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IoT Based Smart Healthcare Monitoring System for the Paralysis and Mute Person

Abstract: - Flex sensors are used by the IOT-based smart healthcare monitoring system for paralyzed and silent people to identify their requirements. The system includes temperature and pulse rate monitoring, and it transmits and displays real-time data updates via Internet of Things to an LCD. The brain of the system is an Arduino or CPU, which gathers and processes input from several sensors and coordinates all of the system's functions. It displays vital sign data, interpreted requirements, and any alarms or messages that the patient or caregivers may observe in real time. Because of its Internet of Things (IOT) characteristics, this system can send gathered data to distant servers or devices over the internet. This makes it possible for caregivers or healthcare professionals to view the patient's data remotely for tracking and prompt action. In the event that any sensor readings exceed predetermined thresholds indicating critical circumstances, an alarm system is included to rapidly contact caretakers or medical personnel. The buzzer functions as an auditory alert that requires quick attention. Caregivers are alerted by a buzzer when high sensor readings are detected. The method uses audio playback to convey requirements that have been discovered in order to improve communication with patients who are silent. By delivering timely information and promoting efficient communication, this integrated approach improves treatment for people with paralysis and those who are silent. It also makes the healthcare environment more responsive and patient-centered.

Keywords: Doctor Consultation, Internet of Things (IOT), Paralysis and Mute Patient, Arduino Uno.

I. INTRODUCTION

The emergence of the Internet of Things (IOT) has sparked revolutionary developments in the field of healthcare, leading to the creation of intelligent systems that are revolutionizing patient monitoring. Given this, the suggested Internet of Things (IoT)-based Smart Healthcare Monitoring System stands out as an important invention, especially for those dealing with paralysis and muteness. The use of flex sensors to precisely identify patient demands is essential to the system's operation. The system does not stop at identification; it also keeps a close eye on all the important health metrics, such as temperature, blood oxygen levels, and heart rate. In addition to being shown on an LCD, real-time data is also easily sent via the Internet of Things enabling accessible from a distance. The system's capabilities are further boosted by the addition of audio playback, which gives silent patients a voice and promotes improved communication between caregivers and patients. In order to ensure rapid action, the system employs a proactive strategy by including a buzzer warning mechanism to immediately inform caretakers of any unexpected sensor results. In the context of paralysis and silent people, this combination of sensor technology, IoT connection, and audio communication offers a transformative option for individualized and responsive treatment.

1.1 Paralysis and Mute Patient

It is important to begin by outlining the intricacies and effects of paralysis and mute patients in order to address the difficulties these patients confront. A limb's lack of muscular function is referred to as paralysis. Numerous factors, including spinal cord injuries, strokes, and neurological illnesses, may cause it. There is a wide range in the degree and severity of paralysis, from localized muscular weakness to total lack of mobility in certain body areas. The mobility, independence, and general quality of life of a person are significantly impacted by this constraint. Conversely, muteness, or the inability to speak, may be caused by a variety of ailments, such as injuries,

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neurological diseases, physical problems affecting the vocal cords, or selective mutism, in which people choose not to speak for psychological reasons under certain circumstances. Lack of verbal communication makes it difficult to convey needs, feelings, and ideas, which affects every day functioning and social relationships. When

these two circumstances come together, people may battle with restricted or nonexistent mobility in addition to verbal communication, which is a basic component of human contact, making their struggles much more intense.

1.2 Doctor Consultation

Individuals who are paralyzed and silent often have several difficulties interacting with society. Physical obstacles that impede their access to public areas, buildings, and transportation may be created by paralysis patients who are unable to move, which makes it more difficult for them to integrate into society. Furthermore, being unable to speak increases their social barriers as it is harder for them to readily express their wants, take part in discussions, and connect with others. Their struggles are made worse by the stigma and misunderstandings in society around these disorders, which may result in prejudice, sympathy, or even avoidance from others. The patient's confidence, self-esteem, and general mental health are negatively impacted by these interrelated difficulties, which together represent a strong barrier to full involvement in social, educational, and professional domains. In order to create a more inclusive environment that accommodates and supports people confronting these issues and allows them to enjoy full lives and actively participate in their communities, it is imperative that efforts be made to promote accessibility, education, and awareness within society.

