iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 Issue: IV Month of publication: April 2023

DOI: https://doi.org/10.22214/ijraset.2023.50773

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

Multi-Parameter Health Monitoring System

Mr. K. Lakshmi Narayana[1], D. Bhavana Prathyusha[2], Divya Manjari.G[3], G. Dinesh[4], B. Sai Pavan [5]
Department of ECE, Sir CR Reddy College Of Engineering, Eluru, India

Abstract: "Multi-Parameter Health Monitoring System" (MPHMS) is an IOT term that describes the collecting and collaboration of patient data from sensors. Sensors, a Raspberry Pi 3 Model B, a GSM Module, and sensors make up the project's hardware platform. The sensors used in this suggested proposal collect the patient's heartbeat, temperature, and electrocardiogram (ECG). This system also monitors the extra Saline level and Falldetection. The sensor data will be stored to be used for patient health analysis in the Thing Speak cloud. These metrics' threshold levels are established in accordance with the general state of health.

An email and SMS alertwill be sent if there are any anomalies. This data is transmitted via the Internet and kept on a medical server. Consequently, the medical server is used to monitor the patient's health metrics. The patient's condition will be accurately diagnosed by the doctor, who will then be able to administer precise therapy. The data generated by the IOT will help the patient recuperate more rapidly and obtain better medical care at a lower cost. This is most helpful for those who require ongoing monitoring.

Keywords: IOT, Multiparameter, Thing Speak, ECG, Fall Detection, Saline level, Medical Server

I. INTRODUCTION

IOT is a network of simultaneously connected objects to the internet. The fundamental principle of IOT is that things and things, like sensor nodes, can recognise, detect, process, and interact with one another. IoT has a huge impact on the healthcare industry[1].

The current state of the healthcare system is disintegrated due to poor patient-doctor communication. In order to solve this issue, information technology becomes necessary[8]. IoT- enabled medical equipment can significantly improve healthcare services. There is a big chance of virtually savinglives by implementing IoT concepts in healthcare[3].

IoT-based e-health solutions should give patients valuable health information, and clinicians can make better choices regardless of where their patients are. The Internet of Things (IoT) has already made strides in a number of healthcare- related fields, including collaborations, data storage, data transit, intelligent medical equipment and devices, patient monitoring, and diagnostics[5].

There are slightly fewer doctors in rural areas than in urban ones. Outside of government facilities, medical equipment is not easily accessible in rural areas[2]. When compared to government-run hospitals, these clinics see a greater percentage of patients. The machinery, which has virtually stopped, is the same[4].

So, in an emergency, this hardware component will send a report as soon as it is practical to the doctors or medical specialists[15]. The doctors will do the remaining work based on their findings. This IoT's primary goal is to improve cosmology-based reactions with the capacity to monitor well-being[9].

Thanks to iot-based health monitoring devices, users can now get the essential physiological data while relaxing at home. Because it can be difficult and laborious for them to travel a long way to the hospital, elderly folks now have it easier[12]. In this study, we have selected a few particular sensors to identify various issues. The device will keep track of the patient's temperature, heart rate, oxygen saturation level, and other factors[7].

Everyone desires to be in good health. To prevent anyfuturedramatic changes, it is equally crucial to regularly check on a person's health. Moreover, simple health status monitoring for older individuals is essential. We may use IoT to collect data, send data over the internet, and provide means for datainteroperability[13].

A. Motivation

Patient health issues and healthcare costs are decreased with this system. The gathering, recording, analysis, and sharing of data streams over the internet eliminates the need forpatients to frequently visit their doctors to check on health parameters like heart rate, temperature, oxygen level, etc. These data streams are primarily used for cancer and dialysis patients who require continuous monitoring. We discoveredthat the current health monitoring solutions do not offer a storing option for future patient health analysis. So, we wantto create a system that can save the data for further examination.

II. SYSTEM ARCHITECTURE

The design portion is divided primarilyinto the following twosections:

A. Hardware Architecture

This system includes Temperature sensor, Heart beat sensor, Ultrasonic sensor,Fall sensor, ECG sensor, Raspberry Pi3 Model B.

