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Speaker Based Paralytic Patient Assistant System

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ABSTRACT:

Advancements in technology have opened up new possibilities for improving the quality of life for paralytic patients, specifically a finger-mounted flex sensor, to empower paralytic patients and enhance their daily activities and independence. By integrating this sensor with an Arduino microcontroller and a speaker-based patient assistant, we aim to address the challenges faced by paralytic patients and provide them with a seamless and effective solution for managing their basic needs.Paralytic patients often encounter significant challenges in performing even the most basic daily tasks, such as requesting water or food. The inability to move freely and communicate effectively can lead to feelings of isolation, frustration, and a decreased quality of life. These challenges can take a toll on the physical and mental well-being of the patients,

Finding innovative solutions that address their specific needs of paralysis patient is the need of hour to increase the quality of life. To address the challenges faced by paralytic patients, we propose the use of a finger-mounted flex sensor.

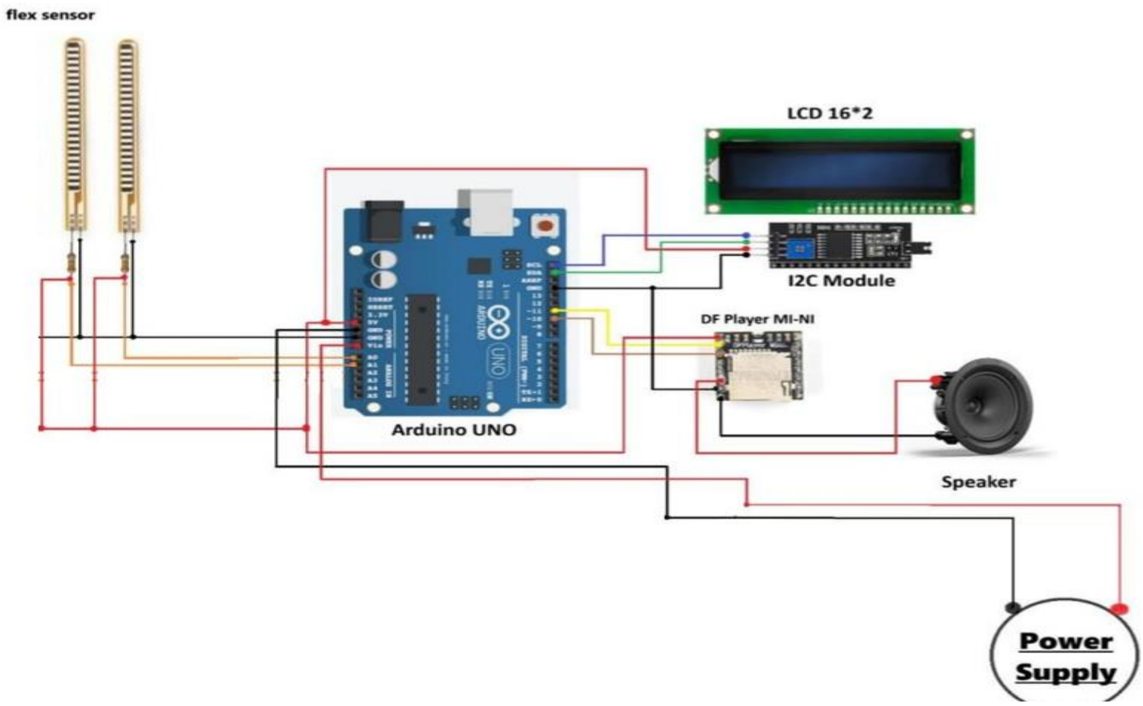
This sensor is designed to detect the bending of the patient's finger, allowing them to communicate their needs with ease. By strategically placing the sensor on the patient's finger, they can simply fold or flex their finger to trigger specific actions, such as requesting water or food.

The finger-mounted flex sensor is seamlessly integrated with an Arduino microcontroller, a versatile and programmable platform. The Arduino processes the sensor input and translates it into actionable commands. This integration ensures that the patient's movements are accurately detected and interpreted, enabling the system to respond appropriately to their needs

