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Wearable Sensing and Tele health Technology with Potential Applications in the Corona Virus Pandemic

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Abstract: ***COVID19 has been a serious talk of town since its emergence as one of its impacts is also death. A virulent disease like COVID-19 results in unusual demands in various health care sectors, extraordinarily decreases the population, also it raises fear in the common public. whereas tremendous efforts at the top-notch area unit placed on police work, other health care works of doctors and nurses, it's conjointly extremely vital to look at the systems and technologies for braving malady exposure, stunning its unfold and particularly the strategy for diseases interference***
Keywords: Microcontroller, SpO2 Sensor, Arduino Nano, NodeMCU

I. INTRODUCTION

A pandemic of the corona virus disease has emerged, causing death and life-threatening symptoms. A large-scale pandemic, like COVID-19, puts tremendous demands on the global health systems, significantly devastates marginalized citizens, and poses a significant threat to global communities in ways that have never before been witnessed. It's important to look at the technology and methods for preventing disease emergence, halting its transmission, and especially the disease prevention plan. While significant efforts are being made on the front lines to identify the virus, provide treatments, and develop vaccines. In various application settings, this article's goal is to study sanctionative technologies and strategies for handling the COVID-19 dilemma.
The article will pay particular attention to:

1) Wearable devices suitable for monitoring citizens in danger and people in quarantine, as well as for assessing the health status of caregivers and force and facilitating hospital admissions hospital emergency processes;
2) Subtle sensing systems for identifying the disease and for monitoring patients with relatively mild symptoms whose clinical signs could suddenly worsen in sophisticated hospitals; and
3) Finally, any difficulties or chances for potential future help plan are addressed.

COVID-19 is a disease that makes breathing difficult. If people suffering from COVID19 are being exposed to anything they are allergic to or are in a situation which deviates their normal breathing patterns then their symptoms can become more critical. The issue of this disease is severe irrespective of how poor or rich the country is. Sadly there ais no cure for COVID19 disease yet but there are various medications and therapies invented by professional doctors which has proved to be very effective. The best possible way is to reduce the spreading of virus by taking necessary precautions. As a result, developing novel methods and equipment for COVID-19 diagnosis, especially affordable moveable devices, is a key job. Modern technologies are capable of providing critical tools for identifying a variety of disorders, including COVID-19. Currently, there is a trend toward painstakingly introducing new technologies, particularly in the creation of ultramodern low-cost moveable gadgets for diagnosing or covering human conditions.
COVID-19 is one of the most common chronic illnesses among adolescents and the third biggest cause of hospitalisation. Coughing, wheezing, and trouble breathing are symptoms of this medical disease. During the years 2008–2010, the prevalence of COVID-19 was higher in children than in adults. It affects 7.1 million (1:11) children, according to the Centre for Disease Control, and its prevalence has increased by 15% in the last decade. COVID-19 was found in roughly 21% of high school students (grades 9-12) in 2013. COVID-19 necessitates a lot of health-care application and a lot of lost school and work days. COVID-19 is characterised by intermittent exacerbations and episodic respiratory symptoms. COVID-19 symptoms, airflow restriction, and exacerbations vary widely in terms of frequency and severity. Monitoring these occurrences is critical in the treatment of COVID-19 patients, and it is aimed at detecting exacerbations early. Supervision can also be utilised to investigate factors like resistance and trigger sensitivity that may contribute to inadequate control and exacerbations. Determining who will do the monitoring is crucial since it affects the kind of collected data, its legitimacy, and its delicate nature. The following people may be covered by COVID-19:

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The COVID-19 patients as self-monitoring enables the early detection of exacerbations
The controlling physician should evaluate COVID-19 control and look into the causes of poor control, and healthcare directors should evaluate the cost and quality of care for COVID-19 cases.
COVID-19 monitoring is examined from each of these angles in this piece. COVID-19 is a chronic illness that affects one out of every nine Australians. COVID-19 was responsible for 1.5 out of every 100,000 fatalities in Australia in 2014. Breathing becomes very challenging due to symptoms like cough, asthma, chest tightness, and shortness of breath.