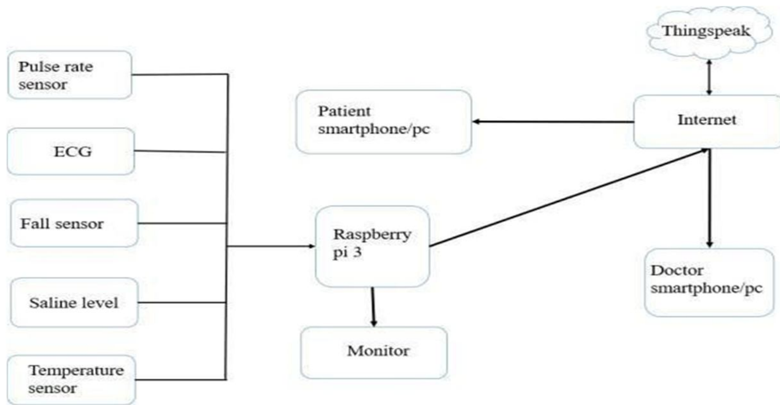


Fig.1.Block diagram

1) Raspberry Pi

The Model B+ of the Raspberry Pi 3 range includes a new 64-bit quad core processor running at 1.4GHz with an integrated aluminium heat sink, dual-band 2.4GHz and 5GHz wireless LAN, faster (300 mbps) Ethernet, and PoE functionality through a separate PoE HAT.Due to its quad-core, 64-bit, 1.2 GHz ARM Cortex-A53 SoC CPU from Broadcom, the Raspberry Pi 3 is around 50% more powerful than the Pi 2. As a result, the new Raspberry Pi 3 can access the internet and run commercial applications.

2) LM35-TemperatureSensor

An analogue output voltage proportional to temperature is produced by the temperature measuring device, model number LM35. It provides output voltage in Celsius (degrees Celsius). There is no need for further calibration hardware The sensitivity of the LM35 is 10 mV/degree Celsius. The output voltage rises as the temperature does. similar to how 25 °C and 250 mV.

3) MAX30102-HeartBeatSensor

The MAX30102 is a heart rate and pulse oximetry module. A MAX30102 works by shining both lights onto a finger or earlobe, then using a photo detector to measure how much light is reflected. The name of this method for light-based pulse detection is photoplethysmogram. The two elements that make up MAX30102's operation are pulse oximetry and heart rate measurement (measuring the oxygenlevel of the blood).

4) ADXL345–FallSensor

The ADXL345 is a full 3-axis MEMS accelerometer module with I2C and SPI interfaces is compact and low power. The 3.3V voltage regulator and level shifter on the ADXL345 board make it straightforward to connect to 5V microcontrollers like the Arduino.This module's central processing unit is the Analog Devices ADXL345 IC. The ADXL345 is a small, thin, complete 3-axis accelerometer with low power usage and signal-conditioned voltage outputs. The device monitors acceleration throughout a full scale minimum range of 16g.

5) UltrasonicSensor

In this system we are using this sesnsor for measuring the saline level of the saline bottle. This module's basic operating premise is straightforward. It uses a 40 kHz ultrasonic pulse that travels through the air and returns to the sensor if it encounters a wall or other object. The distance is calculated using the sound speed and travel time. Transparent item identification works best with ultrasonic sensors. Applications that use infrared sensors, for example, have difficulty monitoring liquid levels in this particular use case due to target translucence.

6) ECG Sensor

The electrocardiogram, or ECG as it is sometimes referred to ,is a technique for gathering electrical impulses generated by the human heart. The ECG sensor is used to understand person's psychological state as well as to gauge their level of physiological arousal when they are experiencing it. A sensor called an AD8232 is used to measure the electrical activity of the heart.

7) GSM Module

The GSM (Global System for Mobile communications) network allows connections from mobile devices by looking for nearby cells because it is a cellular network. GSM networks functionacross four distinct frequency bands. Most GSM networks operate in the 900 MHz and 1800 MHz frequencies.. Due to the fact that the 900 and 1800 MHz frequency channels were already taken, certain nations in the Americas Instead use the 850 MHz and 1900 MHz frequencies. The more uncommon 400 and 450 MHz frequency bands have been allotted in certain countries where these frequencies were previously used for first-generation systems.

8) LCD Display

LCD stands for liquid crystal display. It is a particular kind of electronic display module that is utilised in many different circuits and gadgets, such as calculators, cell phones, and other gadgets. Most seven-segment and multi-segment light-emitting diodes are preferred for these displays. Adopting this module has a number of benefits, including minimal cost and limitless display options for customised characters, original animations, etc.