Introduction

According to the Global Burden of Diseases (GBD), stroke claims the lives of around 5.8 million people each year. Stroke is the most common cause of paralysis, affecting around 33.7 percent of the population. Paralysis can also arise as a result of severe spinal cord injury sustained as a result of a serious accident. The World Health Organization recently conducted a survey. Of 5.6 million people who were predicted to be paralyzed, accounting for 1.9 percent of the population among the fifty. However, there is no ideal tracking system in place to keep track of the patient's health and daily demands. In today's fast-paced world, it's impossible to continually look after loved ones who require assistance. To address these issues, a device is presented that uses the ESP32 and the accelerometer to detect the motion of the patient's hand, allowing them to convey their most basic requirements to their caregivers. We come across hospitals and non-governmental organizations (NGOs) that serve paralytic individuals who have had their entire or partial body paralyzed by the paralysis attack. Most of the time, these persons are unable to communicate their requirements since they are unable to speak properly or communicate through sign language owing to a lack of motor control in their brain. In this case, we present a system that allows a disabled person to display a message on an LCD screen by simply moving any portion of his body with motion capabilities. This system also handles situations where no one is available to assist the patient, by sending a message via ESP32 of what he wishes to say via SMS. To send a message, the user now only needs to tilt His hand at a specific angle. Different messages are conveyed by tilting the gadget in different directions. We're going to use an accelerometer to measure motion statistics. The ESP32 analyses the data and displays the appropriate message based on the input received from various sensors. The associated message is now shown on the LCD screen. When it receives a motion signal from the accelerometer, it also sounds a buzzer and displays a message. In this approach, the Automated Paralysis Patient Care System truly automates the patient's ability to care for themselves, ensuring timely attention and, as a result, optimal health.

Figure 1



Literature Review

1.Title: "Remote patient monitoring using GSM technology"Authors: Ghosh, S., & Maiti, J. (2019),

Ghosh and Maiti (2019) demonstrated the development of a GSM-based remote patient monitoring system that allows caregivers to track vital signs and receive alerts in case of emergencies. Their study highlighted how GSM technology facilitates communication between patients and healthcare providers, ensuring timely medical intervention and reducing the need for frequent hospital visits (Ghosh & Maiti, 2019). This approach not only provides a safety net for patients but also offers a practical solution for managing chronic conditions associated with paralysis.

2. **Title: "Bluetooth-based assistive technologies for individuals with paralysis Authors: Kumar, A., Patel, R., & Singh, R. (2020).**

This research presents a Bluetooth-based Bluetooth-enabled devices can be used for localized monitoring and control of assistive technologies, such as wheelchairs and home automation systems. Their research showed that integrating Bluetooth technology with assistive devices allows patients to operate these systems with minimal physical effort, thus improving their autonomy and comfort,

Title: "Hybrid healthcare systems combining GSM and Bluetooth for paralytic patients"Authors: Patel, S., Sharma, M., & Gupta, A. (2021)

Proposed a hybrid system that combines GSM for remote data transmission and Bluetooth for local device control. Their system includes sensors for monitoring physiological parameters and actuators for controlling environmental factors, such as lighting and temperature, in the patient's home. The study found that this integrated approach not only enhances the patient's ability to manage their environment but also provides healthcare providers with valuable data for personalized care

4. Title: "Security challenges in GSM and Bluetooth-based healthcare systems"Authors: Sharma, V., & Saini, H. (2022).

Ensuring secure data transmission and protecting patient information from unauthorized access are essential for the successful implementation of GSM and Bluetooth-based healthcare systems. Their research emphasizes the need for robust encryption methods and secure communication protocols to safeguard sensitive health data while maintaining the efficiency and usability of these technologies

Case and Methodology

A **Speaker-Based Assistant System** for a **paralytic patient** using a **flex sensor** and **Arduino Uno**, with communication via the **I2C protocol** to a speaker and **DFPlayer Mini** (an MP3 player module), is designed to help the patient communicate their needs through finger movements.

Arduino Uno: The microcontroller acts as the brain of the system, reading inputs from the flex sensor and controlling the DFPlayer and speaker.