1.3 Implementation

In the Smart Healthcare Monitoring System which is based on the Internet of Things (IoT) for persons who are immobile or silent, there are several of essential components that are put into consideration in order to have their demands met. Flex sensors are used by the system to record minute muscle movements or gestures, which are then converted into useful data in order to detect and identify patient requirements. The patient is able to effectively convey their needs thanks to the processing and sharing of this data via an audio replay capability. Using specialized sensors, the device simultaneously and constantly analyzes important health factors including temperature, blood oxygen level, and pulse rate. For remote access by caregivers or healthcare practitioners, all of this data is delivered over an IoT network, shown on an LCD screen, and updated automatically. An alert system sounds a buzzer to promptly warn caretakers or medical experts in the event that any sensor readings above predefined thresholds indicating significant health issues. This ensures fast action.

This system is aimed at increasing the treatment quality and ensuring the health of patients with those illnesses through providing the necessary feedback in real time, facilitating communication, and enabling prompt interventions.

II. RELATED WORKS

Hospitals [1] and non-governmental organizations (NGOs) tend to paralyzed individuals whose attacks have left them completely or partially paralyzed. Most of the time, owing to a loss of brain-related motor function, these individuals are unable to express their requirements since they cannot talk clearly or use sign language. From this point, the Automatized Paralyzed Patients Care System really work like that patients take care of themselves automatically, and getting attention quickly will, therefore, be benefiting the patients.

These individuals can talk properly or use sign language, but they are usually unable to convey their needs due to a lack of mental motor coordination. In this scenario, we propose a technology that allows a handicapped individual to broadcast messages on the LCD by moving any part of his body that can move. This technique uses GSM to deliver an SMS message to the patient in the event that they are unable to get in-person care. Our proposed system functions by determining the tilt direction of the user portion. Consequently, patients may converse at home or at work over the internet with doctors, therapists, or other loved ones. Health facilities are required to regularly submit case-specific data, such heart rate. The recommended approach monitors the heart rate and other relevant data for the body of the case. To measure heart rate, for example, photo plethysmography is used. A microcontroller connected to a transmitting module continuously transmits the decoded periodic data. The croaker can so keep an eye on and manage many situations at once. The application also enables us to verify the information gathered.

Because their brains [3] have lost the ability to govern their muscular function, most paralyzed individuals are unable to express their demands via sign language or speech. Our suggested solution assists the impaired individual in this scenario by enabling them to simply move their hand to show a message on the LCD. The suggested method operates by interpreting the hand's different tilt orientations. The patient wears a glove with the transmitter linked to it. To communicate various messages, the user just has to tilt the gadget in different ways. Motion data are measured using an accelerometer. It then sends this data to the microcontroller, which interprets it and displays the appropriate message based on the received input. As soon as the accelerometer sends a motion signal, it sounds a buzzer and displays the message. After that, the information is sent online to the IOT Adafruit server, where the message is shown. With the use of this device, paralyzed individuals may communicate their critical requirements to others.

Many people [4] still struggle to utilize voice assistants, virtual assistants, and other new technologies in a comfortable and efficient manner even after they have been available. Our effort primarily benefits the elderly, the disabled, and those who are bedridden. Old age homes and hospitals are the application areas for our concept. Our prototype can efficiently manage emergency scenarios in which the user is unable to use his or her mobile phone by identifying the user's hand signals and notifying hospitals and caregivers. Additionally, our model incorporates a medical alert system. This prototype notifies the user at that precise moment based on the time that was previously initialized for taking the medications. The OLED and a buzzer are both used to show the alert message. This glove has integrated temperature, flex, and pulse-oxy sensors that provide continuous measurements of user-health metrics that are shown on an OLED that is attached to the glove. The glove's primary function is to convey the user's wants, which is made possible via a flex sensor.