B. Software Architecture

1) Python-IDLE

IDLE, which Python's Integrated Development Environment (IDE) is an acronym for Integrated Development and Learning Environment. The IDLE module comes pre- installed with the Python installation for Windows.Python distributions for Linux do not by default include IDLE. The appropriate package managers must be used to install it. IDLE can be used to create, edit, and run Python scripts in the same manner as Python Shell may be used to execute a single statement. The fully featured text editor in IDLE, which offers features like syntax highlighting, autocompletion, and smart indent, may be used to write Python script. Additionally, it offers stepping and breakpoint facilities for a debugger.

2) VNC-Viewer

Users can instantaneously and remotely access any computer, whether it is running Windows, Linux, or Mac OSX, using the remote PC software VNC Viewer. This programme enables keyboard and mouse control while allowing you to view the desktop of the distant computer. Nevertheless, users must first download a VNC server app to the computer they intend to manage before downloading thatapp to the computer they wish to use as a control point. A graphical desktop sharing system in computers is called VNC, or "virtual network computing." For remote computer control, this programme employs the remote-frame buffer protocol. Through a network, it sends the keyboard and mouse movements from one machine to the next and the graphical screen updates the other way around.

3) ThingSpeak

Users can communicate with gadgets that support the internet using the open-source Ruby programme known as ThingSpeak. By offering an API to both the devices and social network websites, it makes it easier for users to access, retrieve, and log data. ThingSpeak customers can analyse and visualise uploaded data using MATLAB without purchasing a MATLAB licence from Math Works thanks to integrated support from the numerical computing programme.

Send sensor data to the cloud using the IoT cloud platform ThingSpeak. MATLAB or other software, as well as creating your own programmes, can be used to analyse and visualise your data. MathWorks runs the ThingSpeak service. Small, non-commercial projects using ThingSpeak are free.

III. METHODOLOGY

Personal health monitoring systems are very beneficial as patient's can access them remotely The following figure explains the system's entire methodology. Since the Raspberry Pi is the primary control device, we must first connect it tothe power source in order to operate the system.

The Raspberry Pi, temperature, pulse rate, ECG, ultrasonic, and fall sensors make up the bulk of our system. The main new parameters added to this system and absent from other health monitoring systems are fall detection and salinity level detection,which are not available in existing systems.Itconsists of a temperature sensor that measures the temperature, a MAX30102 sensor that measures the pulse rate and oxygen level, an ECG that measures the patient's heart rate, an ultrasonic sensor that indicates the saline level,and a fall sensor that measures the patient's position.

When a patient is fed saline, nurses must constantly watch the patient and check the saline level. Yet, it produces high frequency sound waves and evaluates the echo by employingan ultrasonic sensor. According to this mode of operation, the sensor determines the saline level based on how far it is from the sensor. The ADXL335 module measures acceleration in the three dimensions of X, Y, and Z using ananalogue input. It keeps track of the user's motion. Fall warning detectors can tell when a person has unexpectedly fallen by detecting abrupt changes in body movement. The device will immediately activate an emergency fall alarm and contact emergency services when a fall occurs and it determines that these conditions are in the danger zone.

Raspberry Pi transmits the values sensed by these sensors tothe cloud. As a result, all data is saved in the cloud and can be accessed by doctors using their login credentials. A user, on the other hand, can log into their mobile app and verify all parameters using the GUI and cloud within the android- based app.

