International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 01 | Jan 2022 www.irjet.net p-ISSN: 2395-0072

IOT BASED HEALTH MONITORING SYSTEM FOR COVID 19 PATIENT

Sonali Chandrakant Kasbe[1] Vandana C. Maindargi[2]

[1] M.TECH Student, Dept. of Electronics and Telecommunication Engineering, TPCT's College of Engineering , Osmanabad, Maharashtra, India.
[2]Professor, Dept. of Electronics and Telecommunication Engineering, TPCT's College of Engineering, Osmanabad, Maharashtra, India.

Abstract – *When COVID-19 pandemic is ongoing, Internet of Things- (IOT) based health monitoring systems for COVID-19 patients are immense beneficial. This paper gives an IOT-based system which is a instantaneously monitoring the health of the patients by using measured values of pulse rate, body temperature and oxygen saturation. These are the important measurement values required for the high level care. The system will displays the measured temperature, pulse rate, and oxygen saturation level by using (LCD) liquid crystal display and by using this we can easily simultaneous with a mobile application for the spontaneously access. The given IOT based method also includes an Arduino Uno. It was verified and tested by using five human test subjects. The results obtained from the system gave good result and Obtained data from the system will be stored very fastly. The results got from the system are found to be promising. When we compared to other already available systems, Systems based on IOT and it may immensely very valuable during ongoing COVID-19 pandemic.*

Key Words: COVID -19, IOT, Arduino Uno, LCD, Microcontroller, WiFi Module

1. INTRODUCTION

Presently, If we seen in the Maharashtra, the total number of cases 5,5,299 positive COVID-19 patients. These COVID-19 patients have symptoms, like as fever, infections in throat breathing problem, tiredness, reducing oxygen level, dry cough, diarrhea, vomiting, headache, loss of taste and smell, body pain and aches, decreasing in pulse rate and chest pain. From these symptoms fever, low oxygen level, and decreasing in pulse rate are taking consideration in serious manner. Low oxygen level and difficulty in breathing causing hypoxemia and hypoxia.

Hypoxemia Patients are suffering the problems of pulse rate and having a less chance of persevere, sometimes patients didn't perceive hypoxemia and rate of pulse increasing, and they are dying without receiving any proper treatment. As a person enters in old age it is becomes very important for them to receive high level medical health checkups, since it is going to be very time consuming and also difficult for most of the people to receive regular and spontaneous health checkup appointments. IOT based systems can be essential to individuals for regular routine health checkups.

IOT technology is developed into innovations which are very important or urgent with applications in various areas.

2. PROPOSED SYSTEM

The given smart health monitoring System provides remotely to the home quarantine corona patients. The main aim is to save the thousands of people lives from infections and death. It totally depends on the integration of artificial intelligence and internet of things for fusing multiple sensory data from various medical sensors to detect the degree of development of the disease and the seriousness of the health condition. The proposed system improves decision making quickly and simultaneously.

It is based on monitoring the reading's heart pulse, respiratory rate, and blood pressure, Blood PH level in real-time.

It proposes to be a time-series data that includes sequenced data points in a time domain. The data extracted from multiple sensors are gathered sequentially based on multi-variable measurements. It proposes a classification of patient's cases. It also targets observing multiple users concurrently. The proposed technique will be constructed based on the combination between the fusion feature level and fusion decision level. It will rely on the long-short term memory (LSTM) technique that is considered a deep neural network (DNN) technique for sequenced data [28]. It uses the power of feature learning ability and improves classification of serious health condition levels. Then using the Dumpster-Shafer fusion technique for fusion decision.

3. ARCHITECTURE

The Suggested system is able to monitor the patients from their homes and that would be save governmental cost and also time for measuring the changes in patient's medical readings. It is helping in the reduction in Covid infection and save patients around the world. The main importance is, It also saves places for emergency cases in hospital. The smart health techniques includes main six layers in cycle named by cleaning data layer, anomaly detection layer, extracting features based on deep learning, LSTM deep learning layer, and fusion layer as shown in the lifecycle in Figure.

