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# IOT based Paralysis Patient Health Care System

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**ABSTRACT:** Paralysis is the loss of muscle function in body components. It can affect any region of the body at any moment, and may not cause discomfort in the affected location. Technological and therapeutic breakthroughs aim to enhance quality of life. Our goal is to create a user-friendly and cost-effective technology that combines basic health care monitoring with nursing care. Paralysis patients are unable to communicate their messages or requirements. The IoT-based paralyzed patient health care system facilitates communication between patients, doctors, nurses, and loved ones sitting at home or in the office on the internet. The system uses microcontroller-based circuitry to achieve its functionality. The system utilizes a finger bending recognition system. The circuit detects the bending of fingers using a flex sensor and the microcontroller communicates the corresponding output or the need of a patient to the caretaker of the patient using a GSM module.

## I. INTRODUCTION

Patients suffering from paralysis are unable to move their muscles in order to function. This disorder can have a wide range of symptoms and causes, particularly in cases of spinal cord injury that impact the neurological system. Certain systems are currently in place for personal comfort. Nonetheless, this technology will support tracking the patients' overall needs. Based on the input from the sensors, their messages will be shown. The goal is to create an innovative tool that aids those with disabilities. The lives of those who are paralyzed might be improved by this gadget in the future. While there are many cutting-edge methods for treating paralysis, this technique will assist patients adapt by maximizing their level of independence. Thankfully, technological advancements over the past ten years show promise in addressing these.

The IoT-based paralyzed healthcare system transmits patient data to caregivers and loved ones via the internet. The IoT-based paralyzed patient health monitoring system allows patients to communicate with doctors, nurses, and loved ones from their home or business. The Internet. To achieve this functionality, the system uses microcontroller-based technology.

The system includes a hand motion recognition circuit and receiver/transmitter circuit. The hand motion circuit uses a flex sensor to detect hand movements and wirelessly transmits the data to the receiver system. The receiver system receives and processes commands, displays them on the LCD, and transmits data to a mobile application. The WHO reports that the doctor-to-patient ratio in India is approximately 1:854. The ratio suggests that one doctor must visit almost 98% more than the average. However, so far, there are high-tech and pricey systems used to monitor patients in hospitals. ECG and EEG devices are used to monitor heart rate and brain activity, respectively. These systems are fairly pricey.

The suggested study provides clinicians with an efficient and economical way to monitor the health condition of several individuals. Tracking a patient's vital signs on a regular basis is called patient monitoring. Sensor connections are usually required for patient monitoring. Wireless connectivity, displays, and sensors are among the components. Nodes and other auxiliary parts Transducers, which are utilized to capture all of the patient's physical data, are what sensors are. Devices are combined to display desired signals on HMI or LCD screens. Generally, communication devices have a shorter range. Typically, microcontroller units are used as auxiliary parts in patient monitoring systems.

## II. LITERATURE SURVEY

Smart healthcare is important for patients who need continuous monitoring that is not available outside of hospitals. Additionally, it's critical in townlets or rural areas with nearby conventions to inform megacity hospitals about the health state of their patients. This study presents a smart health monitoring system that uses biological detectors to check a

patient's condition and sends an online notification to the patient. An Arduino Uno regulator then reads the data from the biological detectors and connects it to an LED display so that the occurrence may be seen. Body vitals, or palpitations, temperature, and moisture, are important indicators of a case's health and aid in formulating a treatment plan and documenting the patient's response to that plan.

While gathering vital signs from a bigger population of patients on a tight routine can be exciting and tiresome, the risk of false positives grows with delicacy, time pauses, and instrumentation estimation. In order to solve this issue, we offer a real-time, digitally calibrated vital dimension equipment that can function in real time, capture data, and send it for additional expert consultation. In addition to increasing the effectiveness of health tracking records, measurement-generated data can also be used statistically. This gadget aims to raise the standard and effectiveness of medical care.

In order to visualize the data on a smartphone, it is uploaded to a web page for storage and observing. To enable their caregivers and family members to view the case's details with ease, an android operation has been created.

