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AUTOMATIC HEALTHCARE SYSTEM FOR PARALYSIS PATIENT

N. S. Vatkar [1], Ayush Patil[2], Tejas Munjal[3], Vaibhav Sutar[4], Rushikesh Vibhute[5], Samruddhi Kirolkar [6], Yogesh Vatkar[7]

Professor, Department of E&TC, D.Y. Patil College of Engineering &Technology, Kolhapur, India[1]

Student Researcher, Department of E&TC, D.Y. Patil College of Engineering &Technology, Kolhapur, India[2-7]

Abstract: Paralysis occurs when you're unable to make voluntary muscle movements. A nervous system problem causes paralysis. Uninjured nerves send signals to muscles. Those signals make muscles move. When you're paralyzed, or have paralysis, you can't move certain parts of your body. According to a report from the Indian Institute of Paralysis, out of every one crore people, 12,000 to 15,000 have Paralysis. In many cases, individuals with paralysis face challenges in expressing their needs, as they often struggle with speech impediments and cannot communicate through sign language due to partially compromised motor control. In response to this critical necessity, our proposed system offers a solution by facilitating message display on an OLED screen through simple hand gestures. The system operates by detecting various tilt directions of the fingers, facilitated by a transmitter embedded within a glove worn by the patient. Users can convey different messages by tilting the device in different directions. An accelerometer captures motion statistics, which are transmitted to a microcontroller for processing. Subsequently, the microcontroller interprets the data and displays the corresponding message on the OLED screen. Additionally, a buzzer is activated simultaneously with a message display upon receiving motion signals from the accelerometer. This innovative approach holds promise in empowering individuals with paralysis to communicate effectively, enhancing their quality of life and independence.

Keywords: Smart Gloves, Paralysis, ECG, ATmega2560, Flex Sensor, OLED, LM35, Accelerometer.

I. INTRODUCTION

A wearable device for people with speech impediments or paralysis has been introduced into the healthcare sector to help them in their everyday lives. These gloves are fitted with sensors, microcontrollers, and AI algorithms that can interpret hand and finger motions. Consequently, these movements are converted by the smart glove into commands that can be used in controlling different devices like computers, mobile phones, and prosthetic limbs among others.

The smart glove's introduction is a milestone made towards enhancing independence and performing tasks considered impossible before for people living with paralysis or speech difficulties. Hence, through simple gestures of the hands and fingers users can communicate with their environs, interact with other people as well as efficiently manage an array of appliances.

It is important to note that one great merit of smart gloves lies in their patient adaptability because even slight actions can be registered based on the level of sensitivity of the sensors. Thus, patients requiring this delicate treatment will each get a customized glove concerning their capability levels plus any other specific requirements they may be having. Overall, smart gloves present a promising technological innovation for patients with paralysis or speech impediments, promising increased autonomy and addressing some of the challenges associated with their conditions. With ongoing technological progress, the potential for further innovative applications of these devices in the future is anticipated.

II. METHODOLOGY

In this system, we first give an overview of how it works, explaining its parts and what it does to observe patients who can't move. We choose the hardware and develop the software needed for it. When patients move their fingers, special sensors detect it. They can then ask for help with things like getting water or calling for someone to help them go to the bathroom. The system uses a small computer called Arduino to process these requests. Then, it sends out spoken instructions through a speaker. It also sends messages to the caretaker using a module called GSM. If a patient falls, a sensor called an accelerometer detects it and sends an alert to the caretaker.

