IoT Based Automated Paralysis Patient Healthcare System Using Arduino and GSM

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***Abstract*—In order to ensure the well being of persons who suffer from incapacitating disorders like paralysis, continuous care and monitoring are often necessary. Here, we present a GSMbased Internet of Things-driven paralysis patient health monitoring system that is powered by Arduino. Our system communicates with a variety of sensors, including flex, temperature using an Arduino Mega (ATmega2560) microcontroller. Flex sensors, which detect movement beyond predetermined limits, are installed in each of the three fingers. These sensors are used by a GSM module to deliver SMS notifications to consumers in real time. Notifications are simultaneously displayed on a 16x2 LCD screen and sent audibly through an buzzer. DHT11 temperature sensor, in that order, with information shown on the LCD panel. With the help of this system, paralysis patients will be thoroughly monitored in real time, allowing carers and medical experts to respond quickly to emergency circumstances and ultimately improving patient safety and wellbeing.**

***Index Terms*—GSM Module, Arduino IDE, Flex Sensors,Arduino Atmega2560, DHT11**

I. INTRODUCTION

The Internet of Things is a rapidly developing topic with technological, social, and financial implications. Microcontrollers, sensors, and other peripherals for online communication comprise the Internet of Things. User and device interaction and communication are facilitated by the integration of these components with the appropriate protocol.[1]

To deal with location, which is used to keep an eye on the patient's health. People who have had a paralytic attack are either totally or partially incapacitated. The patient who is paralyzed is unable to speak or make requests. These patients lack a fast reflex system, which results in minimal to non-existent coordination between the brain, limbs, and vocal systems. In that case, the project that is being suggested can be useful. Our proposed system enables the disabled person to display a message on the LCD with a simple hand gesture. The proposed system functions by analyzing the various tilt orientations of the hand. The patient wears a glove with the transmitter attached to it. To communicate different messages, the user only needs to tilt the device in different directions.[3]

The message based on the received input. As soon as the accelerometer. The goal of treatment is to help a person become as independent as possible to help them adapt to life with paralysis, even though there are cutting-edge methods for curing or treating paralysis patients [7].Motion statistics are measured

With an accelerometer. It then transmits this data to the microcontroller which interprets it and calculate the activities it sends a motion signal, it sounds a buzzer and displays the message. To see the message on the LCD screen and start a conversation, the patient only needs to move their functional body parts. One special feature of this device is that, if the patient and their caregiver are not nearby, the patient can use the developed mechanism to send an SMS message to them [3].

The fact that these kinds of gadgets are becoming larger and more costly presents a challenge in our opinion. It appears that these are exclusive to hospitals and cannot be utilized at the patient's residence or convenience. Our aim is to create a tool that can help patients regain their natural gait while also being affordable enough for them to use on their own and without incurring significant debt.The document includes a number of movement gesture sensor instructions to aid health personnel assist a paraplegic patient in meeting their needs.

II. LITERATURE SURVEY

Chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system [4].

A wide range of sensors have been developed recently, driven by the growing need for the elderly and other patients, particularly those with chronic illnesses [3].

Flexible wearable sensors can identify and track biological signals, including blood pressure, temperature, heart rate, and respiration rate, in order to diagnose illnesses in a timely manner [4].

To fulfil the requirement for ongoing medical supervision. Wearable sensors that are extremely flexible, stretchable, safe, and dependable have steadily gained popularity as a solution for ongoing medical detection needs [2].

They have created a wearable glove with a 3D accelerometer and five flex sensors—one on each finger—to record hand movements. The flex sensors are plasticfabricated resistors whose resistance varies according to the bend angle [2].

By measuring the voltage drop across a 10KΩ resistor connected in series with the flex sensor in a potential divider configuration, the angle of bend is detected [4].

The microcontroller and Bluetooth module are housed on a data collection board, which is interfaced with the flex sensor and accelerometer [5].

Furthermore, basic thresholding-based signal processing can be used to identify the finger-bending motions. We take advantage of this feature to create an asynchronous, low-power gesture recognition and data gathering system [5].

The GSM module doesn't activate until the hardware logic detects a valid finger gesture [5].

Using the Internet of Things (IoT) and certain medical devices, this enables elderly people to avoid contracting any diseases [6].

This facility will enable people to check their health status without having to visit other medical facilities [6].

To save a patient's life as soon as possible, this is used to take their body temperature and pulse rate and transmit the information to them via a GPS and GSM module web technologies [7].

It provides a cure for improving adaptability and dependability by raising the patient monitoring system's performance and power management. It provides the architecture of the suggested model that uses Bluetooth to measure temperature and heart rate [7].

It states that following the measurement of biological data with a wearable sensor device, an SMS will be sent to a registered mobile phone [8].