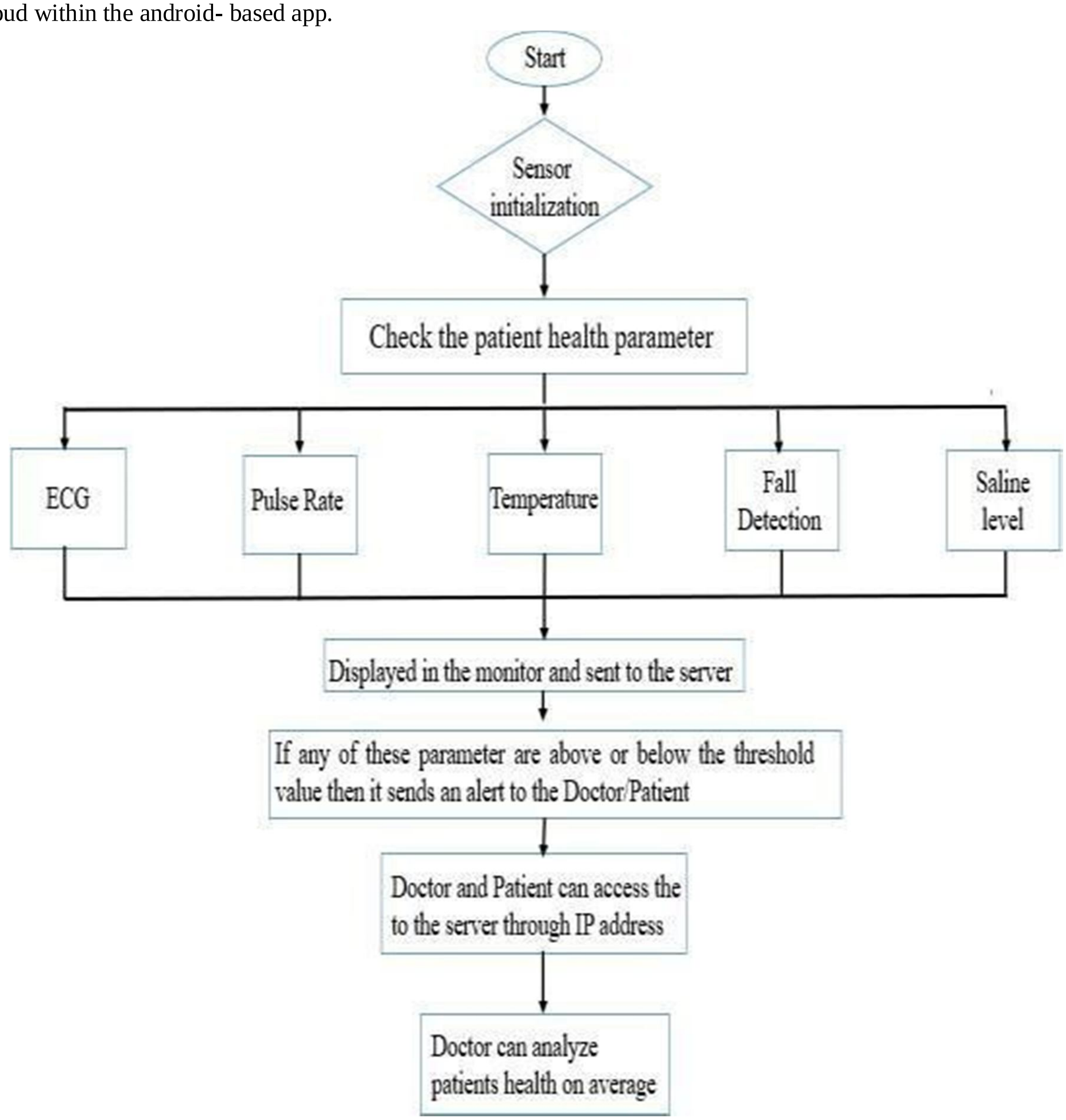


Fig.2.Flow chart

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

IV. RESULTS AND DISCUSSIONS

Fig.3 depicts the experimental setup for our system. The Raspberry Pi is connected through a USB wire, and the sensors and GSM module ,LCD dispaly are attached to the board as well.

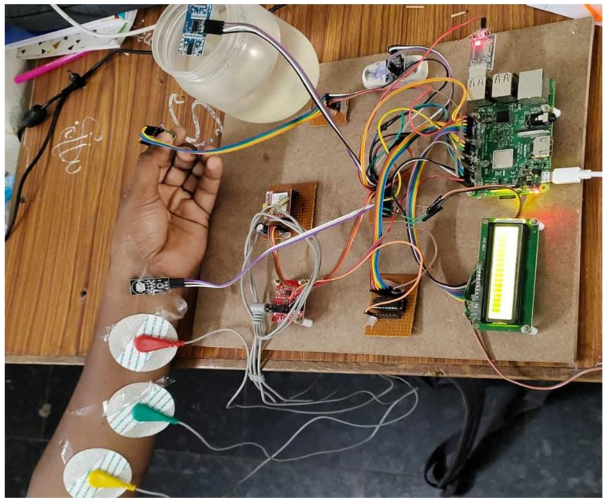


Fig.3.Hardware model setup

In our proposed system, we are displaying the values of the parameters as output in different ways. The following are the different outputs:

