

# IoT based Smart Health Monitoring Band for COVID-19 Patients

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**Abstract:** This paper presents the Health Band based monitoring system for COVID-19 and other serious patients after their recovery helps them to monitor their health parameters when they are alone so that they can get fast aid. The real time health parameters are being recorded and send to the guardians and doctors by using android app. In these technique patient's important medical signs like fever, oxygen level, exercise and fall are included. In this technique a module setup is designed which contains following units and have transmitter, receiver and microcontroller, so transmitter can transmit the live parameter of the patients includes fever, blood pressure and oxygen level. It can be done by using heart beat sensor was used for sensing heart rate sensors as well as body temperature data transmitted and received by a receiver controlled by microcontroller using IOT. The data can be used to examine and save the physical output data. It is a smart phone synced cell phone health monitoring band. This helps patients under risk to save their life. When the band observes dangerous vital signals then smart phone synced itself to their family members and doctors.

**Keywords:** IoT, vital parameters, sensor, Arduino microcontroller, transmitter, receiver, android, smartphone, COVID-19.

## 1. Introduction

The COVID-19 pandemic is one of the drastic thread in century for the entire world and this pandemic hit India too hard as we have seen in second wave of COVID-19 virus in the month of April - May which causes hike in cases up to 2.99Cr in which 2.88Cr are Recovered and 3.87L passed away [1]. We have already seen the dangerous after effects of virus in some of the patients. Due to that our healthcare industry in high pressure and we also seen the shortage of skilled man power. So our research focused on the patients who are facing after effect situation and other patients by using IOT based health monitoring band. In latest innovative healthcare industry, they are focusing to give better and economical facility to patient in a simple way [2]. This can be achieved by using monitoring device to show the vital parameter of patient. These patients need regular monitoring plus live existence, but in busy world, it is hard to look every time. So monitoring the health condition to know their present condition can be done by smart technology. It is a simple and effective approach to give assistance. In this research, android and Arduino technology

have been used to see patient's vital parameters by monitoring.

In given system the collective parameters related to the sever problem is collected from patient, then this data given to two different interfaces included vital parameter and details is displayed and this collected data is given to a web based server, so the presented data can be checked by the doctor any time with the help of android application in their smart phone, it helps them to examine and send precautions to patients and family members same android app so patients, at the same time reminding them to take his medication [4] on time before severe damage. In this system, the IoT plays an important role which offer live, fair and comprehensive monitoring. Take the edge off the patient's governess support to make medical assistance [6].

The implementation of IoT is new idea, helps in patients monitoring with the use of Arduinio. The Internet of Things is a system of sensual objects together with embedded mechanization, it provides proper sensing and secure digital communication [5]. Using IoT with sensors is one of the popular application and provide affordable healthcare applications market. In present days smart watch is highly popular because it shows humans activities without any problem. Now a day's artificial intelligence (AI) techniques integrated with IoT to extract intelligence, patterns, trends, user profiles, outliers for deeper assessment, and care. Instead of several advantages some critical health conditions unpredictable and cause severe problem.

## 2. Architectural Model

This system proposed wireless sensor implementation for 24\*7 and provides health parameters by monitoring them without interrupting daily routine. For this fixed and mobile body sensors are used with desperate algorithm. This helps of for positing and analyze patient's health and to take additional decisions about patient health.

The given architectural model shows in figure 1 the basic structure of the presented technique, in which we are using a sensor called Infineon DPS 310 to detect the fever, blood pressure and oxygen level then after sensing its output is send to Arduinio basically Arduino Nano, it is a small and complete board based on the ATmega328. It has same function as

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Arduino Duemilanove, but in a different package. It works with a Mini-B USB cable instead of a standard one or by using small Li battery, helps to be compact size and Twitter the live patient's parameters for publishing online by Wi-Fi module (Esp8266) and the twitter message can be read by android app on smart phone of the patients doctor and care taker to assist them and on same time the patients health history is also has been save on cloud data base.