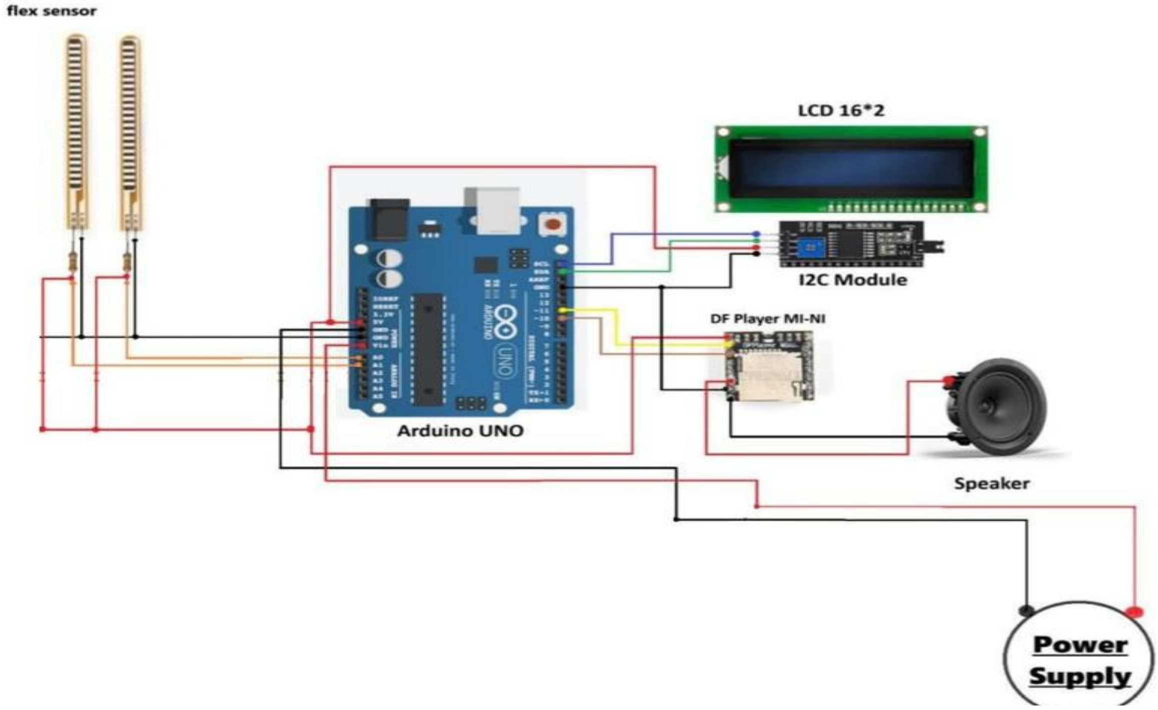
Flex Sensor: A sensor attached to the patient's finger to detect movement. The sensor's resistance changes based on the bending of the finger, allowing the Arduino to detect different degrees of movement.

DFPlayer Mini: An MP3 player module that communicates with the Arduino to play pre-recorded voice messages based on the patient's needs. It supports I2C communication.

8-ohm Speaker: The speaker plays the voice messages from the DFPlayer module.

I2C Protocol: A communication protocol used to send commands from the Arduino to other components, like the DFPlayer or additional sensors/modules.

BLOCK DIAGRAM:



The system reads the input from the flex sensor (finger movement) and plays specific pre-recorded voice messages through the speaker, which can inform caregivers or family members of the patient's needs.

Flex Sensor Detection

The flex sensor is attached to the patient's finger.
As the finger bends, the resistance of the flex sensor changes.
This change in resistance is measured by the analog input pin of the Arduino.
Based on the analog reading (bending degree), the Arduino identifies different gestures (e.g., small bend, medium bend, or full bend).
Each gesture corresponds to a specific need, such as "I need water," "I need assistance," or "I'm hungry

I2C Communication with DFPlayer

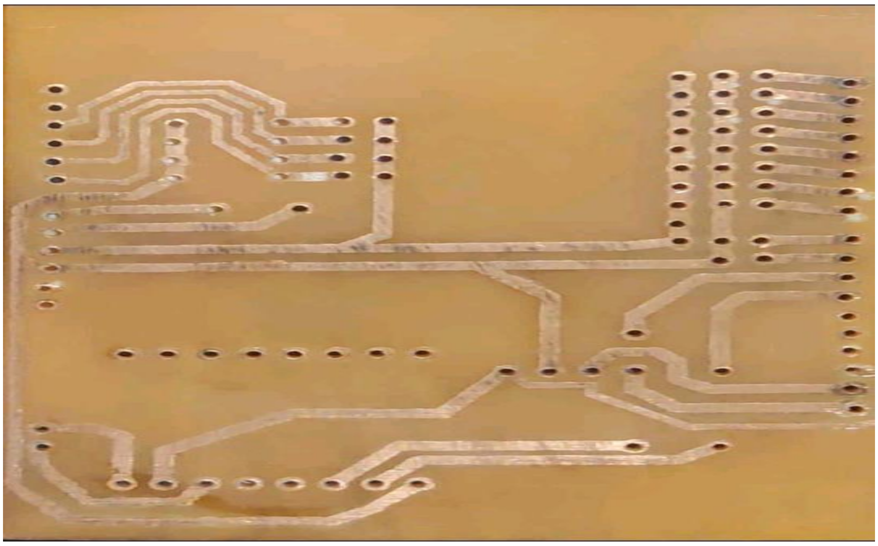
The DFPlayer Mini module stores pre-recorded voice messages on a microSD card.
The Arduino communicates with the DFPlayer Mini using the I2C protocol to select and play the appropriate message based on the flex sensor's readings.
The I2C protocol simplifies communication by allowing the Arduino to send short, simple commands to the DFPlayer.