II. PROPOSED WORK

The COVID-19 Monitoring System is designed around a microcontroller for gathering, sending and receiving information from different sensors and external servers. Better patient healthcare services, more transparent and efficient use of healthcare resources, and a quick hospital reaction in the event of a COVID-19 attack are all objectives of the architecture design. Symptoms can be averted by covering factors which can spark COVID-19 attack. So, it's veritably important that there should be a system which can cover air parameter on regular base and advise the case when these factors can trigger their COVID-19 attack
Based on the patient's particular physical characteristics, the obsession point of the modules is determined.

A. Scope

1) The power consumption resulting from various data connections will be thoroughly profiled and quantified., as a result, look into potential approaches to extend battery life (for example, by optimizing the training dataset to be transferred) while preserving desirable performance and accuracy.
2) The proposed hybrid mobile-cloud strategy will also be investigated in other areas of healthcare.
3) Resolve the problem of ECG signal imbalance to improve the data of the insufficient number of heart-beat kinds.

B. Functional Requirements

According to the kind of software to be developed and the association's overall approach to developing constraints, a system's functional requirements specify what the system should be able to perform. The detailed function of the system, including its inputs and outputs, is defined in the functional system requirements., as well as any exceptions.

Functional needs are those that are similar to the system's technical functionality, such as:

1) With the help of the MAX30100 sensor, the system detects SpO2.
2) The system uses heartbeat sensors to detect heartbeats.
3) In the event of a sensor detection and emergency, the system sends an alarm to the doctor. • In the event of a sensor detection and emergency, the designed system communicates the GPS location.

C. Non-Functional Requirements

1) *Security:* The information stored and shared on this platform is exceptionally secure since it is segmented and divided into parts, protected, and stored on different platforms. The system is hence impervious to attacks.
2) *Scalability:* The system is highly scalable
3) *Performance:* Our network is based on peer-to-peer architecture. It does not depend on single node. Hence there is no chance of single point failure and efficiency is also high.
4) *Simple to Use:* Client-facing apps that allow them to access information. The system is developed in a way that users find it easy to understand and operate
5) *Availability:* Since our system isn’t centralized and there is no single point of failure in our system, thus the availability of our system increased.

D. Hardware Requirements

Arduino Nano, Max30100, Heartbeat Sensor, Temperature Sensor, Emergency Switch, GPS, NodeMCU, Ultrasonic Sensor, Power Supply

E. Software Requirements

Arduino IDE, Embedded C, Telegram

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III. TECHNICAL SPECIFICATIONS

Microcontroller: ATmega328P (Microchip)
5 volts operating voltage
Voltage range: 7 to 20 volts
14 Digital I/O Pins (of which 6 provide PWM output)
6 DC Analog Input Pins Per I/O current 20 mA DC pin 3.3V Pin Current: 50 mA
32 KB flash memory, of which 0.5 S
EEPROM: 1 KB RAM: 2 KB
16 MHz clock speed
Weight: 25 g Length: 68.6 mm Width: 53.4 mm

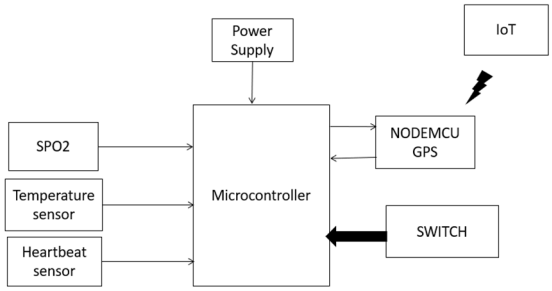


Fig. 1 System Architecture

IV. IMPLEMENTATION

The COVID-19 patient can monitor his own condition at any time, though this he can save the life. Sensor technology is to be used for covering the COVID-19 patient condition fluently. Temperature: For the temperature we have 2 domains, the cold air and the hot air. The patients are exposed to cold air after exercising. It is recommended to avoid temperatures below 18°C. The temperature of 15°C and below is considered parlous. The hot air is by itself dangerous. It also helps contain pollen and air pollution.