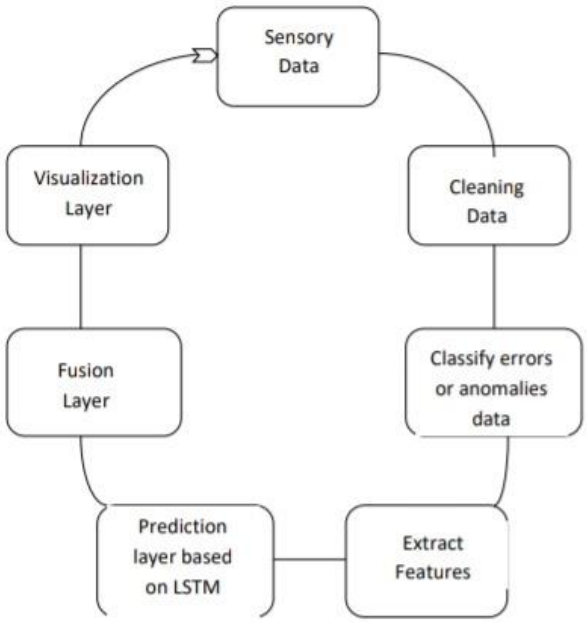

Fig -1: The lifecycle architecture of the proposed system

The architecture of the smart health technique consists of the main six layers, cleaning data, feature extraction layer, deep learning techniques, fusion layer as shown in above Figure.

4. THE HYBRID HEALTH SYSTEM ALGORITHM

The proposed algorithm is a hybrid fusion technique between feature fusion level and decision fusion level concerning determining anomalies to improve decision making quickly and simultaneously also hybrid technique was illustrated for making a decision based on adding new features from the data and fusing the decisions from tracing in each sensor. The proposed system enables to classify patients in the risk level and make decisions concurrently. It also predicts each patient's evolution case based on a remote monitoring process by using mobile application. The algorithm includes the main six layers.

4.1 Cleaning Data Layer

The nature of time-series data usually includes several noisy data or missing data. So, this layer targets ensuring the quality of the input data by ignoring missing data, determining error readings, filtering anomalies or fixing structural errors. It also determines the duplicate observations and ignores irrelevant notifications. This layer is very important to make the system highly reliable.

The steps of this layer are:

- Check on empty records, or terms in each cell.

- Check on duplicate records

- Check on noisy data

- Check on unstructured data to convert the suitable structure for the dataset.

4.2 Anatomy Detection Layer :

The previous layer can filter anomalies or readings errors. These anomalies mean identification of rare events that are happening and affected by other observations. They usually require making decisions quickly and concurrently. This classifies something different to improve the forecast of patients. Algorithm describes the main steps of anomaly detection.

4.3 Features Layer :

The features layer refers to the interaction between extraction features. It deletes redundant and unused features and the extracted features are medical and require expert knowledge. The combination of the two features can interpret a new feature for improving results and decision making.

To keep an integral part of the Heart rate and respiratory rate for standard clinical estimation of people or children presenting. The emergency cases will be identified based on the outranges of these parameters. The previously computed median of the representative centimes (1st, 10th, 25th, 75th, 90th, 99th) for the data from each included study. Finding each age has a different normal range of heart rate and respiratory rate.

4.4 Prediction layer for each patient's case evolution :

Artificial intelligent technique is used for monitoring patients and their case evolution.

Long-short term memory (LSTM) is a deep learning technique for sequenced data.

This layer is based on LSTM to predict the future case for each patient based on previous disease readings.

4.5 Fusion Layer :

There are several fusion techniques but this research applies the Dumpster-Shafer fusion.

4.6 Visualization Layer :

The physicians may be finding a hardness in readings hundreds of patients concurrently.

So, visualizing data is a very important layer to classify the serious condition level for patients (high risk, medium, low) that may use colors (for example, red color for high-risk cases, yellow for medium risk cases, green for the normal rate or low-risk cases) to getting attention from doctors

quickly to improving decision making simultaneously and quickly in Figure.

4.7 Output :

That includes colorized and classified data for all patients for each observer doctor. It also includes a detailed sheet for the evolution of each patient and the prediction risk of their patients.

In Figure The patient cases classification into one from the three classifications (Low risk, medium risk, and high risk)