A portable remote health monitoring system is developed using IOT which can show the patient's oxygen level in the blood, body temperature. For IV bag level monitoring, load cell is used to indicate fall in level of glucose. The oximeter is also included to know the oxygen level in the blood whether it is increase or decrease. [1]

The proposed work includes various monitoring system in healthcare such as heart beat rate monitor, pill bottle and drips bottle remainder, electronic paralysis patient caretaker. These monitoring systems are used to monitor patient health remotely using sensors and mobile communication devices. [1, 1]

To help the paralyzed patients the proposed project is introduced, it consists of sensors that monitor different vital information and also help the patients to convey their messages to the bystanders. The information is stored with a separate database and using an IoT platform such as the Blynk application the alert message or abnormal conditions are noted and viewed by care-takers and also the doctor. [1, 2]

This system continuously monitors the pulse rate and body temperature and updates them to an IoT platform. If any abnormalities are detected then system immediately sends notification to doctor. The IoT platform used in this project is Thing Speak. [1, 3]

In addition to tracking patients' vital signs, activity levels, and medication adherence, the device can give medical professionals instantaneous feedback. In order to improve treatment results, the system can also help with rehabilitation activities, give reminders, and collect statistics on progress. [2]

The aim of this paper is three folds: First, review of key factors that drove the adoption and growth of the IoT-based in-home remote monitoring; Second, present the latest advances of IoT based in-home remote monitoring system architecture and key building blocks; Third, discuss future outlook and our recommendations of the in-home remote monitoring applications going forward. [3].

The Internet of Things is one of the factors transforming traditional healthcare services. Because of the growing population, traditional healthcare institutions cannot offer enough high-quality services. The globe needs to address the issue of its aging population and the ensuing demand for senior assisted living communities. Thanks to developments in mobile and Internet of Things technologies and services, in-home health monitoring applications have proliferated over the past couple decades. These developments include enhanced network architecture, greater indoor network coverage, higher device performance and dependability, extremely cheap device costs, low power consumption, and enhanced device and network.

### III. PROBLEM STATEMENT

The reduced doctor-to-patient ratio suggests that doctors and other healthcare providers are under a lot of pressure to follow up with the healthy status of every single patient admitted to the ward. Furthermore, a great distance between a patient and a doctor degrades the quality of care because, in most situations, it involves life and death.

### IV. OBJECTIVES

The principal aim of this project is to enable the patient to conveniently notify the caregiver and physician of any

unexpected emergencies or tasks that need to be done. The primary goal of this proposed system is to complete the project as a whole; the specific goal is to determine how the project will be carried out from start to finish, with modules that are categorized as simple as possible to achieve the primary goal.

#### 4.1 Main Objective:

To use the Internet of things to create a customizable, low-cost patient health status monitoring system. The caregiver will receive real-time information regarding the patient's condition via the system.

#### 4.2 Specific Objectives:

- To develop and verify code for flex, LM35, pulse and ECG sensors.
- To design a model which monitor the sensor input using Atmega2560 Microcontroller.
- To design a model which monitor the sensor input using Atmega2560 Microcontroller.
- To develop a module which provide real time condition of a patient through GSM module.

## V. SYSTEM ANALYSIS

### 5.1 Existing Systems:

Systems are currently in existence that use multiple sensors—blood pressure, temperature, pulse, ECG, and all of them—to monitor a patient's health. Other methods can also be used to send messages from a patient to their loved ones or to the attendant who is there, but they may not provide real-time values, which could lead to a communication lag between the patient and the attendant.

### 5.2 Limitations of existing system:

- Absence of patient health details in real time.
- There are no device connections made throughout the recording procedure, even when the equipment utilized to collect patient data is digital.
- Although there aren't many systems available, the ones that are don't operate quickly or efficiently enough.

### 5.3 Proposed System:

To overcome the system's inefficiencies and slowness, we have created an Arduino-based paralysis patient health monitoring system that leverages the Internet of Things to facilitate communication between the patient and the person providing care or supporting him in improving. We use flex sensors here, which allow us to feed unique messages into them simply by bending them. Our system closely monitors the patient's heart rate, temperature, and movements, updating the information on the webpage. The patient can then communicate to those assisting him or her to get water, food, or to use the restroom.

### 5.4 Role of IoT:

IoT contributes to healthcare by raising the probability of receiving care and lowering the maintenance burden. It was anticipated that mobile information and general technology killer apps would lead to the emergence of cloud health services, and the additional individual and online health care network was an excellent educational opportunity.

