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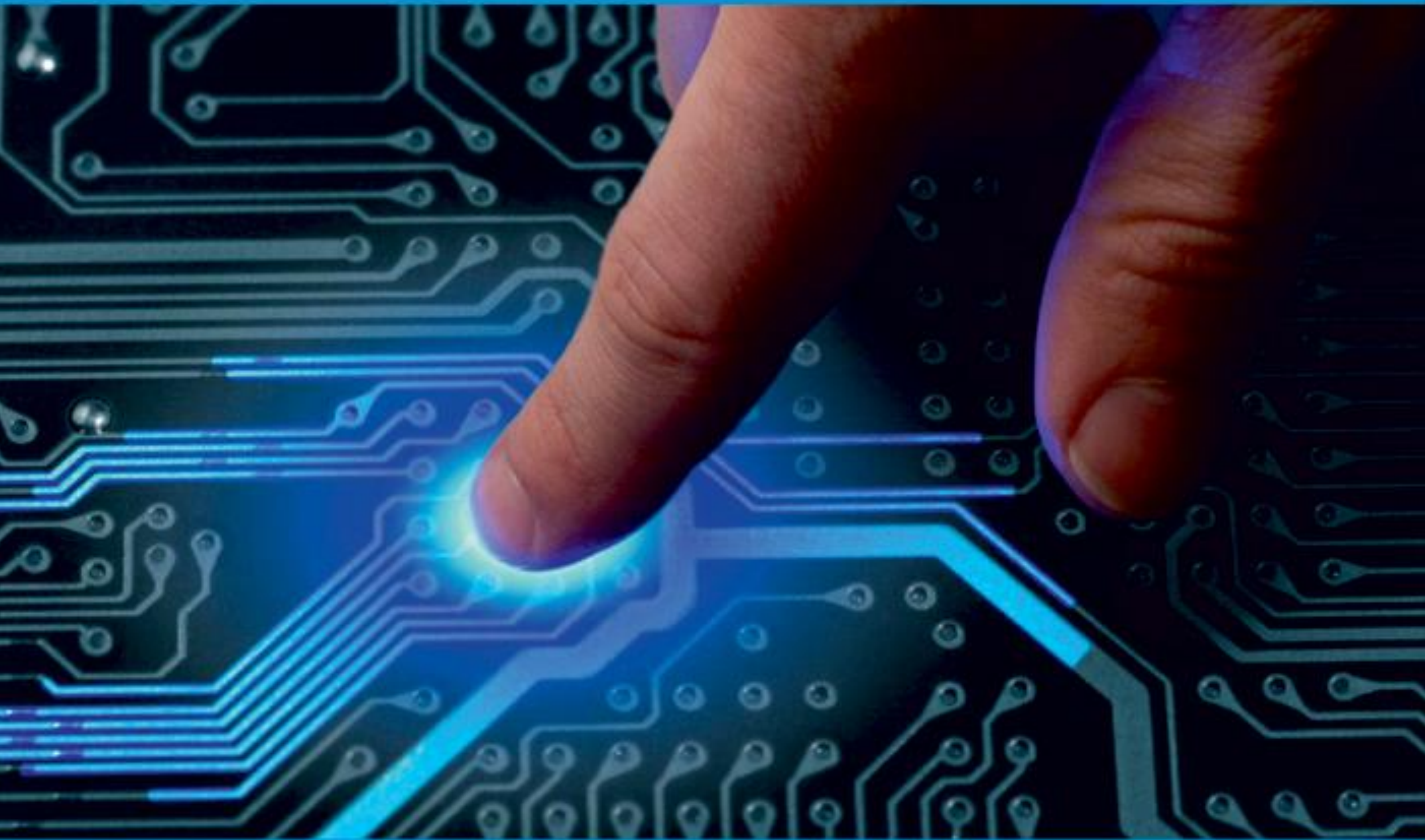

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Smart Gloves for Special People Communication

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ABSTRACT: Communication is the primary means through which we express our thoughts to others. While most individuals can effectively convey their ideas through conversation, there are many in our society who face physical disabilities, such as deafness or muteness, which hinder their ability to communicate effectively. Consequently, they often find themselves at a disadvantage compared to their non-disabled peers. Some individuals experience difficulty with hearing, while others struggle with speech, causing them to fall behind in various aspects of life. While sign language serves as a common mode of communication for many with disabilities, there remains a significant barrier when interacting with those unfamiliar with sign language. To bridge this communication gap between the disabled and non-disabled communities, our proposed project aims to develop a cost-effective solution: a smart glove that enables disabled individuals to communicate with non-disabled individuals seamlessly. By utilizing this technology, communication need not be a barrier between these two communities. With the aid of such a system, individuals with disabilities can participate fully in various fields, contributing to the overall growth and development of the nation.

KEYWORDS: Communication, Physical disability, Deaf and dumb, Sign language, Smart glove, Accessibility.

I. INTRODUCTION

In a world where communication serves as the cornerstone of human interaction, individuals with physical disabilities face unique challenges in expressing their thoughts and ideas. The inability to effectively communicate due to conditions such as deafness or muteness can create barriers, isolating these individuals from fully participating in social, educational, and professional realms. Traditional solutions, such as sign language, while effective within specific communities, often encounter limitations when interacting with individuals unfamiliar with this form of communication.