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III. BLOCK DIAGRAM

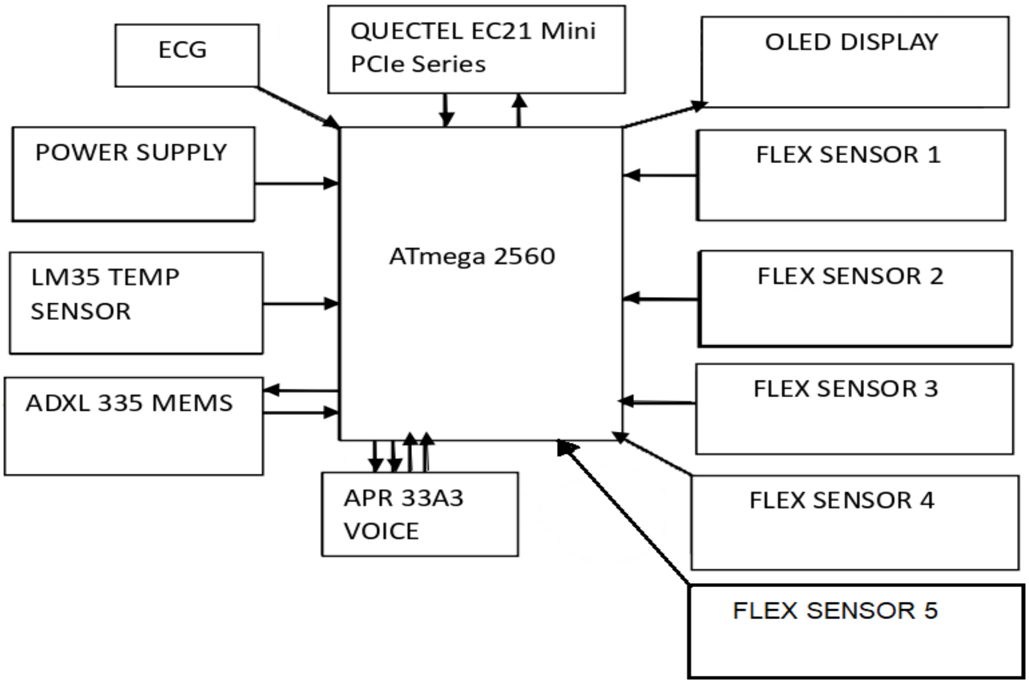

Figure 1. Block diagram of the system.

IV. CIRCUIT DIAGRAM

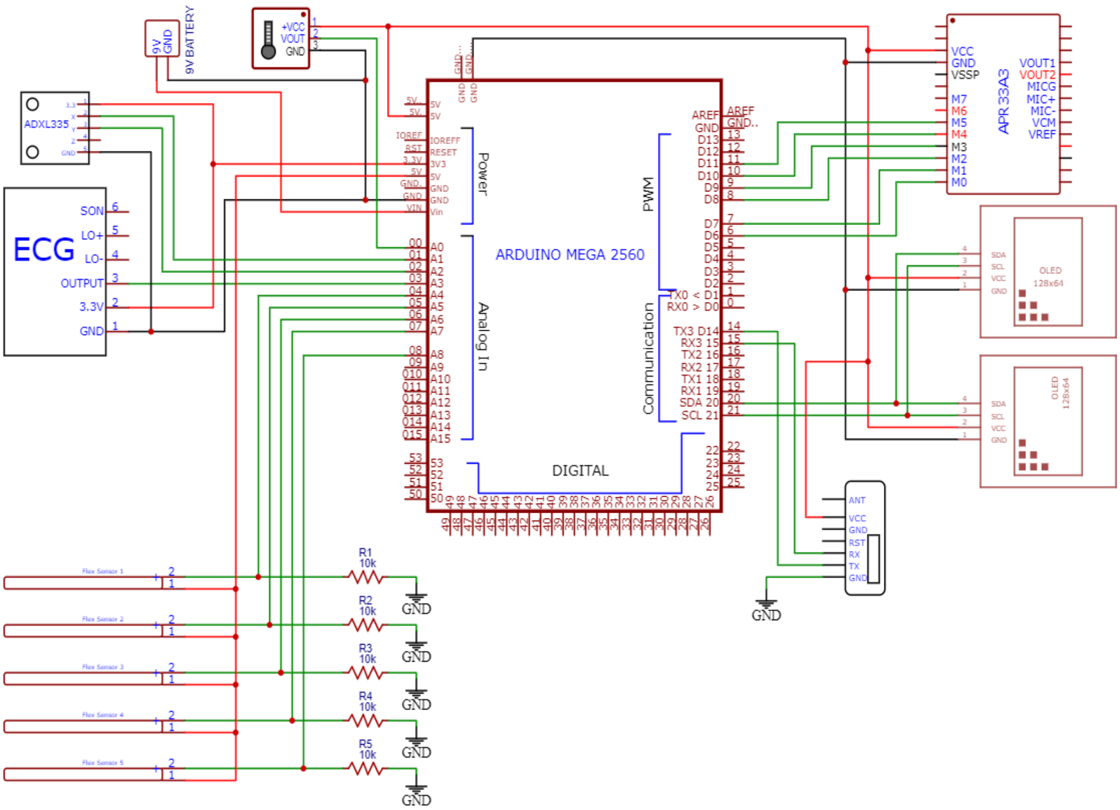

Figure 2. Proposed Circuit Diagram

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V. WORKING

The healthcare system designed for paralyzed patients relies on an Arduino microcontroller as its central processing unit. This microcontroller has both analog and digital pins, facilitating the connection of various input and output devices. The architecture of the Smart Glove System, illustrates its key components. The glove integrates a flex sensor, enabling the detection of finger movements, thereby allowing patients to convey input to the microcontroller through finger bending. Additionally, an accelerometer is embedded within the glove to recognize patient movements, if the patients falls down, it sends a message to caretaker.