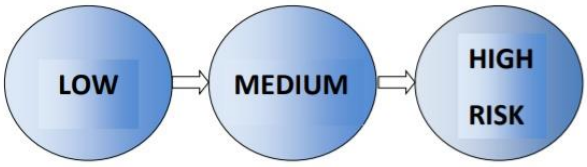

Fig- 2: Output

4.8 Architecture Module :

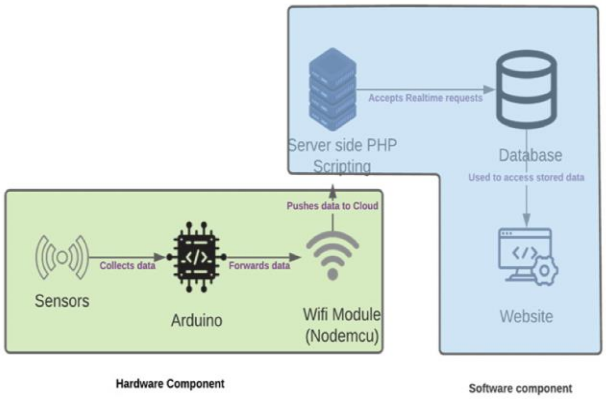

fig – 3: Architecture module

So the architecture module figure explains such as how the device right from the start will working as a complete by showing the working of the device. The sensors works for recording data. It is the way to the very end from where the data could be seen on the respective website. The below mentioned modules working as individual separate modules following the main flow of events for the efficient working of the device.

Sensor reading module: Basically sensor reading module consists of intricate sensors like as MAX30100 and MLX90614. These are capable of record the various things of the patients such as pulse rate, temperature level and oxygen levels and these values will forward to the microcontroller.

Microcontroller module: The microcontroller module is consists of the Arduino UNO. Basically we can say it as a brain of the device so it collecting a whole entire data and forwarded it to the Wi-Fi module.

Wi-Fi module: The WiFi module is the Nodemcu version 1.0 and it is useful for fetching the data from the microcontroller. Also forwarded it to a respective cloud server.

Server module: Server module Consists of various PHP scripts these are interfaces with Wi-Fi module and it is collecting whole data, so that it will be saved for in future use.

Database module: Database module it consists of a designed database which can be used for restoring the data which is received from the database module, so that various steps of the working and analysis also be done on the same.

Website module: Website module acts as the front end component of the device, in which it is not only boosts API integration for showing the COVID statistics but also it displays the readings from the sensor along with the guidelines from world health organization.

5. DIAGRAMS

5.1 Circuit diagram of the system :

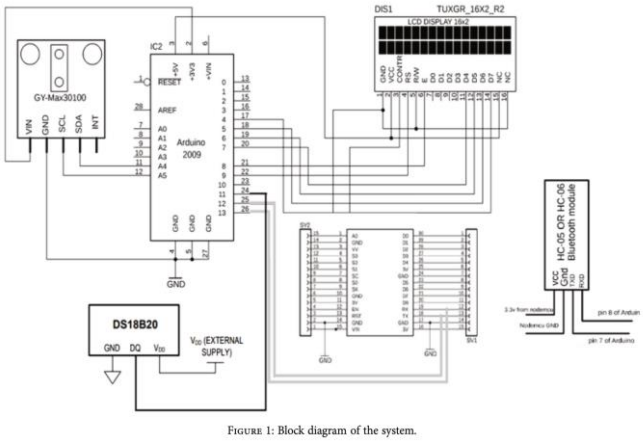

Fig -4: Circuit diagram of the system

The main components like controller, Arduino Uno, and Node MCU starts to receive the measured values .It will happen when power of the system is on.

Then device will displays the measured tempera- ture, pulse rate, and oxygen level. The measured value of oxygen level is gone below 95% and the pulse rate value get less than 60 or more than 90, then device will sends the quick alert to both doctor and patient.

Patients will see the measured readable value by using mobile application and simultaneously patients will see the reading by liquid crystal display.

5.2 Flow chart of the system :

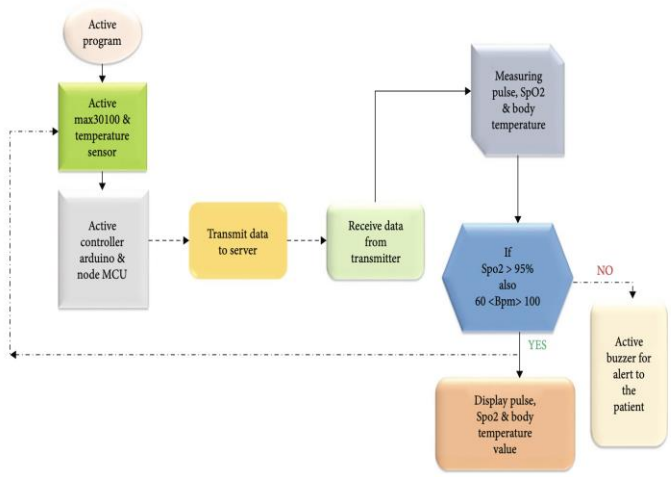

FIGURE 2: Flow chart of the system.