In modern application of the Internet of Things (IoT) which incorporates smart homes and cities, smart health care, smart education, smart transportation, and smart warfare, IoT plays a critical role. The IoT offers enormous advantages, among which is its support for in-hospital patient monitoring not only at a good pace but also in a safe and real-time remote way, thus opening up many opportunities for an increased quality of life. In this report study, Internet of Things technology will be used to track the assessment of healthcare monitoring systems. The article describes the essential role and benefits of IoT in healthcare, as well as general advantages of IoT healthcare. With the help of an exploration literature, we offer the comprehensive research survey of IoT-based healthcare monitoring systems that is currently on-going. The efficacy, efficiency, data protection, privacy, security, and monitoring of different systems are compared in the literature study. The study offers a taxonomy of healthcare monitoring sensors in addition to exploring Internet of Things monitoring solutions based on wearable and wireless sensors. Then, we give equal importance to the problems and unsolved issues that impact QoS and problems associated with security and privacy. In the end, the recommendations and ideas for IoT healthcare applications are provided as well as the direction of some current technological trends in the future perspective.

III. PROPOSED METHOD

Special health care monitoring systems have increased greatly in hospitals and other health centre (together with the new technology), which is now a big issue that distant countries have been concerned a lot about. The adoption of the Internet of Things (IoT) technology in the healthcare sector facilitates the transition of face-to face consultations to telemedicine.

This research proposes a patient tracking system by implementing the Internet of Things (IoT) that can obtain the patient's present environment and vigor indication in real time. This system employs five sensors which represent input data from the hospital environment such as the room temperature sensor, body temperature sensor, CO indicator, and CO2 indication. With this in mind, the proposed plan shows only tolerable errors (less than 5%) for each example. Medical personnel will get data feedback on the patients' conditions from the gateway that connects the whole system and helps out the medical personal to process, view and evaluate the current situation of the patient. Manifested in the system's operational role, it can be used for the health monitoring of patients.

Those who are paralyzed or silent are the target audience for the Smart Healthcare Monitoring system that is being presented. Flex sensors are used to identify the demands of the patient and translate them into audio playback for communication. Furthermore, the system uses sensors to continually monitor vital indications including temperature, blood oxygen levels, and heart rate. For remote access, all data is updated on an LCD and sent via the

Internet of Things. Caretakers or medical personnel are instantly notified by a buzzer alarm if sensor readings suggest critical levels.

The purpose of this integrated system is to enhance the treatment and security services for individuals handling such problems through the creation of communication channels, tracking patient data, and facilitating the provision of prompt response.

