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Patient Monitoring System for Remote Doctors using GSM Technology

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ABSTRACT

In today's world health problems became a significant issue, health related issues can't be controlled since they may ensue to the environmental changes, lifestyle changes or maybe heredity but it can improve the monitoring techniques so we might get immediate help and can be rescued in time. The proposed system aims to watch the patients remotely by using IoT. This device monitors a person's heartbeat, temperature, respiration and therefore the speed of the motion and sends it to the cloud over the net with the help of Node MCU that has in-built Wi-Fi, so the person will be monitored anytime and anywhere round the globe. The condition of the patients is conveyed via a portal to medical staff, where they will process and analyse this situation of the patients. The developed prototype is well matched for healthcare monitoring that's proved by the effectiveness of the system.

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LITERATURE REVIEW

While brain-computer interfaces (BCIs) can provide communication to people who are locked-in, they suffer from a very low information transfer rate [1]. Further, using a BCI requires a concentration effort and using it continuously can be tiring. The brain-controlled wheelchair (BCW) described in this paper aims at providing mobility to BCI users despite these limitations, in a safe and efficient way. Using a slow but reliable P300 based BCI, the user selects a destination amongst a list of predefined locations. While the wheelchair moves on virtual guiding paths ensuring smooth, safe, and predictable trajectories, the user can stop the wheelchair by using a faster BCI. Experiments with nondisabled subjects demonstrated the efficiency of this strategy. Brain control was not affected when the wheelchair was in motion, and the BCW enabled the users to move to various locations in less time and with significantly less control effort than other control strategies proposed in the literature.

Through several shown prototypes such as brain-controlled wheelchairs, keyboards, and computer games, fresh research has pushed the area of electroencephalogram (EEG)-based brain–computer interface (BCI) out of its infancy and into a phase of relative maturity in recent years [2]. With the proof-ofconcept phase completed, the time has come to focus on the development of realistic BCI technologies that can be implemented in real-world settings. We are particularly interested in the possibility of improving the lives of innumerable disabled people by combining BCI technology with existing assistive devices (AT). In order to develop more practical BCIs for usage outside of the lab, we identified four application areas where developments in BCI technology could considerably assist impaired individuals, namely "Communication and Control," "Motor Substitution," "Entertainment," and "Motor Recovery." We highlight the main research concerns in these four domains while reviewing the current state of the art and probable future advances. The most 4 progress is expected in the development of hybrid BCI architectures, user–machine adaptation algorithms, the exploitation of users' mental states for BCI reliability and confidence measures, the incorporation of principles in human–computer interaction (HCI) to improve BCI usability, and the development of novel BCI technology, such as better EEG devices.

This paper presents a semi-autonomous navigation strategy aimed at the control of assistive devices (e.g. an intelligent wheelchair) using low throughput interfaces. A mobile robot proposes the most probable action, as analyzed from the environment, to a human user who can either accept or reject the proposition [3]. In case of rejection, the robot will propose another action, until both entities agree on what needs to be done. In a known environment, the system infers the intended goal destination based on the first executed actions. Furthermore, we endowed the system with learning capabilities, so as to learn the user habits depending on contextual information (e.g. time of the day or if a phone rings). This additional knowledge allows the robot to anticipate the user intention and propose appropriate actions, or goal destinations.

Advances in cognitive neuroscience and brain-imaging technologies give us the unprecedented ability to interface directly with brain activity. These technologies let us monitor physical processes in the brain that correspond with certain forms of thought. Researchers have begun using these technologies to build brain-computer interfaces (BCIs)—communication systems that don't depend on the brain's normal output pathways of peripheral nerves and muscles. Four short articles provide a quick overview of the past, present, and future of BCIs [4].