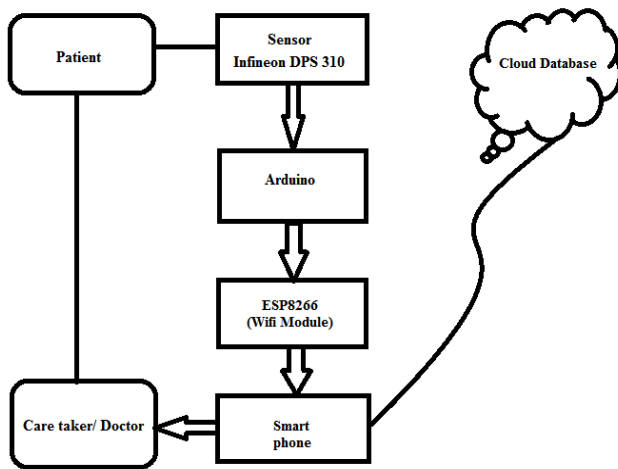


Fig. 1. Architectural model

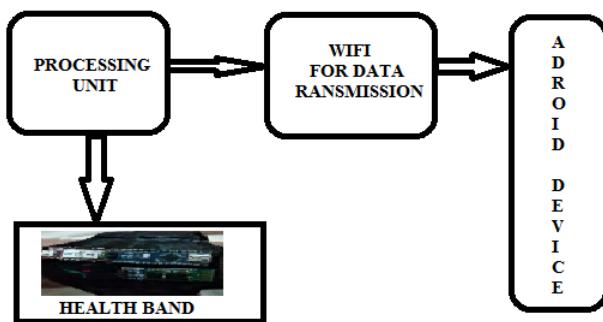


Fig. 2. Proposed system

**3. Hardware Components Required**

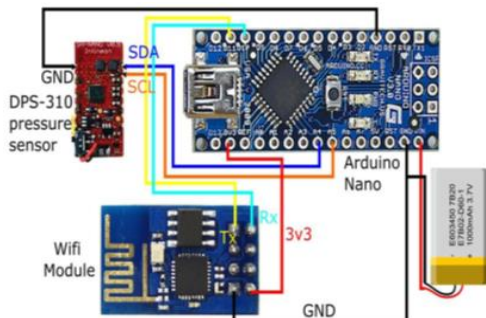


Fig. 3. Health band module structure

**A. Infineon DPS 310**

Infineon DPS310 is a very small barometric air digital Pressure, have high accuracy and low current requirement. The principle of given sensor is based on capacitive sensing and

provide advantage to with stand on high temperature and react on small change. Due to small in size DPS310's is compatible with health band. In DPS310 signal processor turn output by pressure and temperature sensor elements into 24 bit results. For every unit is individually calibrated, so that calibration coefficients calculated during this process are stored in the calibration registers after that the presented coefficients can be used in applying to convert the computational results to high accuracy pressure and temperature values.

**B. Arduino Nano**

Arduino basically Arduino Nano, it is tiny board with ATmega328. It is same as Arduino Duemilanove, in different package. It works by using Lithium Ion battery having 7-12 V and Operating Voltage of 5V with current rating of 40 mA. Flash Memory 32 KB (ATmega328) of which 2 KB used by boot loader, where SRAM is of 2 KB and EEPROM 1 KB basically (ATmega328), it is mostly used in embedded systems, robotics, and automation project. This board is widely used for industrial applications also.

**C. ESP8266 (ESP-01)**

ESP8266 is generally acts as a tiny computer. It is a reliable ESP8266 Wi-Fi microchip, have TCP/IP stack and microcontroller capability. ESP8266 (ESP-01) is a Wi-Fi module that allows microcontrollers and can approach to Wi-Fi network. The presented module is complete System On a Chip or a module and it will not control inputs and outputs as seen in Arduino, there are different version of ESP8266 are available, so depending on their versions it General Purpose Input Output called GPIO's. In this the microcontroller access internet, so ESP8266 access Wi-Fi network. It has 80 kb of built-in flash memory ESP8266 with Input of 16 GPIO'S and consume power of 3.3 V by using Li Battery.

**4. Concept**



Fig. 4. IoT based health band

Arduino IoT Cloud is the fatal combination is an application helps to build connected objects in quick, easy and secure way. In this module multiple devices are connected to each other and permit them to interchange real time data, due to that it provides a way to monitor the patient's vital parameters from anywhere by the simple user interface. It is easy to integrated Arduino IoT Cloud and provide a platform, which is able to generate a template code in Arduino IoT Cloud and it provide a facility to rewrite and upload data to board using the Arduino Web Editor. Arduino is called a brain of entire system, which senses the data from the sensors and process it. Here in this

technique Arduino used is ATmega328 microcontroller can processes data and promote the proper functioning of IoT. The main advantage is that rewrite by changing a simple code is available with C++ language for Arduino programming. For interfacing of Arduino IoT the IDE software Arduino is necessary with ESP-8266 and a Wi-Fi module helps to setup a communication between the Arduino and cloud platform.

