDs operate on the idea of blocking light rather than emitting it, which results in a significant reduction in power consumption. The liquid crystals in an LCD use a backlight to form an image where an LED emits light. LCDs started to be superseded by new display technologies like OLEDs as they took the place of earlier display technologies.

6.8 GSM MODULE

GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI). With a market share of more than 90% and operations in more than 219 countries and territories, it was developed to explain the protocols for second-generation (2G) digital cellular networks used by mobile phones.

7 SOFTWARE DESCRIPTION

7.1 PROTEUS SOFTWARE

A hex or debug files are applied to the microcontroller component on the schematic to implement the microcontroller simulation in proteus. It is then co-simulated with any attached analogue and digital circuits. This makes it possible to use it in a variety of project prototype scenarios, including

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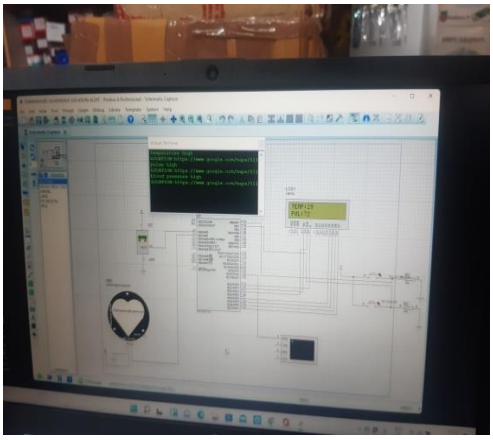
those involving motor control, temperature management, and user interface design. The proteus design suite is a collection of exclusive software tools used mostly for automating electronic design The programme is primarily used by technicians and electronic design engineers to produce printed circuit board manufacturing schematics and electronic prints. A Windows programme for schematic capture, simulation, and printed circuit board (PCB) layout design is called the proteus design suite. Depending on the scale of the designs being generated and the needs for microcontroller simulation, it can be acquired in a variety of configurations. An autorouter and fundamental mixed mode SPICE simulation features are included in all PCB design tools.

7.2 C COMPILER

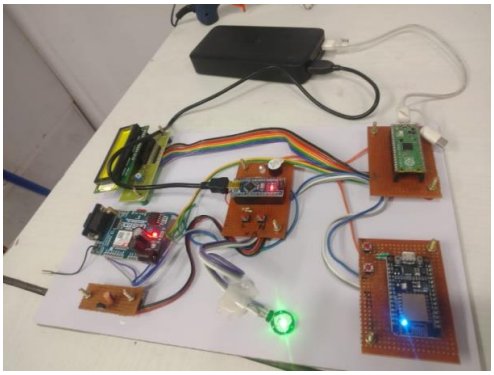
The C standards have created a set of language extensions called embedded C for the C programming language. Committee to handle C extensions for various embedded systems' difficulties with commonality. RS232, I/O, i2c, discrete i/o, and precise delays are included into the system .It enables source level debugging through integration with MPLAB and other emulators and simulators. standard hex file and debug files ensure compatibility with all programmers.

8. SIMULATION RESULTS

Proteus software is used to perform this simulation. The doctor, nurse, and patient's family members will be notified of changes in a patient's condition, and a hospital server's database will be used to record information about the patient's state as well as updates on it.



9. OUTPUT RESULTS



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Sensing devices keep an eye on the parameters. Reading an aberrant value**,** the raspberry pi pico uses a GSM MODULE to send an alert message.

10. CONCLUSION

The limitations of the current technologies have been overcome by a system that has been presented for the health monitoring of COVID patients**.** Therefore, this project will be a successful strategy for resolving the problems with the current approach and enabling society to benefit from comfortable hospitality services.

11. FUTURE SCOPE

Future updates to the framework will include new capabilities like breath sensor and touch sensor interfacing for accurate detection of respiratory and body-related issues in a single piece of equipment.

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