Fig – 5: Flow chart of the system

5.3 Block diagram of the whole circuit system :

The diagram includes pin connection in between Arduino Uno, oxygen level sensor, Node MCU, Bluetooth module, temperature level sensor and power supply of the device.

The Proteus Design Suite software is used for built the above circuit diagram.

For measuring the data, the sensors are used and they send to the processing unit.

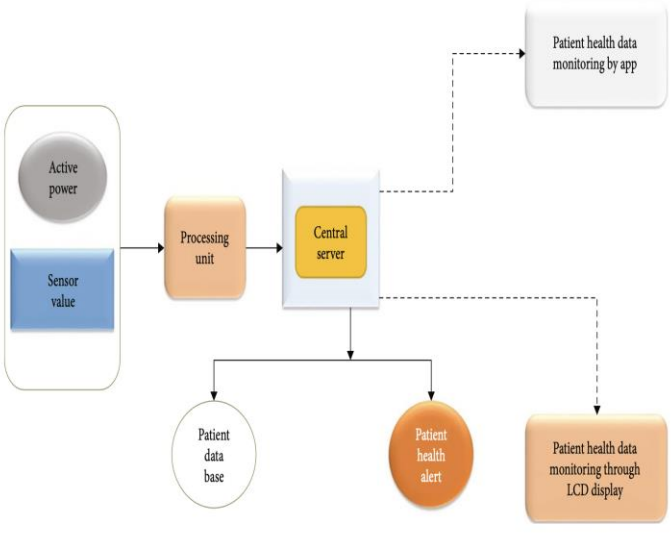

FIGURE 3: Block diagram of the circuit system.

Fig – 6: Block diagram of entire system design

6. ACTUAL WORKING OF THE DEVICE ON MOBILE

We have attached screenshots of the steps so that patients can easily access the device.

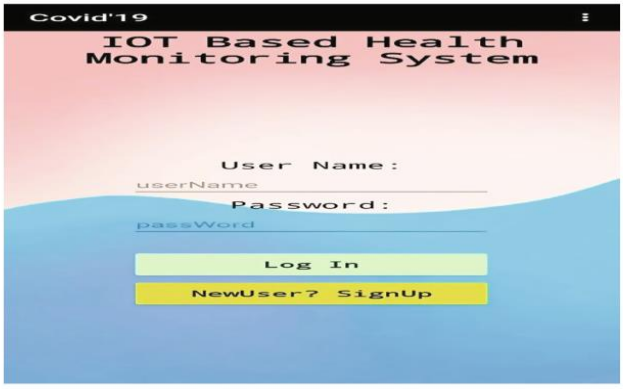

Fig – 7 : Login interface of mobile application

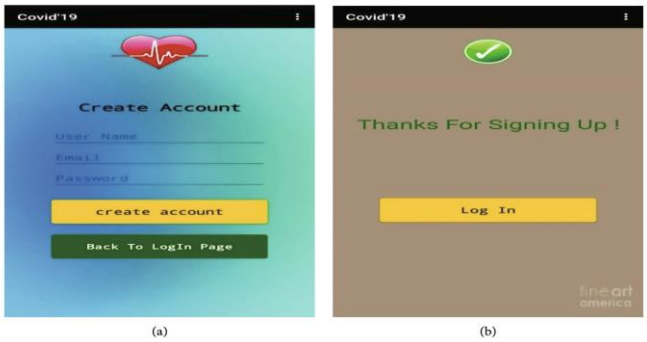

Fig – 8 : a) Sign up interface b) Successful sign up Interface

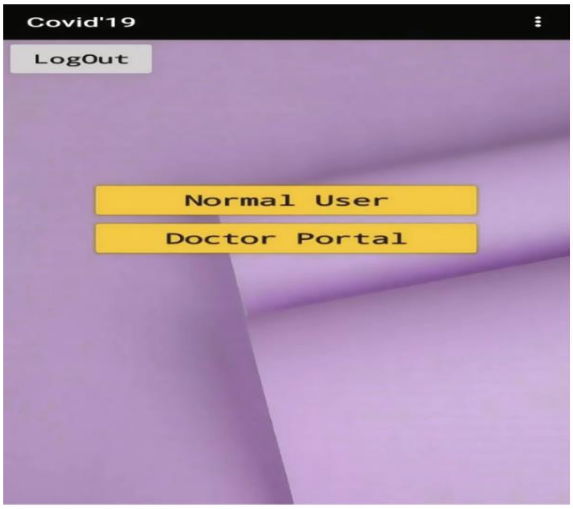

Fig – 9 : Users portal Interface

Fig – 10 : a) Normal user Interface b) Measured pulse rate, temperature and oxygen level