This capability enables the device to execute predefined actions based on sensor input. For instance, in the event of a patient fall, the accelerometer detects the motion and then prompts the GSM module connected to the device to transmit an alert message to the caretaker.OLED display: It serves as a vital component by providing real-time feedback to the user and displaying system actions. When a patient bends their finger, for example, the OLED display can promptly exhibit a confirmation message indicating the detection of input and subsequent action initiation. Similarly, when an alert message is dispatched to the caretaker, the OLED display can convey a notification of successful transmission.

5.1 APR 33A3 Voice Module & Speaker: In conjunction with the OLED display, the voice module and speaker play crucial roles in furnishing auditory feedback to the caretaker upon receipt of an alert message. This auditory confirmation enhances the overall effectiveness of the system in promptly notifying caretakers of critical events.

5.2 Arduino ATmega2560: The microcontroller serves as the central processing unit of the system, managing the operation of various interconnected components. Equipped with numerous analog and digital pins, the Arduino microcontroller facilitates seamless integration with sensors, OLED displays, and other peripherals. Programmed using specialized software and language, the microcontroller executes predefined algorithms to process inputs and generate appropriate outputs, thereby enabling the smart glove to function effectively in catering to the needs of paralyzed patients.

5.3 Flex sensor: It is a fundamental component of the system, exhibits changes in resistance when bent or flexed, thereby providing a means to detect finger movements. This technology is pivotal in enabling patients to convey input to the system through natural finger motions, enhancing user interaction and ease of use.

5.4 Quectel EC21 mini Pcle Series : It enables communication over a GSM network, allowing for the transmission of alert messages to caretakers. Through this module, the system can efficiently relay critical information, ensuring timely assistance and intervention in emergencies.

5.5 ADXL335 MEMS Sensor: The accelerometer, such as the ADXL335MEMS Sensor, detects changes in acceleration, providing valuable insights into patient movement and activity levels. Integrated within the smart glove, this sensor contributes to fall detection capabilities, triggering alert notifications to caretakers in the event of a fall or sudden motion indicative of distress.In summary, the healthcare system for paralyzed patients represents an innovative application of the Arduino microcontroller platform and various sensor technologies. Through seamless integration and intelligent processing of sensor inputs, the system enhances patient monitoring and caretaker communication, ultimately improving the quality of care and support for paralyzed individuals.

5.6 LM 35 Temperature sensor: The LM35 is a precision integrated-circuit temperature sensor that provides a linear voltage output proportional to the temperature in Celsius. Manufactured by Texas Instruments, it offers high accuracy (typically ±0.5°C), a wide temperature range (-55°C to +150°C), and low power consumption (typically 60 µA). The sensor is factory calibrated, eliminating the need for additional calibration steps. It can be easily interfaced with microcontrollers or analog-to-digital converters, making it suitable for various temperature measurement applications. With its reliability, affordability, and simplicity, the LM35 is widely used in industries such as automotive, HVAC, and medical devices.

5.7 ECG: Electrocardiogram (ECG) is a diagnostic tool used to measure the heart's electrical activity. It helps detect abnormalities in heart rhythm and function. During the procedure, electrodes are placed on the body, which record electrical signals transmitted by the heart. These signals are displayed as waveforms on graph paper or digitally. ECGs are vital for diagnosing conditions like arrhythmias and heart attacks, and they are widely used in clinical settings due to their non-invasiveness and effectiveness.