To address this pervasive issue and empower individuals with disabilities to communicate effortlessly with others, innovative technologies have emerged. One such groundbreaking solution is the development of smart gloves tailored for special people communication. These gloves harness the power of advanced sensors, artificial intelligence, and wearable technology to facilitate seamless communication between individuals with disabilities and their non-disabled counterparts.

By incorporating cutting-edge features such as gesture recognition and real-time translation capabilities, smart gloves offer a transformative means for bridging the communication gap. With a simple gesture or movement of the hand, users can convey their thoughts and emotions with precision, transcending the barriers imposed by traditional communication methods.

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1.1 MOTIVATION

Communication between individuals who are unable to speak, such as those who are deaf or mute, can present challenges and inconveniences. This project aims to address this issue by developing a portable glove that captures the user's hand gestures and translates them into text displayed on a device. The glove is equipped with flex sensors to detect the movement and contact of the fingers. A Raspberry Pi microcontroller embedded in the glove analyses the sensor data to recognize gestures from a predefined library.

The goal is to create a glove worn on the right hand that can accurately translate sign language into spoken English. To ensure usability for a wide range of users, regardless of hand size and shape, the device incorporates five Spectra Symbol Flex-Sensors to measure finger flexion. These sensors' data is processed and organized by the Raspberry Pi microcontroller, which then sends the information to a Raspberry Pi running a Python script.

1.2 OBJECTIVE

The objectives of this project are:

1. To interfacing health sensors like – Body temp, Pulse etc.
2. To design, implement and test a device for remotely monitoring hand and fingers movements. The system uses Smart Glove and a multitude of E-textile sensors to measure the range of motion (ROM) of fingers, and a microcontroller.
3. Developing monitoring systems is to reduce health care costs by reducing physician office visits, hospitalizations, and diagnostic testing procedure. The GSM technology helps the server to update the patient data on website.

II. LITERATURE SURVEY

In 2020, Mohamed Abdel-Moniem and colleagues introduced a novel approach to address the communication challenges faced by hearing-impaired individuals. Typically, these individuals rely on hand gestures with specific movements to convey ideas. Their proposed solution is a robotic glove capable of interpreting Sign Language Standard into text or speech, thereby bridging the information transmission gap between the hearing-impaired and the general population. This glove incorporates various sensors such as flex sensors, an accelerometer, Raspberry Pi, and ADC. However, certain letters were omitted from recognition due to their similarity to others, which could potentially confuse the algorithm and compromise accuracy. The decision to exclude certain letters was based on the frequency of use in the Arabic language, aiming to optimize convenience for users of the glove.

In 2019, Fatima Babiker Ahmed Mohammed presented a similar concept: the design of a smart glove aimed at converting gestures into text and speech for disabled individuals, particularly those who are deaf and mute. This glove serves as an electronic device capable of translating sign language gestures into comprehensible text and voice. The device incorporates components such as flex sensors, MPU 6050 sensor, Micro SD Adapter, Speaker, LCD 16X2, and Arduino Nano [2]. By employing five flex sensors and an MPU6050 circuit, the glove can accurately detect finger bending and hand direction. The output is displayed on an LCD screen, featuring letters such as "A," "D," "G," and "H," representing examples of recognized gestures.

III. PROBLEM STATEMENT

In hospitals, continuous monitoring of patient vital signs, such as body temperature and heartbeat, is typically performed by medical personnel. However, this task can become burdensome over time, leading to potential issues. Previous attempts by researchers have aimed to address this challenge using various methods. In some cases, data transmission via SMS using a GSM module has been utilized to send patient data from one device to another.

Our approach offers a solution to employment challenges faced by individuals with disabilities. In our implemented system, we have developed an intelligent microcontroller-based system utilizing Flex sensors. This system is capable of:

- Converting gestures into both voice and text.
- Assisting individuals in controlling home appliances, particularly beneficial for those unable to physically reach the switchboard.

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IV. BLOCK DIAGRAM

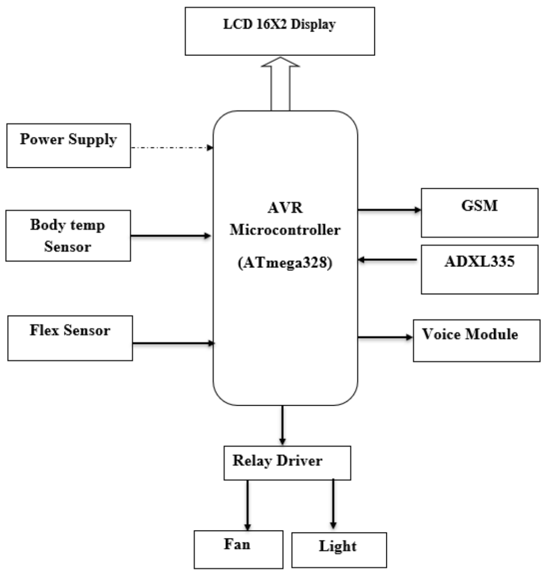

Figure: 1 Block Diagram of Smart Gloves for Special People Communication

This project begins with the movement of hand gloves equipped with flex sensors. These sensors detect changes in value as they bend. The flex sensor is another type of potentiometer are attached to the fingers when we bend the figure the value of the sensor gets changes. The changing value of the sensor is depended upon the resistance and applied angle of the bending when we bend the sensor at some particular angle, we can see the value of the resistance is increase and accordingly the output gets reduced. Alternatively, we can describe it as having an inversely proportional relationship, where an increase in sensor resistance corresponds to a decrease in output value. Utilizing this principle, we can develop projects to our advantage.