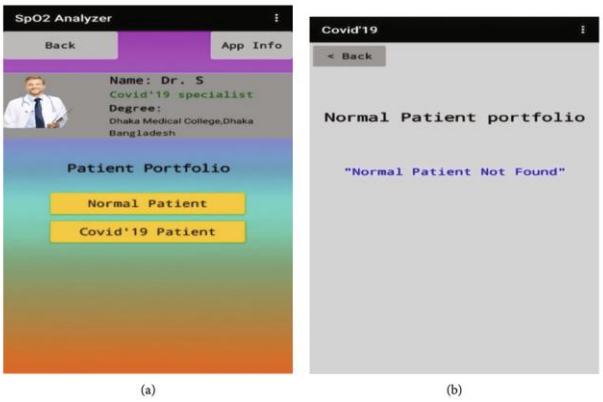

Fig – 11 : a) Doctor Patient interface b) normal patient portfolio

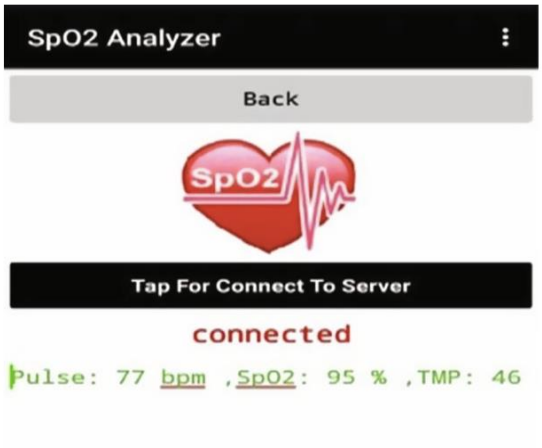

Fig – 12 : Measured pulse rate, temperature, oxygen level

Fig – 13: Working prototype

7. CONCLUSIONS

The COVID pandemic has been big issue in a global health crisis. As we know every day many more people are dying from this disease, it can be reduced if we gave proper and efficient treatment at the right time to the patients. So this systems will detect Various steps, including regular monitoring of pulse rate variation, oxygen level, and body temperature detection. COVID patient oxygen level decreases with time and that's the main reason for the patients die in very short time if emergency steps are not taken. If we Consider the above mentioned incidents, then IOT based smart health monitoring system was developed for COVID patients to avoid emergency's . The device runs by using an IOT based mobile application, and by using this device both the doctor and the patient can got quick alerts . We concentrated to design and develop a best organized mobile application based device. It will be used in the current pandemic.

REFERENCES

[1] "COVID-19 Second Wave. Thailand Medical News," https://www.thailandmedical.news/news/second-wave-record-11,005-covid-19-deaths-in-last-24-hours,-cases-surging-everywhere-from-europe,-japan,-india,-u-s-,-russia,-malaysia-excepthailand?fbclid=IwAR1Ne1WS6YeqtJWfzfS30V0p3Arp9MciXsCfMrnRfsOofFlFXwZZINtAK6U.

[2] "Bangladesh Corona Virus Update," https://www.corona.gov.bd.

[3] N. El-Rashid, S. El-Sappagh, S. M. R. Islam, H. M. El-Bakry, and S. Abdelrazek, "End-to-end deep learning framework for coronavirus (COVID-19) detection and monitoring," Electronics, vol. 9, no. 1439, pp. 1–25, 2020.

[4] D. Hongru and T. Goyea, "Novel coronavirus (COVID-19) cases. Johns Hopkins University, Baltimore, Maryland," 2020, https://coronavirus.jhu.edu/.

[5] 5. "Hypoxemia: Symptoms, Causes, Treatments. Cleveland Clinic," 2020, https://my.clevelandclinic.org/health/diseases/17727-hypoxemia.

[6] 6. M. Pourhomayoun, N. Alshurafa, F. Dabiri et al., "Why do we need a remote human-health monitoring system? A study on predictive analytics for heart failure patients," in 11th International Conference on Body Area Networks, Turin, Italy, 2016.

[7] 7. D. Serpanos and M. Wolf, "IoT System Architectures," in Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, Springer oxygen level of a

[8] International Publishing, Switzerland, 2019.

[9] 8. "Vital signs (body temperature, pulse rate, respiration rate, blood pressure). Johns Hopkins Medicine".

BIOGRAPHY

M.TECH Student, Dept. Of Electronics and Telecommunication Engineering, TPCT's College of Engineering, Osmanabad, Maharashtra, India.