Creation of a unique communication and control modality for people with severe motor impairments. Normal volunteers were taught to navigate a cursor from the centre of a video screen to a target positioned at the highest or bottom edge using an 8–12 Hz mu rhythm recorded from the scalp over the fissure of Rolando of 1 hemisphere [5]. On-line frequency analysis was accustomed determine the amplitude of the Mu rhythm, which was then translated into cursor movement: bigger amplitudes moved the cursor up, while smaller amplitudes moved it down. Subjects learnt to switch mu rhythm amplitude rapidly and properly over several weeks, with the cursor often reaching the target in 3 seconds. Evaluation of the distribution of amplitudes in response to top and bottom targets yielded the parameters that translated mu rhythm amplitudes into cursor movements. This study's utilisation of those distributions was a standout feature and a vital contributor in its success. Improvements to the training techniques and therefore the distribution-based strategy for converting mu rhythm amplitudes into cursor movements should improve this 1-dimensional control even more. The achievement of two-dimensional control is being researched. For disabled people, the mu rhythm may well be an important new communication and control option.

An electroencephalogram (EEG)-based brain computer interface (BCI) for two-dimensional cursor control is proposed in this work. Mu/beta rhythm and P300 potential govern the cursor's horizontal and vertical movements, respectively. The key advantages of this system are: I the production of two nearly independent control signals at the same time; and (ii) the ability to move the cursor from one random position on the screen to another random position on the screen. Our experiment and data analysis have demonstrated these benefits [6].

Brain-computer interface (BCI) approach takes advantage of the fact that the P300 component of the event-related potential is elicited by unusual events in the oddball paradigm (ERP). The BCI shows the user a 6 by 6 cell matrix with one letter of the alphabet in each cell. While the rows and columns of the matrix are magnified, the user concentrates his or her attention on the cell containing the letter to be transmitted. Each intensification is an oddball sequence event, and the row and column containing the attended cell are "unusual" items, eliciting a P300 solely for these occurrences. By calculating which row and column elicited the P300, the computer determines the transmitted character. The scientists report that an off-line version of the system can communicate at a rate of 7.8 characters per minute with an accuracy of 80 percent, based on a bootstrapping 6 approach. The system's real-time performance was also evaluated. According to the authors' findings, a P300-based BCI is viable and practicable. These conclusions, however, are based on experiments conducted on healthy people [7].

It's difficult to develop user interfaces that can deal with unusual control features, and traditional interface design techniques aren't much assistance. This work looks at how interactions can be built to explicitly account for control input uncertainty and dynamics. The asymmetry of feedback and control channels, in particular, is highlighted as a fundamental design restriction, which is particularly apparent in current non-invasive brain–computer interfaces (BCIs). Brain– computer interfaces are devices that can decode cerebral activity in real time, allowing a computer programme to be controlled directly through thought. BCIs, on the other hand, have signal characteristics that are vastly different from those of most traditional interface devices. The bandwidth is extremely limited, and there are long and unpredictable delays. These interfaces can't just be treated like clumsy mice. They are an example of a burgeoning category of sensor-based interfaces with unusual control features in this regard [8]. As an example, we show the text entry application "Hex-O-Spell," which is controlled by electroencephalography based on motor imagery (EEG). The system makes use of the large visual display bandwidth to compensate for the restricted control signals, with the timing of state changes encoding the majority of the data. We offer findings that demonstrate the interface's comparatively excellent performance, with entry rates reaching seven characters per minute.

A self-training semi-supervised support vector machine (SVM) technique and its associated model selection method in this research, which are meant to train a classifier with limited training data. We then show that this algorithm is convergent [9]. Two examples are given to demonstrate the applicability of our model selection process. Finally, we test our method using data from a P300-based brain computer interface (BCI) speller. This algorithm has been found to greatly minimise the amount of time required to train the P300-based BCI speller.

An EEG-controlled web 7 browser based on self-regulation of slow cortical potentials (SCPs) allows severely paralysed patients to browse the internet without using their muscles [16]. This system, however, had various flaws, including the fact that patients could only explore a limited number of web pages and had to select links from an alphabetical list, which caused issues if the link names were identical or if the user didn't recognise them (as in graphical links). Here, we describe Nessi, a novel EEG-controlled web browser that addresses these issues. The open-source browser Mozilla was augmented by graphical in-place markers in Nessi, allowing the user to pick any link on a web page by corresponding distinct brain reactions to different frame colours placed around chosen things. Other interactive features, such as e-mail and virtual keyboards, are available to the user in addition to links, opening up a wide range of hypertext-based applications.