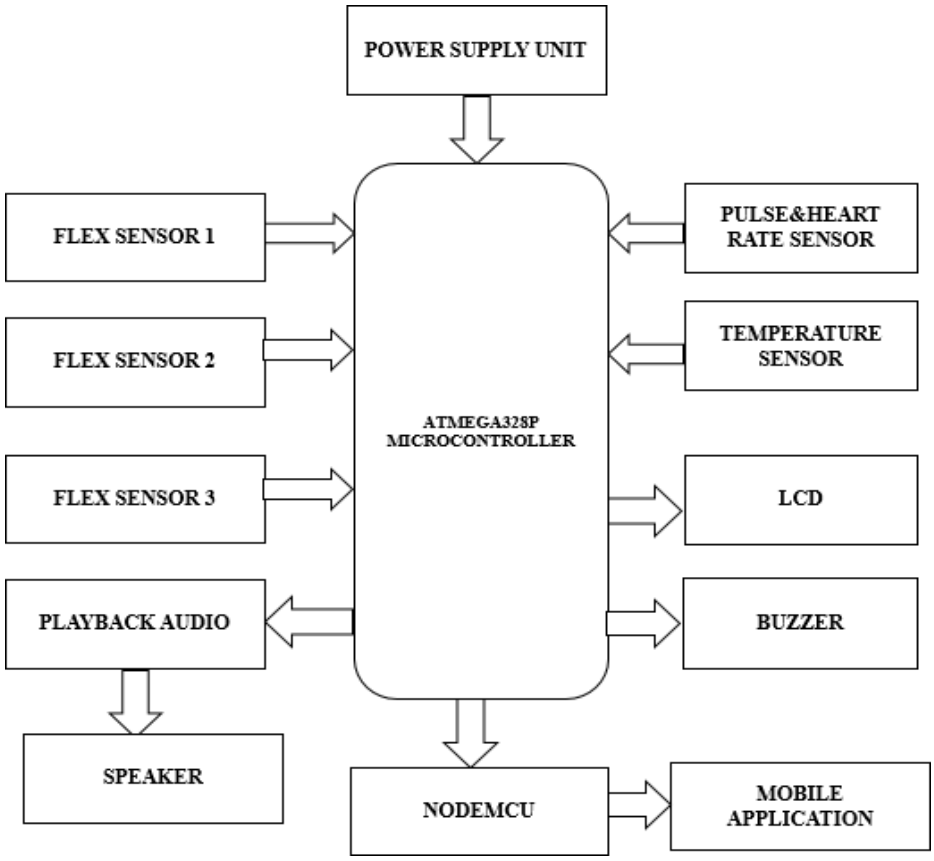

Figure 1 Block diagram of Proposed Method

3.1 Power Supply

An integral part of electronic systems and gadgets is a power supply unit, or PSU. The purpose of this integrated system is to enhance the treatment and security services for individuals handling such problems through the creation of communication channels, tracking patient data, and facilitating the provision of prompt response.

A PSU's job is to adjust the incoming electrical voltage so that it powers the device at the proper level. For instance, in many other regions of the globe, home outlets provide AC (alternating current) voltage at 220-240V, but in the United States, the average voltage is 110-120V. Nonetheless, a lot of electronic parts and circuits run at lower voltages, often DC (direct current). The voltage is adjusted by the PSU to the necessary amount. A controlled and constant output voltage is supplied by a PSU. This indicates that the PSU maintains a constant output voltage even in the event of changes or fluctuations in the input voltage or the load, or the devices attached to it. This is essential for sensitive electrical components to operate correctly and dependably. In order to guard against overloads and short circuits, PSUs often feature a current restriction. The PSU will restrict the current to avoid harm if the connected devices demand more current than a safe level.