The Internet of Things (IoT) is a network of physically connected objects that enable distant devices to observe, listen, and analyse data. the computational process that connects computer hardware and enables sensor and smart sewing machine connectivity. The five layers—perception layer, which uses sensors as data minors, broadcasting layer, which handles networks and transportation, middle layer, which handles data processing, and application layer, which handles analysis are crucial to IoT implementations in IoT data processing.

## VI. PROPOSED METHODOLOGY

The sensors in the system will be used to mine the patients' pressure and temperature. The physician is qualified to provide adequate medical advice. IoT devices that are regularly utilized by patients with disabilities require closer supervision. Monitoring strategies have been gathered with the aid of the sensors to make sure that patients who are recommended to the physicians are consistently moving items. As a result, the quality of care is raised. In the end, this leads to medical costs.

Four flex sensors have been incorporated into the system, and distinct messages have been planted into each one. When the system is turned on, the patient can bend the finger in the direction of their want. These sensors are linked to an

Arduino board, which enables it to read input and leverage the Internet of Things. In this case, a GSM module is used to send a message to the designated number. Other sensors include body fall detection, temperature, and pulse, all of which aid in patient care. With this system, requirements can be easily communicated, continuous monitoring can be accomplished, and the output of the sensors is shown on a webpage.

Because of this, the caregiver needs to be aware of the patient's needs and adjust their assistance accordingly. This system includes a temperature, humidity, and pulse meter; the sensors are designed to be used in gloves or by individuals with special needs. If the patient is on the floor or has a higher-than-normal pulse rate, the system will sound a warning through a buzzer, alerting the caregiver to the patient's severe condition. This inexpensive, easy-to-use device can help treat individuals who are paralyzed.

### VII. BLOCK DIAGRAM

The IoT is simply the web. Through a wireless network, autonomous technology may gather and send data without the need for human interaction. Opportunities for relationships or business abound. With IoT-enabled gadgets, remote monitoring has become possible in the healthcare sector, allowing doctors to deliver exceptional care while also keeping patients safe and well as react to actual objects, allowing them to gather data and carry out commands. IOT concepts are useful for gathering, handling, storing, and modifying data.

Since it is the preferred microcontroller when more GPIO ports, flash memory, or quicker execution times are needed, the ATmega 2560 microprocessor was used in this project. In comparison to other commercially available microcontrollers of its class, the ATmega2560 has a comparatively greater quantity of I/O pins. Compared to other microcontrollers, the ATmega2560 has more capacity: 256KB of flash memory and 8KB of SRAM.