EEG-driven web browsers based on slow cortical potential (SCP) self-regulation have previously shown that patients with severe paralysis can surf the Internet independently of spontaneous muscle control [14]. However, this system had some drawbacks. For example, patients can only view within a limited number of web pages, need to select a link from an alphabetical list, and have problems if the link names are the same or unknown to the user. (Example: Graphical left). Here we describe a new EEG-driven web browser called Nessi that overcomes these shortcomings. In Nessi, the open-source Mozilla browser has been extended with in-place graphical markers, with different brain reactions corresponding to different border colors around selectable items, allowing users to use any on a web page. You can select the link. In addition to links, other interactive elements such as email and virtual keyboards are available to users, allowing them to take advantage of a variety of hypertext-based applications.

Designing person interfaces that may address unconventional manipulate houses is challenging, and traditional interface layout strategies are of little assist [9]. This paper examines how interactions may be designed to explicitly recollect the uncertainty and dynamics of manipulate inputs. In particular, the asymmetry of remarks and manipulate channels is highlighted as a key layout constraint, that is especially apparent in present day non-invasive brain–pc interfaces 8 (BCIs). Brain–pc interfaces are structures able to interpreting neural pastime in actual time, thereby permitting a pc software to be without delay managed through thought. BCIs, however, have definitely specific sign houses than maximum traditional interplay devices. Bandwidth could be very confined and there are relatively lengthy and unpredictable delays. Such interfaces cannot actually be dealt with as unwieldy mice. In this admire they're an instance of a developing subject of sensor-primarily based totally interfaces that have unorthodox manipulate houses. As a concrete instance, we gift the textual content access software "Hex-O-Spell", managed through motor-imagery primarily based totally electroencephalography (EEG). The gadget makes use of the excessive visible show bandwidth to assist atone for the confined manipulate signals, in which the timing of the country modifications encodes maximum of the information. We gift consequences displaying the relatively excessive overall performance of this interface, with access costs exceeding seven characters consistent with minute

DISCUSSION

Existing system

• Robust healthcare is a requirement for both industrialized countries, where healthcare costs are high and security and privacy are essential concerns, and developing countries, such as India.

• Hospitals must handle a large number of patients and robust healthcare procedures are required. Doctors should check on the patient on a frequent basis. It is possible that a nurse will make a mistake when recording the report.

• Doctors or nurses will insert the NFC card into a card reader, causing sensors to transfer data to a microcontroller, which can then be seen on a PC via ZIGBEE.

• Using Android-based smart phones and tablet PCs, NFC tags may be used to automate the identification of patients and clinicians in hospitals. In the medical world, NFC can be utilized to investigate new approaches of real-time healthcare workflows and data processing.

Disadvantages

• In small hospitals this method can be followed, but in big hospitals this method can not be followed as the level of complexity is high.

• Maintenance of database of the patients as hardcopy of any accident or burn cases is not possible as some misplacement might occur.

• As more people use their devices to connect, the crowded airwaves make it difficult to find a stable signal.

• The most significant difficulty with IoT is privacy, as all linked devices transmit data in real time. If the end-to-end connection is not secure, personal data can be hacked. Criminals can profit from the personal information of others.

• Accuracy concerns may arise as a result of managing such large amounts of data in real time. Although the Internet of Things may lower the cost of diagnosis and treatment for patients, the cost of installing and maintaining all of the devices is rather expensive.

• Security and privacy: Because healthcare monitoring systems have the potential to be breached or hacked, security and privacy remain a major worry preventing users from embracing IoT technology for medical purposes. Theft of sensitive information regarding a patient's health and whereabouts, as well as tampering with sensor data, might have serious implications, negating the IoT's benefits.

• Risk of failure: Sensor and connected equipment performance can be impacted by failure or faults in the hardware, as well as power outages, putting healthcare operations at risk. Furthermore, skipping a planned software update could be much riskier than skipping a doctor's appointment.

• Integration: Because there is no consensus on IoT protocols and standards, gadgets from different manufacturers may not be compatible. The lack of consistency hinders IoT from being fully integrated, limiting its potential usefulness.