1) LCD Display

Fig.4.LCD Display

2) Sms Alert

a) Normal Condition

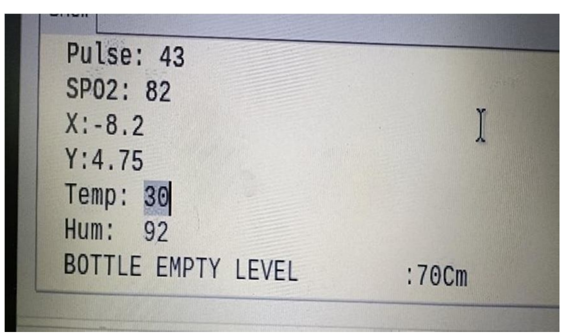


Fig.5.Normal Condition

b) Abnormal Condition

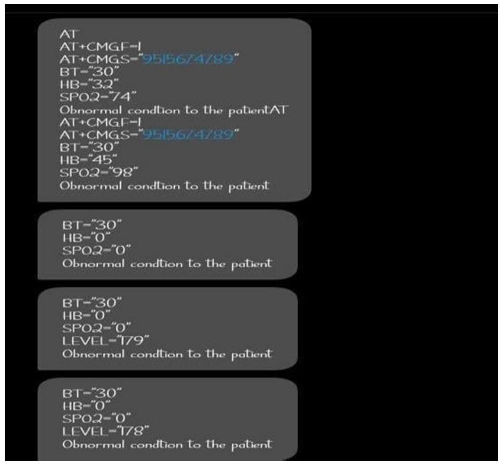


Fig.6.Abnormal Condition

3) Cloud Storage-Thing Speak

a) Temperature Values

Fig.7.Temperature values

b) Heart beat values

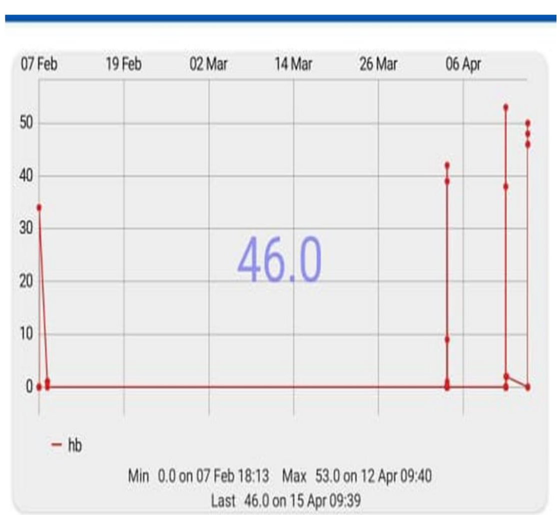


Fig.8.Heart beat values

c) Oxygen Level Values

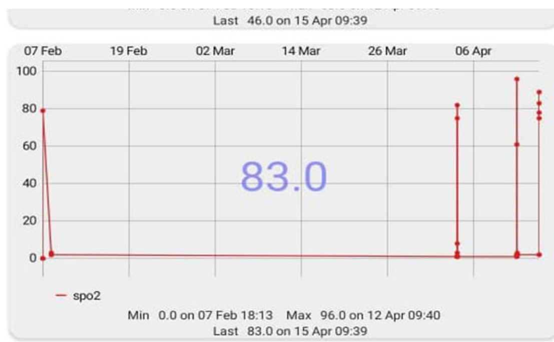


Fig.9.Oxygen level values

V. CONCLUSION

In this proposed system we have examined a Raspberry Pi-based IOT health monitoring system. Applications of ongoing patient monitoring are made possible by the model. The purpose of the health monitoring system is to alertthe doctor and continuously monitor the patient using the sensors. If there are any health abnormalities, the doctor, authorised personnel, orguardian will be notified by SMS. Via the thingspeak or thingview apps, thedoctor can remotely assess the patient's condition and only then propose the necessary precautions tobe taken. One major restriction is that the values provided by the ECG may not be reliable. The system is addressing the issue of older citizens' health monitoring from the comfort of their homes, which will serve to improve citizens' quality of lifeand lead to healthy life.