The heart rate sensor is engineered to provide a digital output of the heartbeat when a finger is inserted into it. This digital output can be connected to Arduino directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger each pulse.
The most widely measured physical parameter is body temperature; it can be calculated by putting the sensor in contact with human body. The sensor employed in this project is the LM35 temperature sensor, renowned for its precision. It functions as an integrated circuit temperature sensor, with its output varying proportionally in relation to the temperature measured (in degrees Celsius). The LM35 sensor has more features that attracted us to choose it, such as Calibrated directly in Celsius (Centigrade), Linear + 10-mV/°C scale factor; it measures temperatures from -55°C to +150°C range, the accuracy ±0.5°C.

4.1 Software Requirements
1) AVR Studio (Programming c)
2) Express PCB (Circuit &layout design)

4.2 Hardware Requirements
1. Microcontroller (AT mega 328)
2. GSM model
3. Pulse Sensor
4. Buzzer
5. Relay
6. Regulator
7. Lcd 16*2

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V. RESULT AND APPLICATIONS

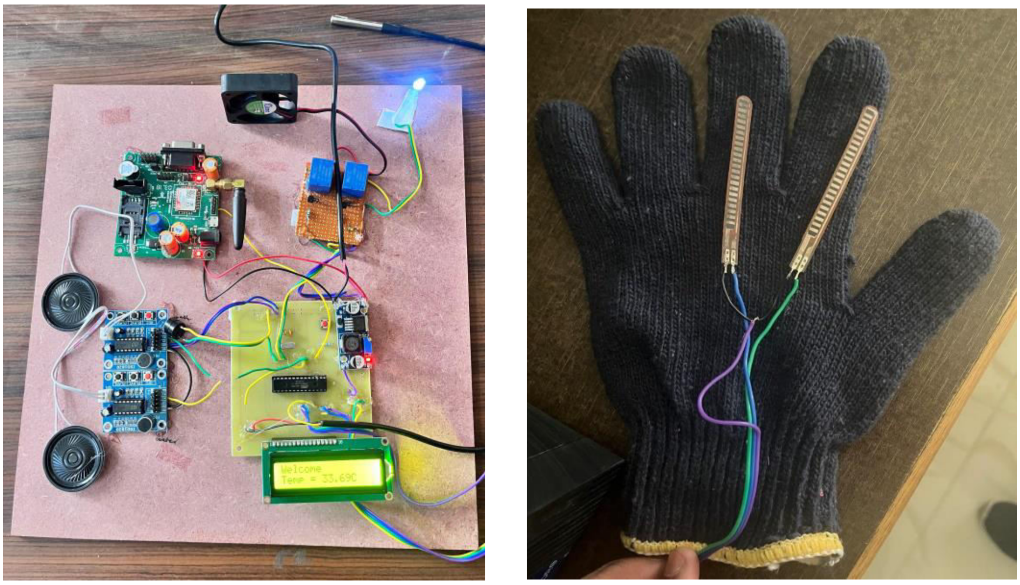

Figure: 2 Block Diagram of Smart Gloves for Special People Communication

The system functions as intended, seamlessly integrating with selected hardware and software. It has the potential to decrease illiteracy and improve employment opportunities for the deaf and mute population, including students and individuals.

Applications:

1) This project facilitates communication between deaf and mute individuals and the general population.
2) It offers portability, catering to individuals with hearing and speech disabilities who can carry the glove with them wherever they go.
3) It has applications in robotics, employing AI-based technology.
4) It can be utilized for artistic and entertainment purposes, enhancing educational experiences through various AI-based activities in schools.

Advantages:

1. Demonstrates significant utility.
2. Beneficial for speech-impaired and paralyzed patients.
3. Enables efficient real-time communication and provides an easily accessible search interface for users.
4. The flexible nature of the glove allows it to be worn by anyone.

Limitations:

1. The primary drawback is the potential for slow system processing.
2. It lacks the ability to convey facial expressions.

VI. CONCLUSION

This system presents a boon for individuals with physical disabilities, effectively bridging the divide between them and the general population. Its dual-portability ensures constant accessibility, making it an invaluable asset. Particularly for non-verbal patients, this prototype proves invaluable, acting as a lifeline for the paralyzed and those with rare medical conditions, and serving as a voice for the hearing-impaired. Through the establishment of a nuanced vocabulary, it facilitates the transmission of diverse messages across intricate systems.

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