• Cost: While the Internet of Things (IoT) has the potential to lower healthcare costs in the long run, the cost of implementing it in hospitals and staff training is relatively expensive

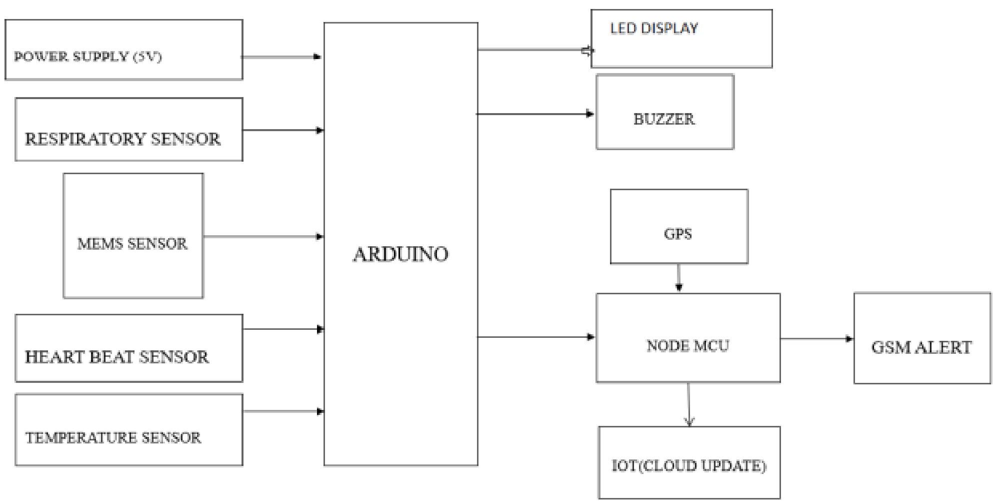

Fig 1 Architecture

PROPOSED SYSTEM

- The proposed system is a robust device that monitors the health of the patient automatically using the upcoming technology IoT (Internet of Things).
- It collects status information from these systems, such as the patient's temperature, body movement, heart rate, blood pressure, and ECG, and sends an emergency alert to the patient's doctor as well as the caretaker with his current state.
- Using IOT technology, we connected a respiration sensor, a temperature sensor, a MEMS sensor, and a heartbeat sensor to the Node MCU to monitor our home.
- The doctor and the caretaker would be able to keep an eye on their patient from anywhere in the world.
- The system use smart sensors to capture raw data from each sensor and transfer it to a cloud server, where it may be further analyzed and statistically maintained before being used. The data that is being analyzed will be sent to a doctor or a caretaker to be monitored constantly anywhere around the world so that incase of any emergency immediate action can be taken.
- They're made for medical updates, with an interface and access to details and physical signal recording settings. Changes to the system's touch screen and drug sharing parameters can be made via a web interface by doctors. Records from the monitoring equipment are transferred to the system. The data is then encrypted using the control algorithm, Augmented Data Recognize, by the allocation system's distribution.
- The cloud framework is designed to ensure patient safety and security. As a result, the transferred data is saved in the patient file and separated from nonaccessible government issues. Individual or short-term and long-term results are classify data on analytical hygiene gathered for all individuals in the cloud using two analytical methodologies.

Hardware Requirements

- Power Supply
- ATMega328P Microcontroller
- Node MCU 13
- MEMS
- Temperature sensor
- Respiratory Sensor
- Heartbeat Sensor
- GPS Module
- GSM Module
- Arduino UNO

Hardware Requirements

- ARDUINO IDE
- Language: Embedded C
- Ubidots – IoT Platform

DISCUSSION

The output of this system is given below with the pictures. The hardware setup of the system in the given FIGURE 5.1 consists of an Arduino, ATMega328P Microcontroller, Node MCU, Temperature sensor, Respiratory sensor, ECG sensor, LED display and a power supply unit.

Hardware connection discussion

The system uses a voltage regulator of 7-12V as the power supply to power the entire device. Sensors being used in this device are the heartbeat sensor, temperature sensor, respiratory sensor, MEMS sensor. The input sensors are connected to the Arduino and the output is given by the Node MCU where the data is sent to the cloud. The monitor cable is connected to the output pin of Arduino. The 16x2 LED Display is connected to the Arduino and shows the appropriate output for each sensor.