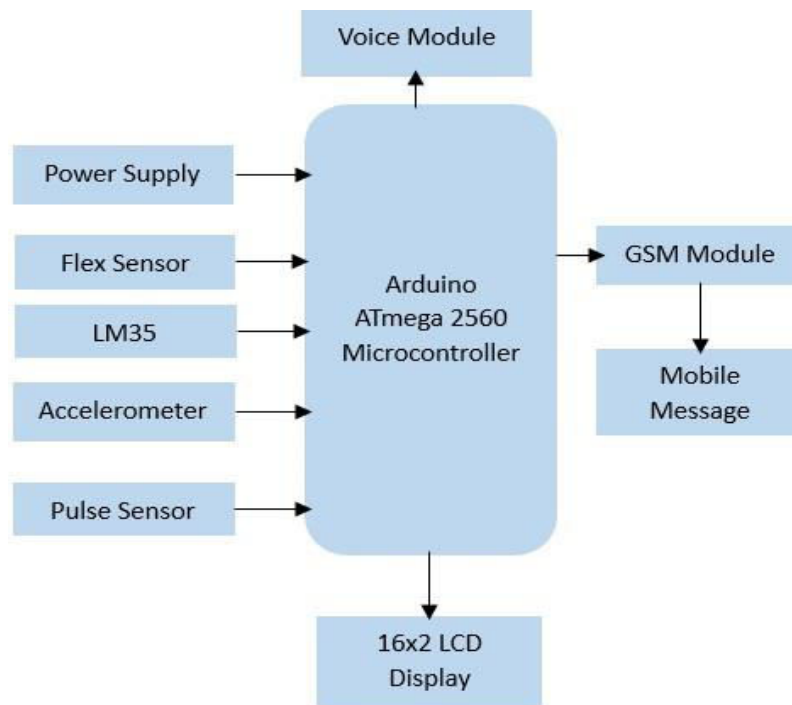


Fig 1: Block Diagram for Paralysis Patient HealthCare System

### VIII. COMPONENTS USED

#### 8.1 Flex Sensor:

A sensor that gauges the degree of bending or deflection is called a bend or flex sensor. Typically, the sensor is adhered to the surface, and the surface can be bent to adjust the resistance of the sensor element.



Fig 2: Flux Sensor

Flex sensors are being used in this study to help patients communicate. Every flex sensor has been given a unique message, which will be transmitted to the patient if they bend in the most comfortable manner.

### 8.2 Arduino ATmega 2560 microcontrollerBoard:

The Arduino Mega 2560 is a microcontroller board that is based on the ATmega2560 (datasheet). It has four hardware serial ports (HARTs), sixteen analog inputs, a sixteen MHz crystal oscillator, fifty-four digital input/output pins (fourteen of which can be used as PWM outputs), a reset button, a USB connector, a power jack, and an ICSP header. The prompt execution of this board led to its selection.

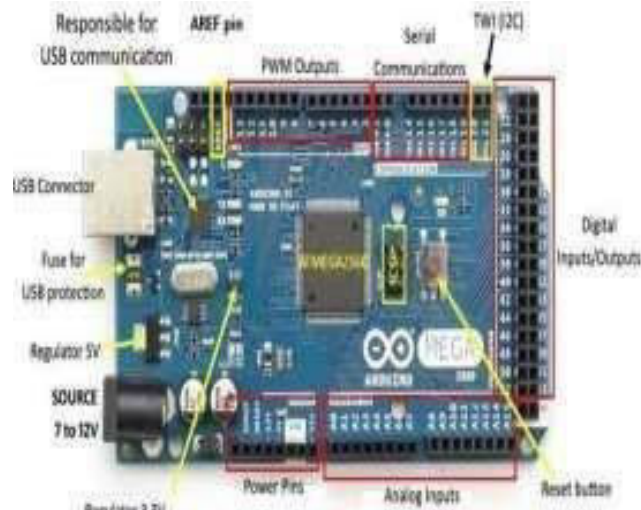


Fig 3: Arduino ATmega2560

### 8.3 GSM Module

The SIM800L Module can transmit SMS and GPRS message data remotely and supports a quad-band GSM/GPRS network. Commands such as 3GPP TS 27.007, 27.005, and SIMCOM improved AT Commands are supported by the SIM800L. Additionally, the board is compatible with mobile location, or A-GPS.



Fig 4: GSM Module

#### 8.4 LM35 Temperature Sensor:

The temperature is directly proportional to the analog output voltage of the temperature-measuring device LM35. The output voltage is expressed in Celsius (Celsius). No external calibrating circuitry is needed for it. The LM35 has a sensitivity of 10 mV/°C. The output voltage increases in tandem with temperature.

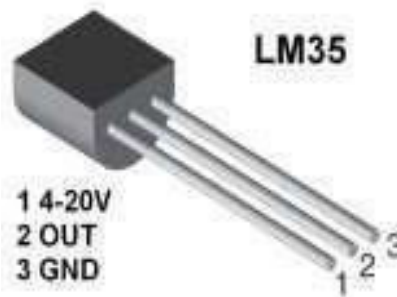


Fig 5: LM35 Sensor

#### 8.5 AD8232 ECG Sensor:

The AD8232 is an integrated signal conditioning block designed for biopotential measurement applications like ECG. Its function is to record, amplify, and filter small biopotential signals in noisy situations, such as those caused by motion or the placement of distant electrodes.