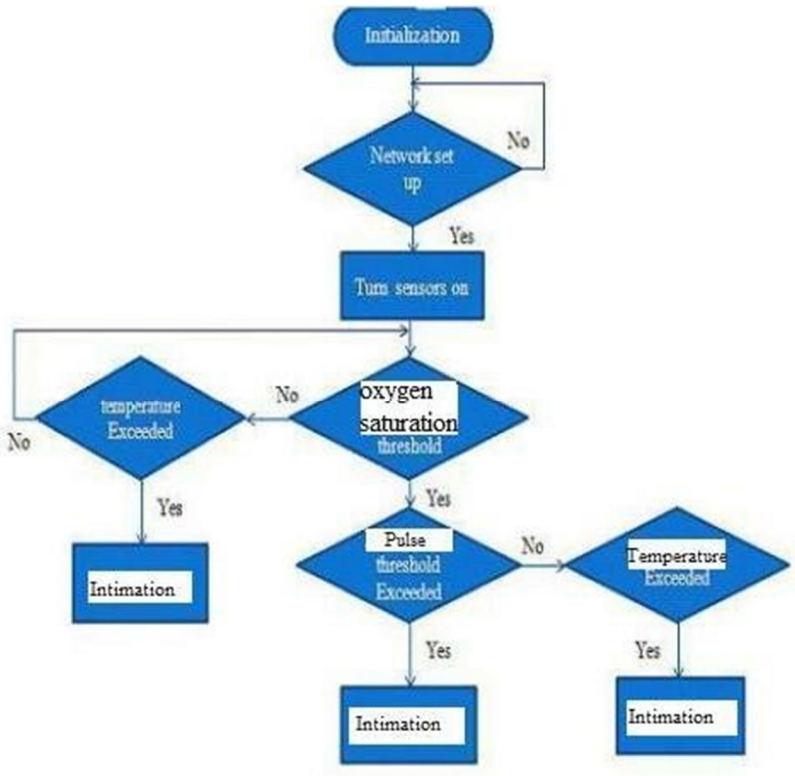


Fig 2: Workflow of proposed system

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The required components are: microcontroller, Sp02 sensor, heartbeat sensor, temperature sensor. The microcontroller controls the entire system. The Sp02 sensor measures the oxygen level in the patient's body, DHT11 temperature sensor measures temperature in the body, heartbeat sensor measures the pulse and keeps the track of the beats. The heartbeat is sensed and measured using LDR. Also, there is GPS, used to track location of covid patients in the case of emergency. It helps tracking using GPS module. There are threshold values set to all the sensor values. If health condition crosses certain threshold values, immediate messages are sent to the closest relatives, friends and doctors. Using GPS, location is tracked and next steps are followed

A. Input Module

1) Sensor Module: In this Module Data from sensors has been received and given as an input to controller. We Use Temperature and oxygen sensor for reading patient body temperature and oxygen levels.

B. Processor Module

1) Arduino Module: This is the main module of the whole project. We use Arduino nano as the processor because of its compact-ness. Processor receive data from sensors and process it and connect to Wi-Fi module for updating to hospitals and care taker for emergency responses.

2) Output Module: In this module we use Wi-Fi module for connecting to internet and update it to user. Here We used ESP Wi-Fi module for IOT Connectivity. User Intimations will be through Telegram Application and IOT will be achieved in this module.