Fig, 2 Hardware

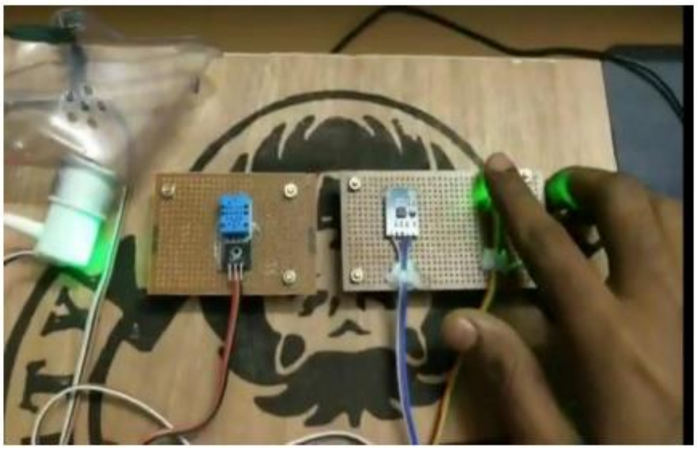

Fig 3 Sensors

PROCESS

Step 1: Register

Figure 3 shows as there are necessary sensors, Patients will record the every HealthCare monitoring parameters using the following Heartbeat Sensor, Respiratory Sensor , Temperature sensor, MEMS sensor and ECG sensor. These Recorded Values from the patients acts as the primary parameters of Smart healthcare system monitoring using Internet of Things.

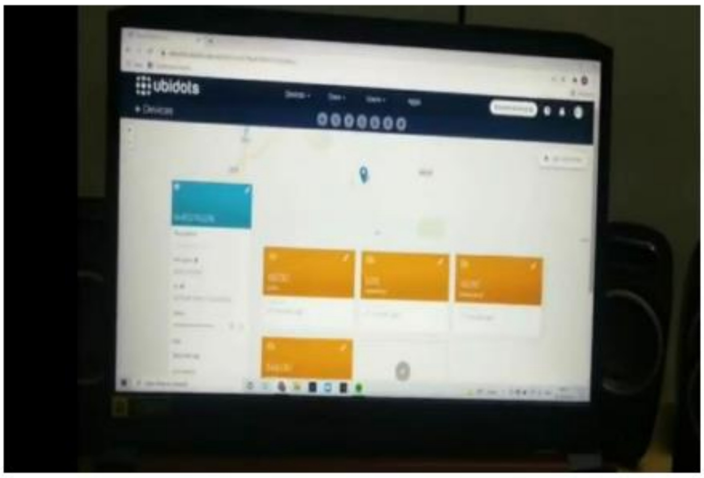

Fig 4 Ubidots cloud database

Step 2: Recorded healthcare monitoring parameters

Figure 4 shows Using Heartbeat Sensor, Patient's Main Pulse is been recorded, which is then stored in a private Database using Cloud. The Pulse rate is then analysed for the Steadiness of Patient and Is then monitored by respective doctor/guardian.

Fig 5 LED Display

Led display:
Every value from Heartbeat Sensor is been displayed in the LED Display which then moved to cloud for Healthcare Monitoring as shown in ***Figure 5***

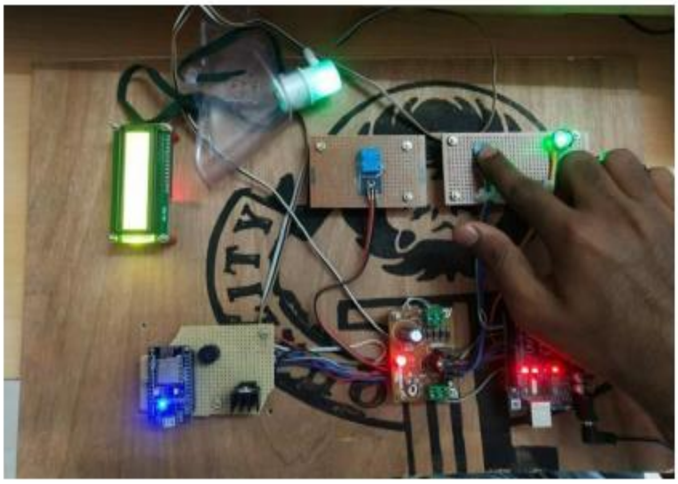

Fig 6 MEMS Sensor

It is a chip-based technology where sensors are composed of a suspended mass between a pair of capacitive plates is shown above in ***Figure 6***. Patient's Mobility and Human Mechanical moment is recorded from this sensor. This Sensor in our project is mainly useful for bedridden/Coma Patients.