### 5. Results

#### A. Oxygen Level

It is necessary for every human should have normal oxygen level to survive. In this result we concentrated on patients SpO<sub>2</sub> with Heart rate (HR) assessment by monitoring the patient's condition and evaluate real time parameters. The estimation and results are used and data is being recorded with the help of web server, so that recorded data for further processing. This can be done by IoT model which is developed for data transmission and reception from cloud server. The presented sensors measures SpO<sub>2</sub> parameter. If the level oxygen is less than normal then the alarming message is sanded to their family members and guardians.

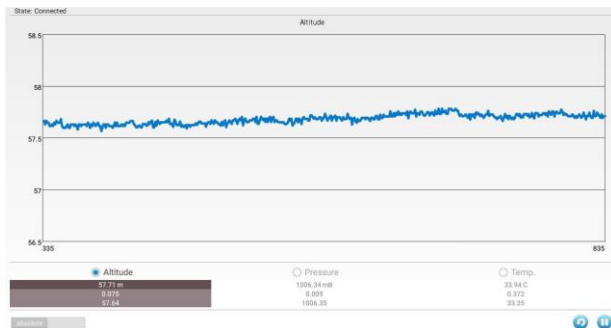


Fig. 5. Measured oxygen level

#### B. Exercise

In most of the cases doctors suggested some exercise to the patients which will benefits them to recover fast. This system helps them by showing the number of steps taken by them and how much time they take to complete it. Counter is used to examine the steps that is integrated with a Health Band detects a "wave" motion it deducts that the patient has begun his/her exercise. The presented parameter shows the complete cycle during exercise. Where, wave from peak to bottom is considered as a one cycle. So steps are counted and generated then displayed, and act as a step counter.

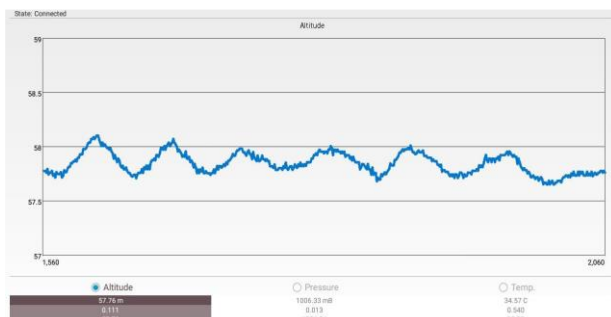


Fig. 6. Level during exercise

#### C. Fever

Fever is another important vital parameter of the research, in this the patient's body temperature is been taken by Infineon DPS 310, reliable and able to sense a small change in temperature. So if the body temperature is raises above 100°C. The sensor is set up in a band in such a way that it is contact with the arm of the patient and provides a live temperature parameter. If the band finds spikes or drops in temperature it will alert automatically by messaging.



Fig. 7. Level of fever

#### D. Fall

Falls is one of the riskiest problems for old people. It is riskiest because it will not assist in time and cause a serious harm. In health band an accelerometer integrated with 6 Low PAN device, collects a data from the patients in real time. For achieving high order on fall examination, sensor readings should be processed and look over by help of a decision trees based on Big Data model run on Smart IoT portal. When the system detects fall an alert is activated and send an emergency message to the guardians and a doctor for their proper. This all data can be stored on cloud act as storage service provider. It helps doctors to access falls data for further analysis.

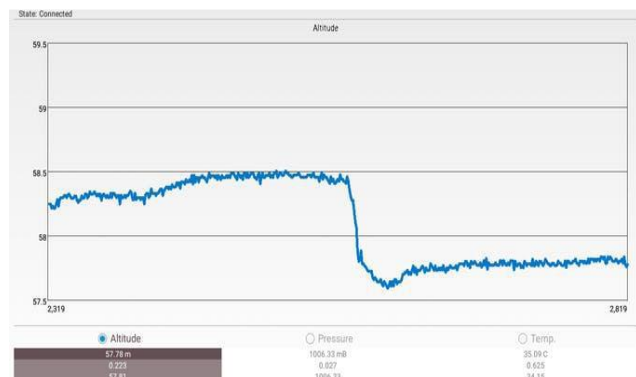


Fig. 8. Level during fall condition

### 6. Conclusion

In presented research the after effects and other health issues of COVID-19 patients monitoring has been done by using health band. It is the efficient, affordable, and accessible healthcare for the ever-growing demographics of elders and ailments pertinent to them is eminently needed, monitoring their vital medical signs like fever, oxygen level, exercise and fall which can cause severe damage. Where IoT plays an important role and provide real-time parameters of the patient's

condition. IoT is growing immensely in the last decade, penetrating the market and with both lifestyle and biomedical applications. The given results of observations have been shown successfully with high accuracy, precision and gain.

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