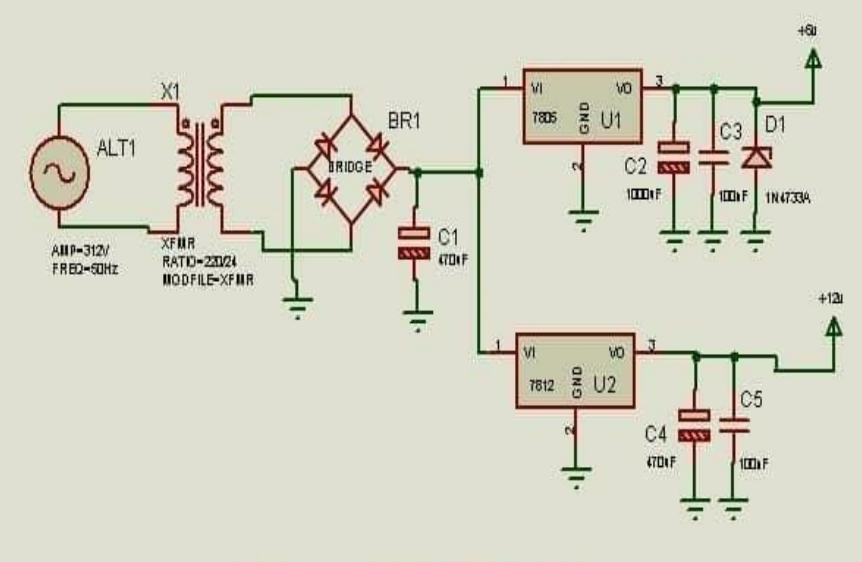

Figure 2 Power Supply Unit

3.2 Arduino UNO

The well-known Arduino Uno microcontroller board is a great place for novices to start as well as a flexible tool for seasoned makers, engineers, and electronics enthusiasts. It is a member of the Arduino microcontroller board family, which is renowned for its adaptability, simplicity, and variety of uses. Based on the AVR architecture, the ATmega328P microprocessor powers the Arduino Uno. For a variety of applications, this microcontroller offers an excellent mix of memory, computing power, and I/O capabilities. The board's power supply is a 5V output, therefore the microcontroller onboard as well as the circuitries running in current are powered with 5V. Suggested input voltage ranges will be between 7V and 12V. Input voltage value will fluctuate from 6V to 20V.

3.3 Flex Sensor

An electrical component that responds to bending or flexing is called a flex sensor, often referred to as a bend sensor. This adaptable sensor is frequently utilized in robots, medical equipment, and virtual reality systems, among other fields where the measurement of bending or curvature is necessary. A flex sensor is generally a narrow strip of material that changes resistance when bent. It is often constructed of a unique conductive ink composition. Depending on how far it is bent, the resistance of the sensor either rises or falls. This resistance change, which is often expressed in ohms, may be calibrated to get exact data on the bend's degree or angle.

3.4 SpO2

The SpO2 sensor is a crucial part of a pulse oximeter, a medical instrument used to detect blood oxygen saturation levels. Selecting the appropriate SpO2 sensor is essential for both accuracy and comfort of your patient. What kind of SpO2 sensors are available, then? Four kinds of SpO2 sensors are distinguished neonatal, baby, pediatric, and adult SpO2 sensors. Take into account the application location, weight, and age while choosing a SpO2 sensor.

Blood oxygen concentration is measured using a SpO2 sensor. The pulse oximeter sensor counts the quantity of hemoglobin attached to oxygen molecules. Every sensor probe has a pair of light-emitting diodes, one produces near-infrared light and another generates red light. Photo-detector works simultaneously with them to provide the data. The photodetector is the device that captures the intensity of light transmitted to each of the wavelengths. Furthermore, the reading's fluctuations are used to calculate the blood oxygen concentration. It is customary to insert the probe on the body at an earlobe or on a fingertip. There are two distinct ways that light may go via the transmitting material.

3.5 Buzzer

An electrical gadget used to generate audible sound signals is called a buzzer. This little, uncomplicated part beeps or buzzes continuously or sporadically when it is turned on. Typically, buzzer mechanisms are made out of an electromagnet that, when activated, produces sound waves via a vibrating element or a diaphragm. Buzzer devices are widely used in electronic gadgets, home appliances, cars, and industrial equipment for a variety of functions, including alarms, alerts, and indications. They are useful for alerting people to certain occurrences, alerts, or status updates. Because of their affordability and dependability, buzzers are a cost-effective option for sound communication in scenarios where auditory warnings or messages are required.

IV. RESULTS AND DISCUSSION

The outcomes of our real-time, IoT-based health monitoring system, which is capable of measuring, tracking, and reporting people's health conditions both offline and online from any location. Our suggested Internet of Things (IoT) solution can provide private health data in real time to caregivers and medical facilities. The suggested system measures body temperature, pulse rate, heart rate, and body temperature in a smart home environment using an Arduino UNO, Node MCU, and a sensor. Historical medical records for the patient also be accessed by the system. A few test scenarios were used to evaluate our solution, and it performed flawlessly and accurately. In developing nations, the suggested method has a lot of promise for both urban and rural regions.

4.1 Reading in Application

The temperature, heart rate, oxygen level and blood pressure wave forms of patient are shown in Figure 3 -7. It clearly indicates the patient health condition at various time intervals.