REFERENCES

[1] Kaur, Amandeep, and Ashish Jasuja. "Healthmonitoring based on IoT using Raspberry PI." In 2017 International conference on computing, communication and automation (ICCCA), pp. 1335-1340. IEEE, 2017.

[2] Naik, Seena, and E. Sudarshan. "Smart healthcare monitoring system using raspberry Pi on IoT platform." ARPN Journal of Engineering and Applied Sciences 14, no. 4 (2019): 872-876.

[3] Alekya, R., Neelima Devi Boddeti, K. SalomiMonica, R. Prabha, and V. Venkatesh. "IoT basedsmart healthcare monitoring systems: A literature review." Eur. J. Mol. Clin. Med 7 (2021): 2020.

[4] Senthamilarasi, C., J. Jansi Rani, B. Vidhya, and H. Aritha. "A smart patient health monitoringsystem using IoT." International Journal of Pure and Applied Mathematics 119, no. 16 (2018): 59-70.

[5] Shashidhar, R., S. Abhilash, V. Sahana, N. A.Alok, and M. Roopa. "Iot cloud: In health monitoring system." International Journal of Scientific and Technology Research 9, no. 1 (2020): 227.

[6] Sunil, G., Srinivas Aluvala, G. Ranadheer Reddy, VedanthamSreeharika, Parupally Sindhu,and Sriramula Keerthana. "IoT based saline levelmonitoring system." In IOP Conference Series: Materials Science and Engineering, vol. 981, no.3, p. 032095. IOP Publishing, 2020.

[7] A. Gutte and R. Vadali, "IoT Based Health Monitoring System Using Raspberry Pi," 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), Pune, India, 2018, pp. 1-5, doi: 10.1109/ICCUBEA.2018.8697681.

[8] R.Chengoden et al."Metaverse for Healthcare: A Survey on Potential Applications, Challenges and Future Directions," in IEEE Access, vol. 11, pp. 12765-12795, 2023, doi: 10.1109/ACCESS.2023.3241628.

[9] A. B. Amin, S. Wang, U. David and Y. Noh, "Applicability of Cloud Native-based Healthcare Monitoring Platform (CN-HMP) in Older Adult Facilities," 2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), Glasgow, Scotland, United Kingdom, 2022, pp. 2684-2688, doi: 10.1109/EMBC48229.2022.9871998

[10] Y. Yang, H. Wang, R. Jiang, X. Guo, J. Cheng and Y. Chen, "A Review of IoT-Enabled Mobile Healthcare: Technologies, Challenges, and Future Trends," in IEEE Internet of Things Journal, vol. 9, no. 12, pp. 9478-9502, 15 June15, 2022, doi: 10.1109/JIOT.2022.3144400.

[11] S. S. Rani, T. H. Pavan, A. Vanathi and B. S. K. Devi, "A Review on Patients Health Monitoring using IoT and Cloud Technologies," 2022 Seventh International Conference on Parallel, Distributed and Grid Computing (PDGC), Solan, Himachal Pradesh, India, 2022, pp.1-6,doi:10.1109/PDGC56933.2022.10053279.