Audio Output to Speaker

Once the DFPlayer receives the command to play a specific message, it retrieves the corresponding audio file from the microSD card.
The audio is played through the 8-ohm speaker connected to the DFPlayer.
The speaker then plays the message, such as "I need water," so the caregiver can respond

PCB DESIGN:

Creating a shield PCB for an Arduino UNO involves several steps, from conceptualizing the design to fabricating and assembling the shield. Here's an outline of the process:
Define the Shield Purpose and Components. Determine the shield's purpose: What function will it serve? (e.g., motor control, sensor interface, communication, etc.)
Identify components: Choose components based on the functionality you need. For example, resistors, capacitors, connectors, sensors, or ICs.
Ensure compatibility: The shield must match the Arduino UNO's header pinout and fit correctly onto the board.
Assembly
Order components: Purchasing components
Solder components: Once you receive the PCB, solder the components onto the board. This can be done manually or through an assembly service, depending on your preferences.
Test connections: Use a multimeter to test for continuity and ensure that there are no shorts or open connections
Testing
Mount the shield on the Arduino UNO: Place the shield on the Arduino UNO's headers.
Upload the test code: Write and upload a test sketch to the Arduino UNO to ensure the shield is functioning as expected.
Troubleshoot: If the shield doesn't work, inspect the PCB, check for soldering issues, and verify that the components are placed and connected correctly.



SYSTEMDESIGNPROCESS:

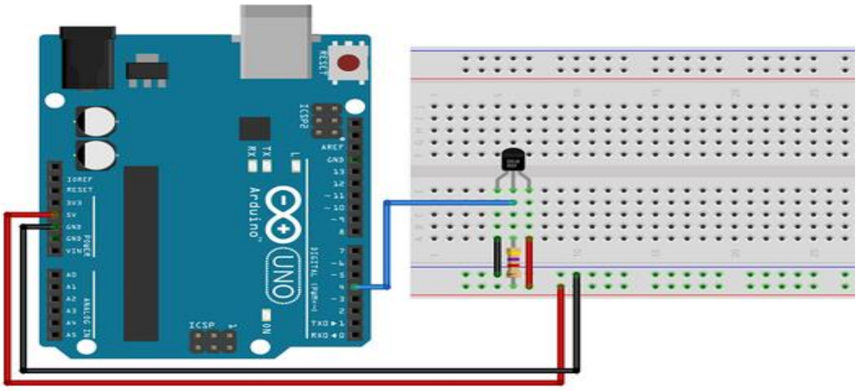
Connect the DFPlayer Mini to the Arduino:
VCC to 5V
GND to Ground
TX to Arduino pin 11
RX to Arduino pin 10

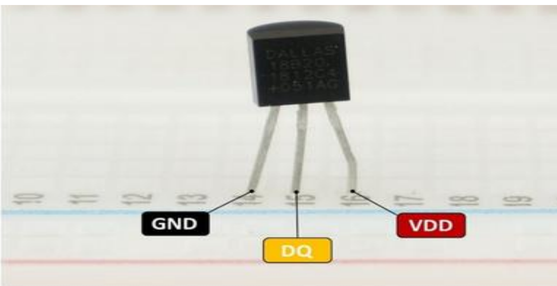
Test the DFPlayer Mini: Ensure the audio plays correctly through the speaker when a command is recognized.

Flex Sensor-Controlled Actions: The patient can trigger actions by bending their fingers or other body parts with flex sensors attached.

TEMPERATURESENSOR:

The DS1820 is a digital thermometer that measures temperature using a 1-Wire interface. It can measure temperatures from -55°C to +125°C in 0.5°C increments.





DS18B20	Arduino
GND	GND
DQ	Any digital pin (with 4.7k Ohm pull-up resistor)
VDD	5V (normal mode) or GND (parasite mode)

Results & Analysis

1. The results obtained are as follows:
2. The gadget detects the motion and generates the exact message matching the• particular direction of motion, allowing patients to communicate their basic demands simply by moving their hands. • Visual and auditory alarms notify the attendants and doctors whenever a message is being conveyed through the device by the patient. If the patient is in an emergency scenario, he or she can use this device to send• a message to the doctor's mobile phone by moving his or her hand in a specific direction.
3.

4.
5.

Conclusion

SUMMARY

An accelerometer detects the angle of the patient's hand movement and a microcontroller analyses this data to determine the angle and direction of the hand movement. After that has been determined, the microcontroller generates a specific• message for that direction, which it will then send to the LCD panel (16X2) to be shown on it. When the gadget generates a "Call attendant" message based on the hand• position, a message is sent to the doctor's mobile phone. This device contains both visual and auditory alarms to notify the patient's• attendant that the patient is attempting to convey his needs to the attendant via this device.

CONCLUSION

Finally, this device has solved the major problem faced by paralyzed patients, which is their inability to communicate with their caretakers even to fulfil their most basic needs, and it has also provided a way for patients to notify the doctor when they require assistance or help.

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