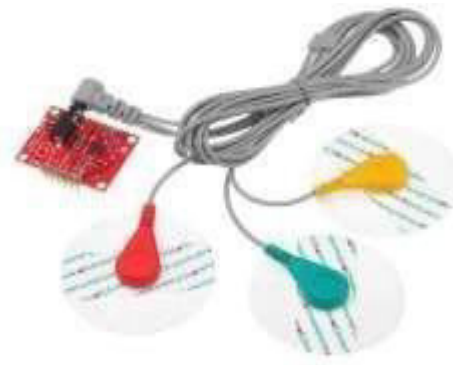


Fig 6: ECG Sensor

### 8.6 LCD Display

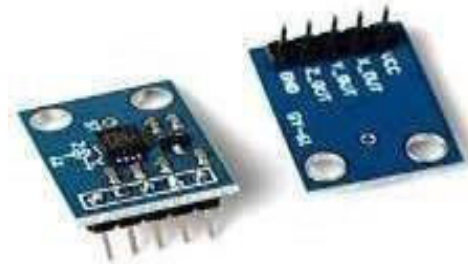
A 16-by-2 liquid crystal display allows for the display of 32 characters total—two rows of 16 characters each. Numerous electrical devices commonly display alphanumeric data using it. Here, we're utilizing it to display the messages in response to the patient's flexsensor movements.



Fig 7: LCD Display

### 8.7 ADXL335 Accelerometer:

The ADXL335 Module 3-axis Analog Output Accelerometer measures acceleration with a minimum full-scale range of  $\pm 3$  g. It can detect both the dynamic acceleration caused by gravity and the static acceleration in tilt-sensing applications by shaking, jolting, or motion. Here, we're using its tilt application to determine whether a body fall is



likely.

Fig 8: Accelerometer Sensor

### 8.8 APR33A3 Voice Module

The amazing APR33A3 Voice Recorder and replay Module makes it incredibly easy for users to record and replay audio files. Notably, it has a 3.5mm headphone connection, support for numerous audio formats, and an integrated microphone.



Fig 9: Voice Module



### IX. RESULT AND CONCLUSION

#### 9.1 Need water:

Every flex sensor has a specific message feed. For example, bending your forefinger will cause the message "I need water" to appear on the LCD and be forwarded to the caregiver.



Fig 11: Output display for fore finger bending

#### 9.2 Need Help:

By bending the forefinger and the middle finger at a time we can receive the message "I NEED HELP".



Fig 12: Output display for bending fore finger and middle finger at a time

#### 9.3 Need Fresh Air:

The microcontroller receives input after bending the ring finger and gives the output as "Fresh Air".



Fig 13: Output display for fourth finger bending

#### 9.4 Body fallen:

The accelerometer sensor determines whether the patient has fallen to the right or left based on movement of their body from its initial position. This information is shown on the LCD and a buzzer will sound.



Fig 14: Output display for accelerometer input

#### 9.5 Body temperature:

Whenever the body temperature of a patient rises above the set temperature, the LM35 sensor identifies the change and the alert message will be sent and the buzzer will sound.

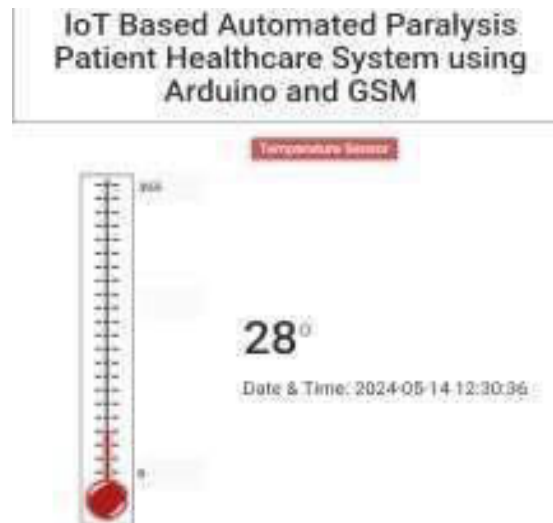


Fig 15: Output display for body temperature

### X. CONCLUSION

This method is very beneficial for disabled people. They can use movement detection to exist in this world just like everyone else, and they can make prearranged moves to seek for help. Due to its lightweight, dependability, and affordability, users can get this equipment for a low cost. This equipment will allow paralyzed patients to move around on their own. It doesn't make this duty any less important just because each person has a different kind and type of obligation. Therefore, a variety of strategies are required to support these people, and it is our duty as future engineers to develop cutting-edge technology to help paralyzed patients.

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