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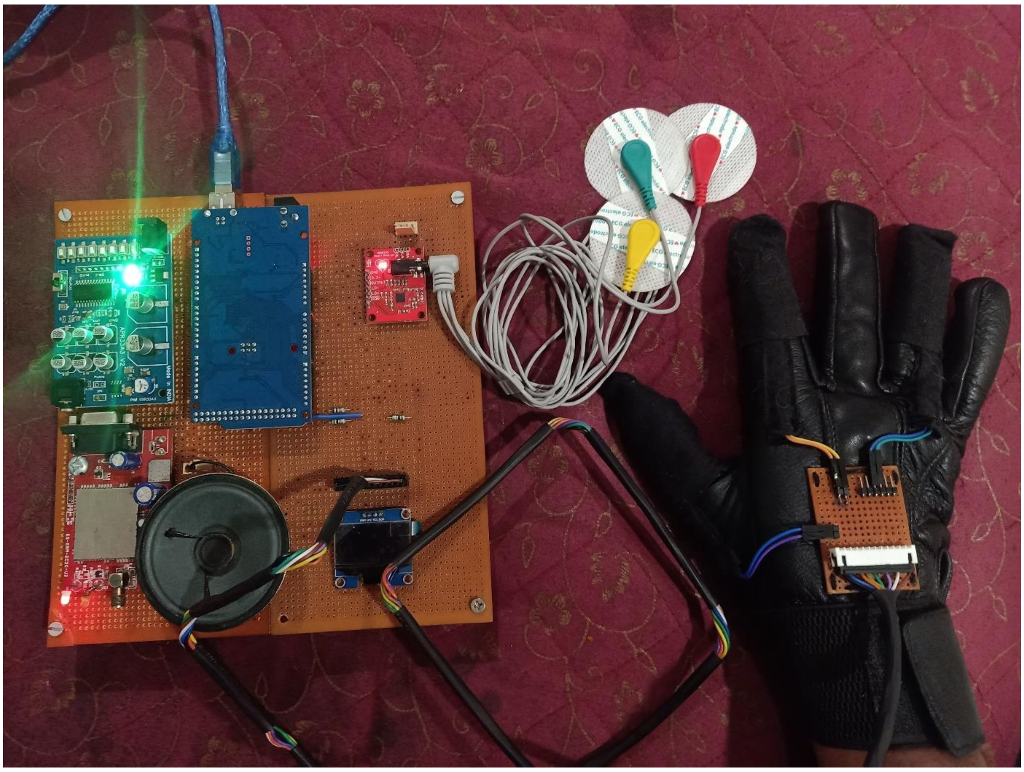
VI. PROJECT PHOTOGRAGH



VII. FLOWCHART

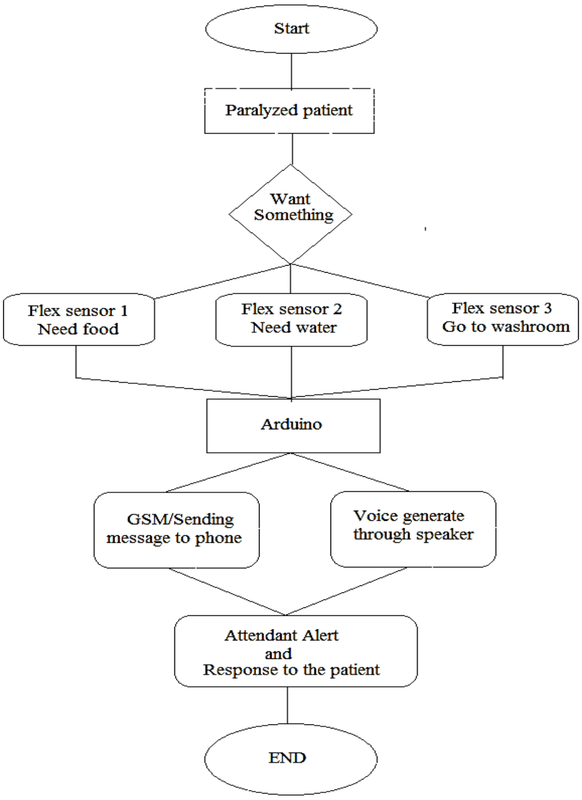


Figure 3 Flowchart

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VIII. FUTURESCOPE

- Develop a mobile application for both caretakers and medical professionals to remotely oversee patients' health status and make necessary system adjustments as required.
- Utilizing advanced algorithms to analyze ECG data in real-time can aid in identifying abnormalities and promptly alerting caretakers to take immediate action.

IX. CONCLUSION

The integration of technology in healthcare for paralysis patients facilitates remote monitoring of their health status and requirements, enabling caregivers to assist them from afar. By employing specific movements, patients can communicate their needs, thus allowing them to function in society similar to individuals without paralysis. This system effectively aids patients in overcoming communication barriers, ensuring their needs are conveyed effortlessly.

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