Patients with paralysis need to be continuously monitored in order to guarantee their health and to administer medical care on time [8].

This method lowers costs by maximizing glove performance and comfort without requiring custom manufacturing. Users can customize the glove by assembling standardized modules [10].

Research indicates that robot-assisted physical therapy can help with neurological injury rehabilitation, which is the driving force behind these kinds of applications [11].

In this paper, design standards for soft Exgloves (SEG)—devices used for assistance or rehabilitation—are established. Suggestions, limitations, and implications are also discussed in this review to improve SEG developments in the future for stroke survivors and individuals with hand disabilities [12].

III.MATERIALS AND METHODS

A. Block diagram of the work

For the development of this work, hardware circuit designed and it is implemented. The hardware design includes the connection of the components as per the circuit diagram and the software design includes coding Microcontroller for controlling the LCD module.

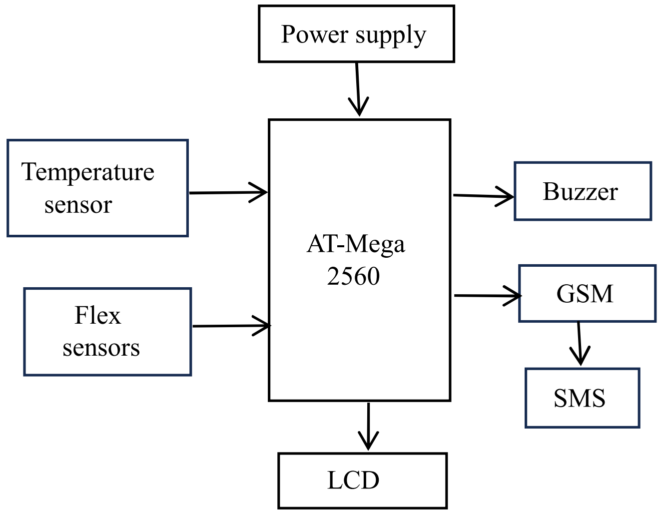

Fig. 1. Block Diagram of hardware implementation

Fig. 1. The paralysis health monitoring system integrates various sensors and components to provide real-time monitoring and assistance to paralyzed people. Basically, the Arduino Mega acts as a central device that manages data from sensors such as Flex sensors, DTH11 temperature sensor. These sensors detect critical events, such as excessive movement or actions, and take immediate action. Once detected, the GSM module communicates with the cellular network to send SMS messages to selected caregivers, ensuring a timely response to emergencies.

At the same time, the LCD screen provides visual feedback on the patient's condition, and the speaker's audio alarms improve accessibility and ensure alarm detection even in noisy environments. The mobile network acts as an important link that enables seamless communication between the monitoring system and caregivers, which facilitates rapid intervention when needed. Through this unified approach, the system provides nurses and medical professionals with a comprehensive view of a patient's health status, facilitating proactive measures and ultimately improving patient safety and well-being. The system using IoT technology is an important tool to improve the quality of care for paralyzed patients and provides peace of mind to both patients and care givers.

Flex Sensors:

To identify movements that above predetermined criteria, flex sensors are positioned strategically on three fingers. These sensors serve as important gauges of the patient's motor function, warning carers of noteworthy motions like reaching for or attempting to handle objects. Such motions are detected by the flex sensors, which then immediately send out signals to provide fast help and action.

DHT11 Temperature Sensor:

The DHT11 sensor measures temperature using a thermistor and measures humidity using a capacitive sensor. It produces a digital signal based on the humidity and temperature measurements.One of the most widely used low-cost digital temperature and humidity sensors in Internet of things applications and do-it-yourself electronics projects is the DHT11. The temperature and humidity range it works in are 0°C to 50°C and 20% to 90% RH. Its temperature and humidity accuracy are within ±2°C and ±5% RH, respectively. Integrating with microcontrollers such as Arduino and Raspberry Pi, it connects via a single-wire digital interface operating at 3.3V or 5V DC.In order to detect errors, DHT11 transmits data in a 40-bit digital signal format that includes checksum bits. Despite being extensively utilized in applications like smart home automation, environmental monitoring, and weather stations.

GSM module:

The GSM module facilitates communication between the monitoring system and the nurses or medical staff through the cellular network. When the GSM module triggers sensor alarms, it sends SMS messages to selected phone numbers, ensuring timely dissemination of critical information. This allows nurses to receive instant alerts regardless of their location, allowing them to quickly respond to emergencies and provide the patient with the care they need. The ability of the GSM module to send alarms via text message increases the reliability of the system and ensures smooth communication between the monitoring system and the caretakers.