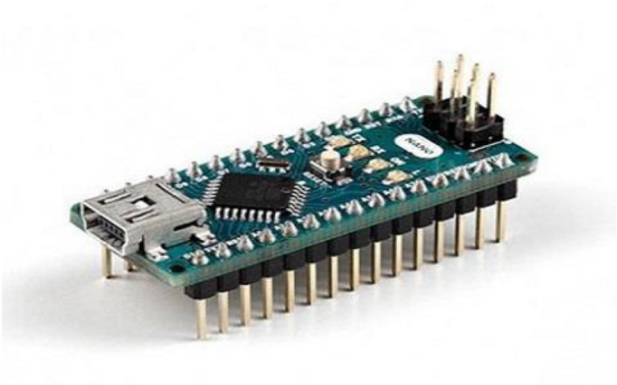


Fig.2 Arduino NANO

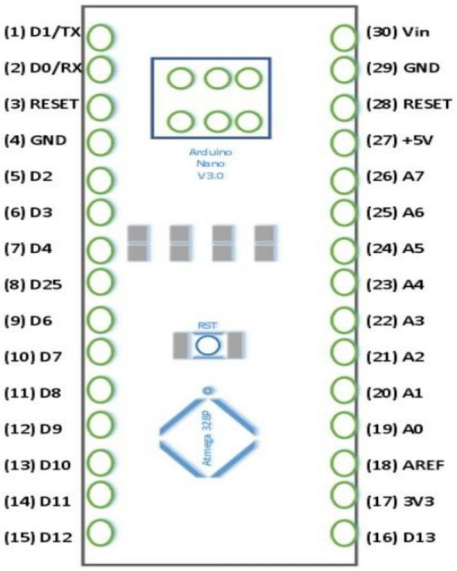


Fig.3 Pin Diagram

Vin is the board's input voltage, which is used when an external power source of 7V to 12V is used.

- The nano board's regulated power supply voltage is 5V, and it's utilised to power both the board and its components.
- The minimum voltage generated by the voltage regulator on the board is 3.3V.
- RST Pin (Reset): This pin is used to reset the microcontroller. • GND is the board's ground pin.
- I/O Pins (Digital Pins D0–D13): These pins are utilised as i/p pins when they are not used as o/p pins. 0V and 5V
- Tx, Rx Serial Pins: These pins are used to send and receive TTL serial data. External Interrupts (2, 3): These pins are used to activate an interrupt.
- PWM (3, 5, 6, 9, 11): These pins provide an eight-bit PWM output.
- SPI (10, 11, 12, & 13): SPI communication is supported via these pins.
- Inbuilt LED (13): This pin controls the LED's operation.
- IIC (A4, A5): These pins are for TWI communication functionality.
- AREF: This pin is used to provide input voltage with a reference voltage.



Fig.4 Temperature sensor

The LM35 series of precision integrated-circuit temperature sensors have an output voltage which is proportional to the temperature in Celsius (Centigrade).. Low costs are guaranteed by pruning and adjusting at the water's surface..

The LM35 is exceptionally easy to interface with reading or control circuitry due to its low output resistance, linear response, and flawless internal calibrating. It can be used with only one source of power or with both positive and negative power generators. Because it only draws 60 A from its supply, it has little self-heating—less than 0.1°C in the still air.

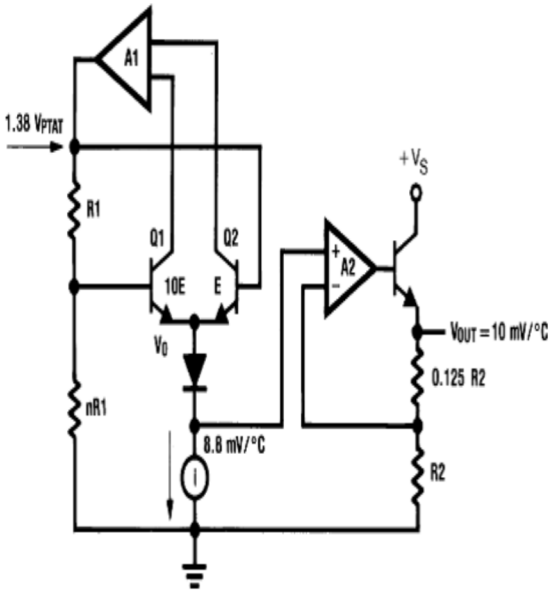


Fig 5 Circuit diagram of temperature sensor



Fig.6 NODEMCU

The Analog (A0) and Digital (D0-D8) pins on the NodeMCU Dev Kit's board are similar to those on an Arduino. It is compatible such as UART, SPI, and I2C.

Using these serial protocols, we may link it to devices with I2C capabilities, magnetometers HMC5883, MPU-6050 Gyro + Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards, and more. The NodeMCU Development board provides Wi-Fi capability, analogue, digital, and serial communication protocols.

To begin using NodeMCU for IoT applications prior to anything else, we must comprehend how to create and download NodeMCU firmware on NodeMCU Development Boards. Where would the NodeMCU firmware be modified to suit our needs before that Online NodeMCU custom builds are available, allowing us to quickly create our own NodeMCU firmware to meet our specific needs..

