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METHODS

Designing of automated paralysis patient healthcare system

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We come across hospitals and non-profit organizations that care for people with paralysis who have had all or part of their body incapacitated by the paralysis attack. Due to a lack of motor control by their brain, these individuals are typically unable to communicate their requirements because they are neither able to speak clearly nor use sign language. In such a circumstance, we suggest a system that enables a disabled person to display a message over the liquid crystal display (LCD) screen by merely moving any part of his or her body that is capable of motion. This solution also addresses the circumstance where the patient is alone and no one is available to care for him or her, sending an Internet of things (IoT) message instead of a short messaging service (SMS).
The system operates by interpreting the user part's tilt direction. By grasping the device in the fingers of the moving hand, the device's operation is demonstrated. To communicate a message, the user only needs to tilt the gadget at a specific angle. The message is conveyed differently depending on the way the gadget is tilted. Here, the statistics of motion are measured using an accelerometer. This information is then transmitted to a microcontroller. The microcontroller analyzes the data and displays the specific message in accordance with the input received. The associated message is now shown on the LCD screen by the microcontroller. As soon as it receives a motion signal from the accelerometer, it also emits a siren and a message. If no one was available to respond to the message on the LCD, then the patient might opt to tilt the device for an additional period of time, which would cause an SMS to be sent via IoT to the patient's registered caretaker with the message the patient wishes to communicate.

Keywords: paralysis patient, healthcare system, IoT

Introduction

Paralysis, the inability of a muscle or set of muscles to move, is one of the stroke-related impairments that occurs most frequently. As a result of the stroke, the brain's ability to communicate with some parts of the body, including the muscles, may be compromised. Losing the capacity to move some or all of your body is known as paralysis. There are numerous possible causes for it, some of which may be dangerous. It could either be transient or permanent, depending on the cause. The main reasons for paralysis are spinal trauma or ischemia, either due to injury to the anterior spinal artery or during the period of surgery. There are four types of paralysis: monoplegia, hemiplegia, paraplegia, and quadriplegia. Injuries or illnesses that impact the central nervous system (brain and spinal cord) are what cause paralysis. It translates to an interruption of the nerve signals going to the muscles. Numerous related secondary problems, such as bowel and urine incontinence, can also be brought on by paralysis.

The goal of treatment is to help a person adjust to life with paralysis by making them as independent as possible, even though there are creative ways to cure or treat paralysis patients. We see a difficulty with the size and cost of the equipment that is being built for this kind of technology. They appear to be restricted to hospital use and not usable at the patient's home or at their convenience. Our objective is to create a gadget that can retrain a patient's mobility while

allowing them to use it independently and keeping the cost low enough for them to pay for it out of pocket.

Methodology

But methodology is a methodical, theoretical approach to gathering and assessing data over the course of a research project. It enables researchers to confirm the accuracy of a study in order to gather new data. Research methodology's goal is to demonstrate the veracity, applicability, and dependability of a particular research technique.

A methodology is essentially a grouping of several approaches, rules, procedures, practices, and methods. Methodologies used in project management are precise, rigid, and typically include a list of actions and tasks at each stage of the project's life cycle. They are defined techniques that outline the precise next steps to take, the reasoning behind each one, and the proper way to carry out each project stage.

Existing system

The project utilized telecommunications technology, and the global system for mobile communications (GSM) module SIM900A was used in this project to incorporate telecommunications evolution. A few circuits and pieces of software are utilized simultaneously to control all the primary and auxiliary devices. A few parts are used, including a microcontroller and a GSM module. The patient will be able to communicate anything they desire through the GSM module by sending messages using the gesture sensor. The function of this sensor is that the patient just needs to move the body part to which the sensor is attached to convey a message. Besides this, the data will be displayed on the LED screen to know what the patient wants to convey. In contrast, a buzzer will sound in an emergency and a text message alert will be issued to the patient's caregiver. The major goal of this research is to assist patients who are paralyzed in expressing their needs or messages.

Proposed system

In this project, the accelerometer is capable of detecting gestures due to changes in position. On changes of position, the sensor gives the direction and analog variation of the voltage on its x, y, and z pins. We convert this analog variation into digital format by using an Op-Amp as a comparator, in which we set a threshold voltage (comparison) by using a preset, and according to the input voltage, the voltage is either high or low.

Our suggested solution operates by detecting the user's tilt. Holding the object in the fingers of the moving hand demonstrates how the device functions. Now, all that is required of the user to communicate a message is a specific tilt of the gadget. Different messages can be sent by tilting the gadget in different ways.

In this project, the statistics of motion are measured using an accelerometer. This information is then transmitted to the microcontroller. The microcontroller analyzes the data and displays the specific message in accordance with the input received. The associated message is now shown on the LCD screen by the microcontroller. As soon as it receives a motion signal from the accelerometer, it also emits a siren and a message.

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Our system's suggested approach is to make a person as autonomous as possible to help him or her adapt to life with paralysis. We see a difficulty with the size and cost of the equipment that is being built for this kind of technology. They appear to be restricted to hospital use and not usable at the patient's home or at their convenience. In this approach, the Automated Paralysis Patient Care System really automates the patients' ability to take care of themselves, ensuring that they receive timely treatment and, as a result, are in good health.