16*2 LCD screen:

The 16x2 LCD screen is a standard liquid crystal display that provides a visual interface to provide real-time information and alerts to nurses or medical staff. The LCD display has two lines of 16 characters and can display various information such as sensor readings, alarms and system status. Its compact size and low power consumption make it an ideal choice for embedding in portable monitoring devices. The LCD display improves the usability of the monitoring system by allowing nurses to quickly assess the patient's condition briefly, even in environments where audio signals may not be practical.

AT-MEGA 2560:

A microcontroller from Atmel's AVR family, which is currently a part of Microchip Technology, is the ATmega2560. The ATmega2560 is an advanced Harvard architecture with separate program and data memories, built on an 8-bit RISC (Reduced Instruction Set Computing) platform. It offers effective processing capabilities for a variety of applications and operates at a clock speed of up to 16 MHz. The ATmega2560 microcontroller boasts a substantial memory capacity. Program storage is available in 256 KB of flash memory. SRAM: Data storage capacity of 8 KB. EEPROM: 4 KB for storing non-volatile information.With a total of 54 digital input/output (I/O) pins, 15 of which can be used as PWM outputs, the microcontroller provides a wide range of General-Purpose Input/Output (GPIO) pin selection.It is appropriate for applications requiring analog sensor interfacing because it has 16 analog inputs.

IV. RESULT AND THEIR ANALYSIS

An ATmega2560 microcontroller serves as the central processing unit of the Automated Paralysis Patient Healthcare System, which makes it easier to integrate and manage different components. A GSM 900A module allows for remote monitoring and communication, giving caregivers and medical professionals access to real-time alerts and updates regarding the patient's condition. The patient's body temperature is continuously monitored by the DHT11 temperature sensor, which is essential for spotting any possible health issues. For the purpose of displaying important data like system status and temperature readings, an LCD display provides an easy-to-use interface. A buzzer can also be used to notify caregivers of emergencies or unusual circumstances.

Flex sensors are incorporated into the system to identify body movements and offer feedback, assisting in the evaluation of the patient's mobility and physical condition. The system guarantees continuous operation and data collection with a dependable power supply. All things considered, this integrated healthcare solution provides a thorough method for keeping an eye on and managing the health of individuals suffering from paralysis, making prompt interventions, and raising the standard of care.

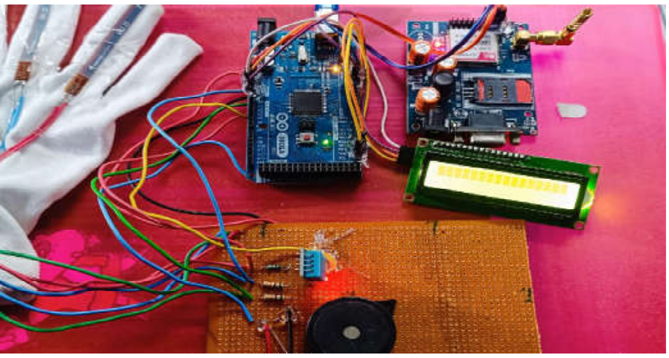

Fig.1 Health monitoring of a paralysis patient using flex sensors and GSM.

Fig.2 Displaying need water when the first flex sensor isbend.

Fig.3 Displaying need food when the second flex sensor is bend.

Fig.4 Displaying emergency when the third flex sensor is Bend.

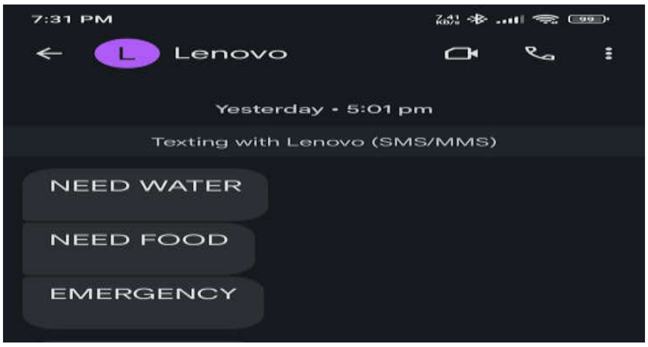

Fig5.Patients needs are send in the form of sm

V. CONCLUSION

An important development in healthcare technology, especially for those who are paralysed, is the Internet of Things-based Paralysis Patient Health Monitoring System with GSM and Arduino. The system offers carers and medical professionals fast alerts and critical information while enabling extensive real-time monitoring and help for patients through the integration of many sensors, communication modules, and display interfaces.

Through constant monitoring of vital indicators including temperature and finger motions, the device enables carers to react quickly to critical circumstances like falls or aberrant physiological states. By utilising the GSM module to send SMS alerts, carers are kept aware no matter where they are, which allows for quick action and the best possible care.

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