Figure 3 LCD Output

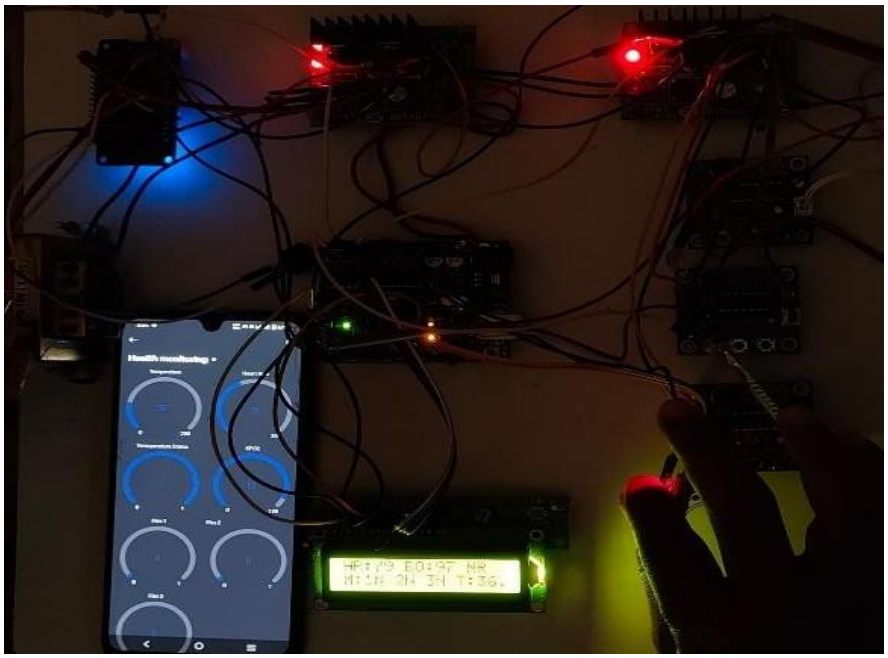

Figure 4 Hardware components of proposed system

Figure 5 Heartrate measurement output

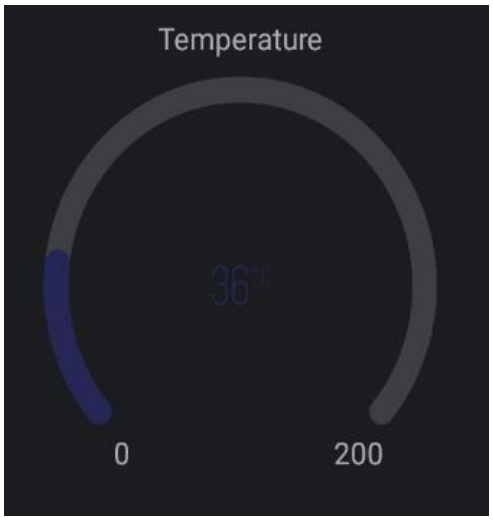

Figure 6 Temperature measurement output

Figure 7 Spo2 measurement output

V. CONCLUSION

In summary, the inclusion of temperature, flex, and SpO2 (blood oxygen saturation) sensors in an Internet of Things- based Smart Healthcare Monitoring System for people dealing with paralysis and muteness demonstrates a comprehensive approach to their treatment. Despite communication hurdles, the system can identify patient demands because to the use of flex sensors, which allow it to read small motions. In the meanwhile, real-time

monitoring of important health metrics that are essential to their wellbeing is made possible by the addition of temperature and SpO2 sensors. When combined with IoT connection, this combination of sensor technologies allows for continuous data collection and transmission, giving caregivers and medical experts the ability to monitor and assess the patient's status remotely. In the end, this all- encompassing monitoring system guarantees timely intervention in the event of any irregularities, improving the standard of care and security for those coping with paralysis and muteness.

VI. FUTURE WORK

Predictive analytics based on gathered data may be used to assist foresee health issues, enabling early interventions and individualized treatment regimens. Improving IOT connection to allow for direct contact with medical experts or telemedicine services would provide people instant access to consultations or advice from medical specialists. Continuous monitoring would be possible without the need for regular battery changes or recharging if power usage was optimized to extend device battery life.

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