Block diagram

Figure 1 shows that, according to the block diagram up top, an accelerometer is used to calculate motion statistics. It delivers the data to the microcontroller. The microcontroller analyses the data and displays a specific message in response to input.

FIGURE 1 | Block diagram.

The message is currently visible on the liquid crystal display (LCD) panel. As soon as it receives a motion signal from the accelerometer, it also emits a siren and a message. The patient can opt to tilt the device for an additional period of time, which will cause an SMS to be sent to the message that the patient wishes to express if no one is available to see the messages displayed on the LCD.

Basic requirements

Installing Java and its dependencies on our systems will enable us to accomplish this project and ensure that the code runs successfully. The prerequisites that must be installed are as follows:

Hardware requirements

Node Mcu (Wi-Fi microcontroller)

Figure 2 shows that the ESP8266 system-on-a-chip (SoC) is a relatively affordable SoC that is the foundation of the open-source node microcontroller unit (node MCU).

Node MCU is an open-source platform based on ESP8266, which can object and let data transfer using the Wi-Fi protocol.

LCD display

Software requirements

Embedded C

An accelerometer sensor is a gadget that keeps track of any person's or object's acceleration relative to its current rest frame. It is not a coordinated acceleration. Accelerometer sensors are used in a variety of electronic devices, including smartphones, wearable technology, and other electronic devices.

Figure 3, a type of flat panel display known as an LCD, operates primarily using liquid crystals. To operate, LCD technology must block light. Liquid crystals don't emit light directly; instead, they form images in either color or black and white using a backlight or reflector.

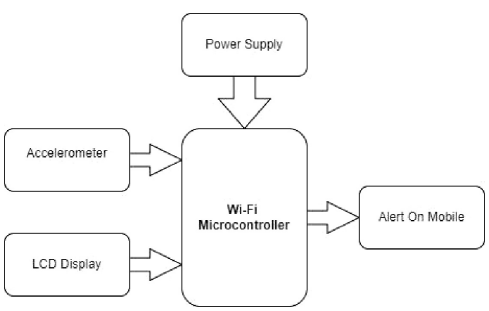

FIGURE 2 | Node MCU microcontroller.

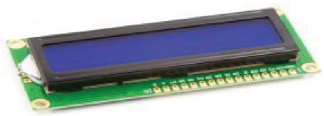

FIGURE 3 | LCD display.

I2C LCD interface board

Figure 4 shows how the PCF8574 I2C chip included in the I2C module transforms I2C serial data into parallel data for the LCD display. The default I2C address for these modules is currently either 0x27 or 0x3F.

Accelerometer

A device that monitors the acceleration of any person or object in its immediate rest frame is an accelerometer sensor (Figure 5). It is not an acceleration in coordinates. There are several applications for accelerometer sensors, including in wearable technology, smartphones, and other electric gadgets.

Power board

Result

The construction of an IoT-based automated healthcare system for patients with paralysis was the project's primary goal. And we have already tested how long it takes for an SMS to arrive at the hardware component, which is the connected cellphone or device. On the basis of that, the system's performance is examined. Patients with paralysis require virtually constant care, and they require someone to be there at all times. So, based on the gesture, they can convey the message to the caretaker, and the output is in digital format. Based on the gestures, the output is digitalized.

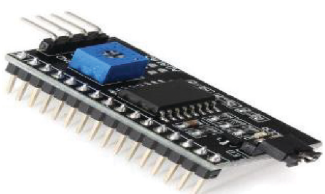

FIGURE 4 | I2C LCD module.

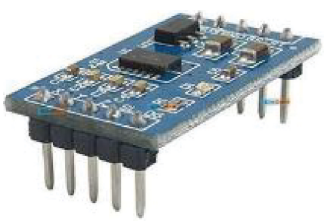

FIGURE 5 | Accelerometer.

Conclusion

Computers are now so advanced that they can help people with difficult jobs because of a sharp rise in processing speed. It makes sense that decoding sign language using these cutting-edge methods contributes to improved gesture recognition efficiency and ease of comprehension for all. In order to achieve the ultimate aim of humans interacting with machines on their own terms, it is evident that additional research in the fields of future extraction, categorization techniques, and gesture representation is necessary to move past this point. This project is useful for deaf and dumb people who cannot communicate with normal people. It is also useful for speech-impaired and paralyzed patients who cannot speak properly.

References

1. Aziz SAC, Kadmin AF, Rahim N, Hassan WHW, Aziz IFA, Hamid MS, et al. Development of automatic healthcare instruction system via movement gesture sensor for paralysis patient. *Int J Electr Comput Eng.* (2018) 9:1676–82.
2. Inamdar AL, Wadhwa LK. Paralyzed patient care system. *J Emerg Technol Innov Res.* (2016) 3:325–8.
3. Al-Sawaai ISA, Lavanya V, Frank A. Safety wheelchair for paralysis patient. *J. Stud Res.* (2020). doi: 10.47611/jsr.vi.977
4. Malgaonkar R, Kamble S, Parkale S, Jadhav M. Survey on automated paralysis healthcare monitoring system. *Int J Sci Res Dev.* (2019) 7: 517–9.
5. Sindagi KV, Patil RB, Mujawar RL, Mulik MB. GSM Based paralysis patient monitoring system. *Int Res J Eng Technol.* (2020) 7.