V. CONCLUSION

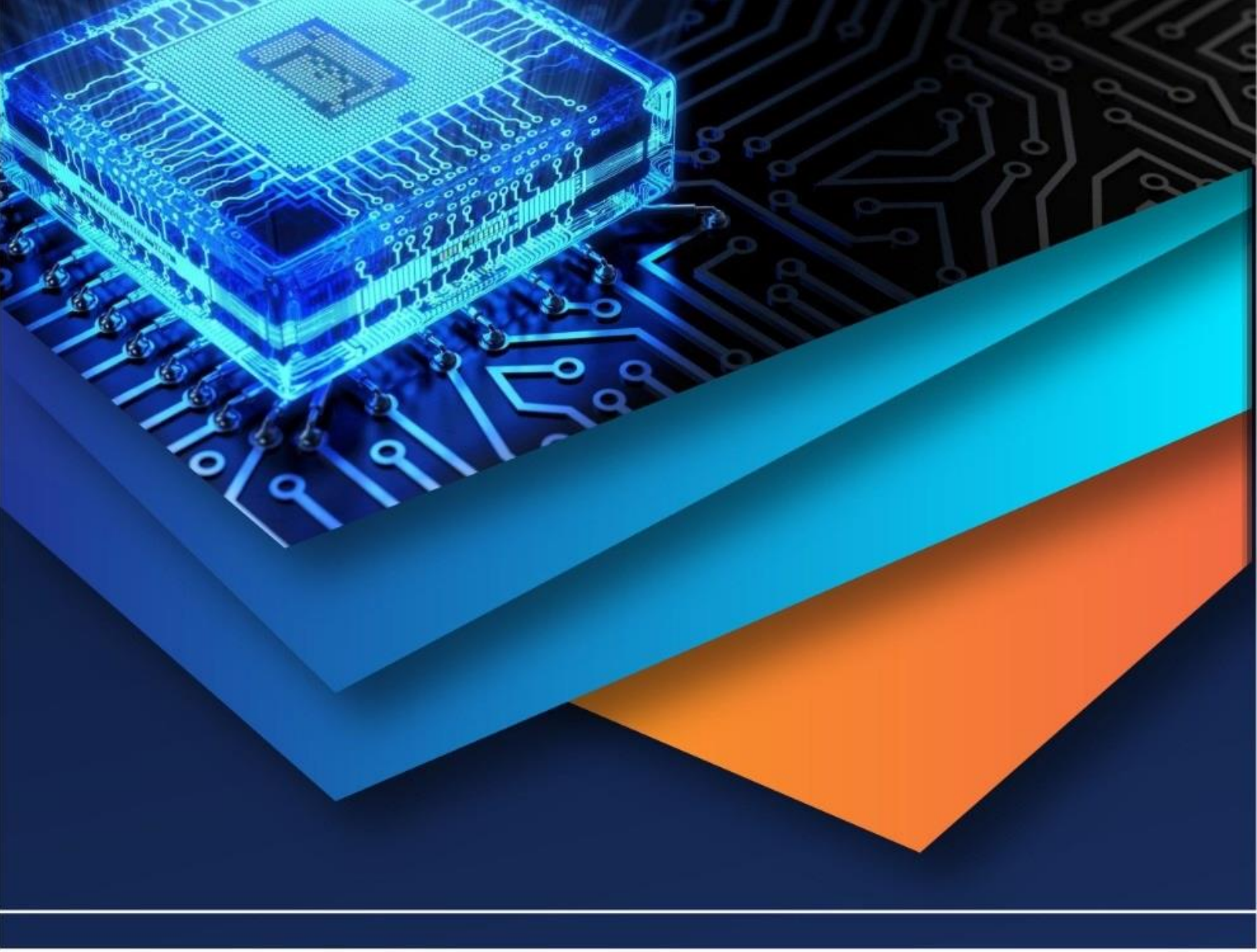
This paper presents an overview of telehealth, wearable technology, and hidden sensors as well as its potential uses in the fight against COVID-19. Clinical outcomes can be improved through timely intervention by identifying any deterioration and exacerbation at an early stage; diagnosis and treatment can be swift with screening of suspected and asymptomatic/PR characteristic cases; and the burden on healthcare systems can be reduced with the successful implementation and deployment of these emerging technologies during the evolving pandemic. They therefore show great promise in the struggle against pandemics like COVID-19.

VI. FUTURE ENHANCEMENTS

We can make use of cloud platform to increase efficiency and security.

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