The temperature of the patient is recorded using the Temperature Sensor. This Recorded parameter is used to check the regular condition of the patients, If The Value is exceeded the regular temperature (above 37 degree Celsius/100.4 Fahrenheit),The recorded Temperature in database will alert the respective patient's doctor/guardian.

Using the Respiratory Sensor, Patient has been equipped with The Respiratory Mask and the breathing of the patient is recorded in regular period of time. This Sensor helps to check the unevenness of Respiration in patients.

Step 4: Recorded database using cloud
Every Parameters Recorded Using The respective Sensors are Stored in a specific Database using Cloud.
The following Figures 7,8,9 and 10 shows the output of Pulse sensor, Temperature Sensor.
Respiratory Sensor and MEMS.

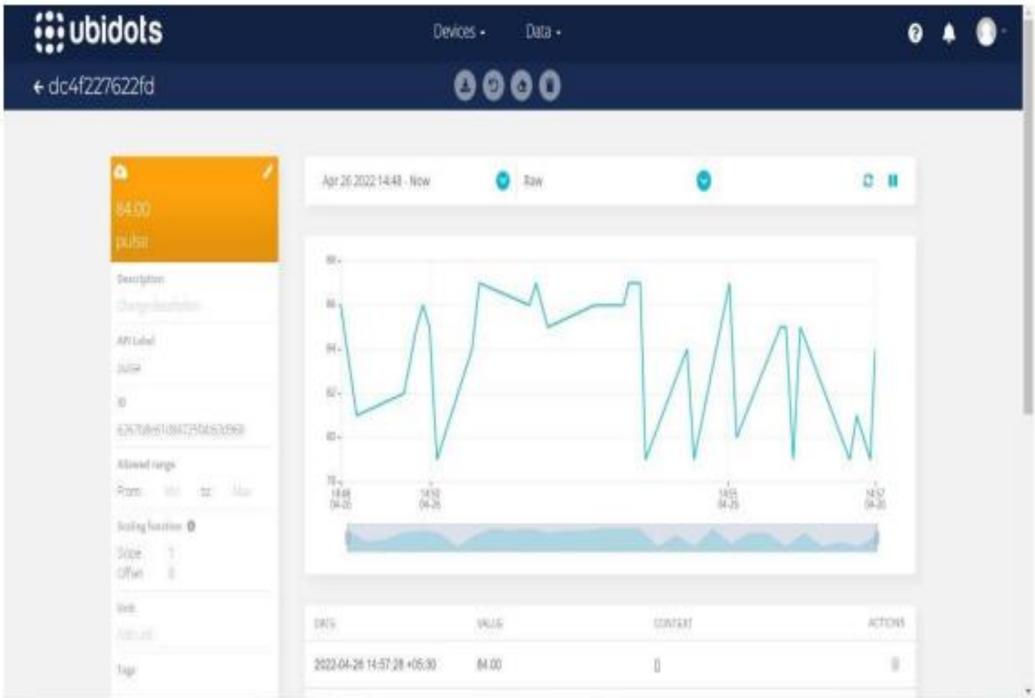

Figure 7 Output of Pulse sensor

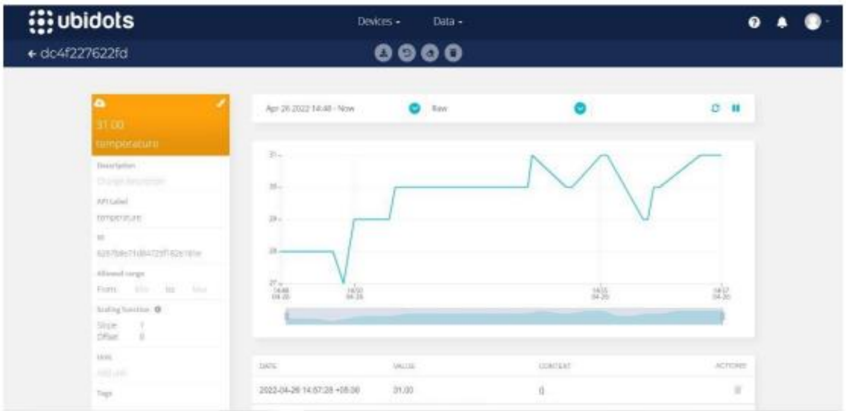

Figure 8 Output of Temperature Sensor

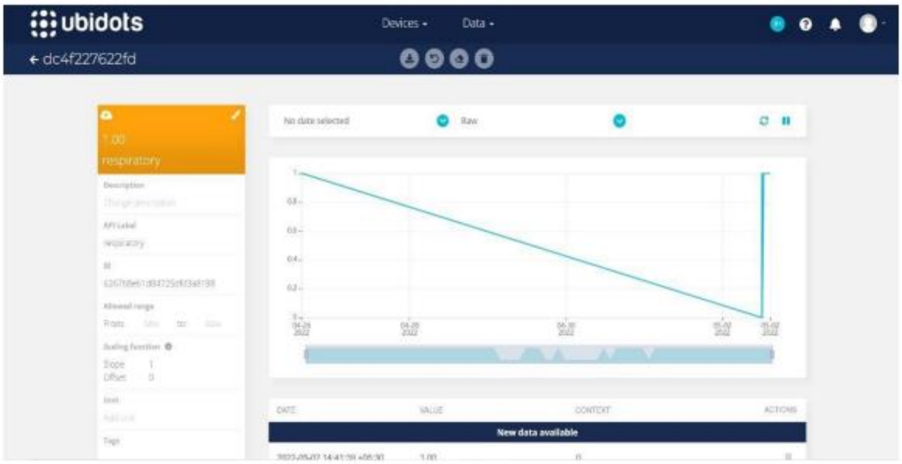

Figure 9 Output of Respiratory Sensor

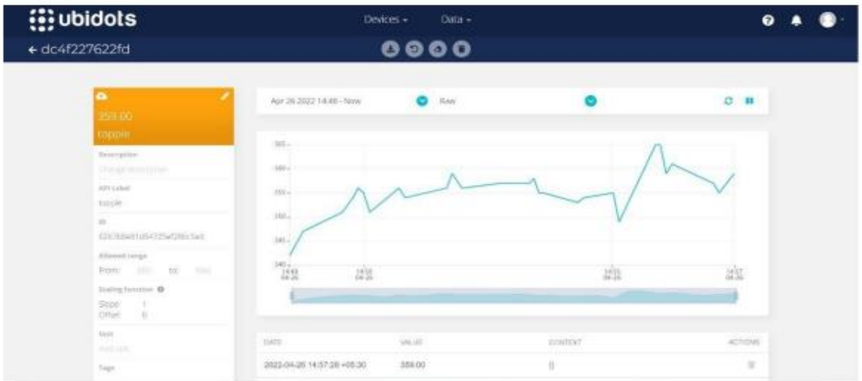

Figure 10 Output of MEMS

CONCLUSION

The system introduced smart healthcare that monitors the patient's basic vital signs like rate and temperature, still as room condition measurements like room humidity, CO and CO2 gas. The success rate of observational and actual data is around 95% or higher all told cases of the developed healthcare system. Real medical staff can view and track data in real time, even when the patient is being tested outside the hospital. this method may also analyze raw medical data in an exceedingly short amount of your time, which is additionally beneficial for nurses and doctors in epidemic and crisis situations. The developed prototype is incredibly easy to style and use. The system is extremely useful within the case of communicable disease sort of a novel coronavirus (COVID19) treatment. The developed system will improve this healthcare system which will protect plenty of lives from death. You will learn a lot when you complete this project. Learn how IOT-based sensors actually work. This project is useful for both doctors and patients. Physicians can know the patient's health through IoT-based sensors and can also analyse health data stored in real-time databases. It saves time and the patient gets an instance of the appropriate treatment

This project can be used in hospitals and diagnostic centres in patient management systems. It can also be used for remote health monitoring at home.

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