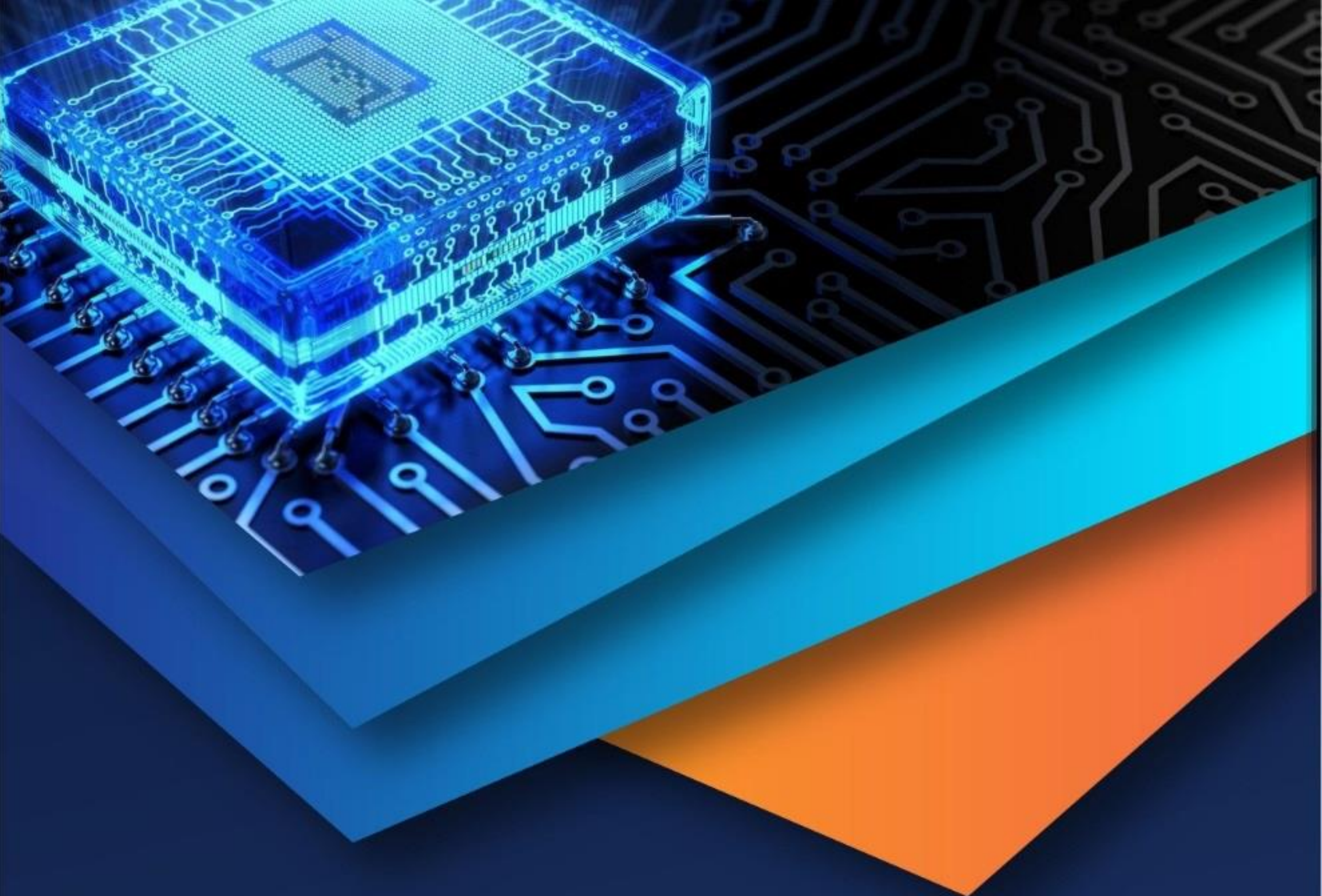
[12] G. S, V. L, R. V. B, D. SS and A. N, "IoT Based Health Monitoring System," 2021 Innovations in Power and Advanced Computing Technologies (i-PACT), Kuala Lumpur, Malaysia,2021, pp. 1-6, doi: 10.1109/i- PACT52855.2021.9696937.

[13] Shruti and M. Singh, "Intelligent HealthCare System using Raspberry Pi," 2021 International Conference on Technological Advancements and Innovations (ICTAI), Tashkent, Uzbekistan, 2021,pp. 565-570, doi: 10.1109/ICTAI53825.2021.9673348.

[14] I. D. Sabukunze, D. B. Setyohadi and M. Sulistyoningsih, "Designing AnIot Based SmartMonitoring and Emergency Alert System for Covid19 Patients," 2021 6th International Conference for Convergence in Technology (I2CT), Maharashtra, India, 2021, pp. 1-5, doi: 10.1109/I2CT51068.2021.9418078.

[15] Prasetyo, I., A. W. Nugraha, and R. S. Ammar. "Health care monitoring system based-oninternet of things." In Journal of Physics: Conference Series, vol. 1413, no. 1, p. 012008. IOP Publishing, 2019.

[16] Hunter, Gary W., Raed A. Dweik, Darby B. Makel, Claude C. Grigsby, Ryan S. Mayes, and Cristina E. Davis. "Portable breath monitoring: A new frontier in personalized health care." The Electrochemical Society Interface 25, no. 4 (2016): 63.



doi crossref

10.22214/IJRASET

INDEX COPERNICUS

45.98

ISRA JIF

IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY