SMART ASSISTANCE HAND GLOVES FOR DISABLED PEOPLE
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ABSTRACT
The Smart Hand Glove for Disabled People is a type of wearable technology that is specifically designed to aid individuals with mobility impairments, as well as those who are deaf and mute, in performing their daily activities. The glove incorporates flex sensors and microcontrollers that interpret hand and finger gestures and send signals to either a smart device or a microcontroller, which in turn triggers assistive devices, such as home automation systems or voice modules. It is also equipped with a microphone, speakers, and a message delivery system that enables wearers to communicate with their family members and other people. Additionally, the glove features a display screen that can display text messages, providing an alternative means of communication.

Keywords: Smart Glove, Gesture To Voice, Gesture To Text, Home Automation Analysis.

I. INTRODUCTION

Communication is essential for human beings to connect and understand one another's thoughts and ideas. Speech is often considered the most effective means of conveying an idea. However, many individuals face various degrees of disability in their daily lives, which makes communication and daily activities challenging. This is particularly true for those who are partially or fully disabled, such as those who are deaf, mute, or have paralysis in one hand or leg. To address this, the Smart Assistance Hand Glove for Disabled People was created to improve their daily lives and provide a sense of independence.

The Smart Assistance Hand Glove for Disabled People is a wearable device that is suitable for individuals with a range of disabilities, including but not limited to spinal cord injuries, cerebral palsy, muscular dystrophy, and arthritis. The glove incorporates various sensors, such as flex sensors, that detect hand gestures and movements. The signals generated by these sensors are then processed by a microcontroller, which translates them into the desired action. The glove is designed to be lightweight and comfortable, made from a breathable and flexible material that conforms to the user's hand. It can be adjusted to fit different hand sizes and can be worn on either the left or right hand. In addition to this, the glove can be used for home automation, enabling the wearer to control various appliances from a single position without having to move. This feature is particularly beneficial for individuals with mobility impairments, allowing them to control household appliances such as fans and lights without the need for assistance.

II. LITERATURE REVIEW

Numerous smart gloves have been proposed in recent years, which utilize wireless technology and offer various features. However, these prototypes are often unreliable, heavy, expensive, and not user-friendly, as the components used in their fabrication, such as flex sensors, microcontrollers, wireless transmitters, and batteries, are bulky and difficult to use. To facilitate communication between individuals with hearing or speaking disabilities.

One study published in the Journal of Rehabilitation Research and Development (JRRD) in 2019, titled "Smart Glove for Hand Rehabilitation," described a wearable device that provides functional electrical stimulation to the fingers of individuals with incomplete spinal cord injuries. The device improved hand function and grip strength, as well as promoted cortical reorganization.
The advantages and disadvantages of this technology can be summarized as follows:

- It utilizes wireless communication and has both display and voice capabilities.
- It is portable and includes a built-in battery.
- However, it is bulky to wear and can be challenging to handle.
- Additionally, it is fragile and the components used in its fabrication can be costly.

III. PRACTICAL IMPLEMENTATION

3.1 Block Diagram

The block diagram provided above depicts the comprehensive architecture of the Smart Gloves for Disabled People. It comprises several components, including Flex Sensors, Arduino Mega, 16*2 LCD Screen, APR33A3 Voice Playback module, Transmitter, and Receiver with Electronic Switches. The central element of this device is the Arduino Mega Microcontroller Board, which is connected to the flex sensor, voice module, transmitter, and LCD screen. The entire assembly operates on a voltage of 5 volts and 9 volts, supplied by a power supply block.

![Fig-1: Block Diagram](image)

3.2 WORKING

The project’s initial phase involves the movement of the hand gloves to which flex sensors are attached. When the sensors experience bending, their values change. These flex sensors act as another type of potentiometer and are attached to the fingers. When a finger is bent, the sensor’s value changes according to the resistance and angle of the bending. As the sensor’s resistance increases at a particular angle, the output decreases inversely proportionally. This feature is leveraged to make the project possible.

Once the output value changes, the Arduino records the value and displays it on the attached LCD. The process begins when the Arduino receives a varying value from the sensor. The value of the output is continuously displayed on the LCD screen.

![Fig-2: Implemented Prototype.](image)
3.3 Mode 1
This mode allows the user to utilize voice and playback features by creating specific gestures that trigger pre-recorded audio playback. Upon activation of the mode, the sensor transmits data to the Arduino, which then sends a signal to the voice and playback recorder (APR33A3) based on its programming. The recorder identifies which port or section is currently active and plays the corresponding pre-recorded audio. The audio is then heard through the speaker that is connected to the recorder.

![Block diagram of Audio and Playback](image)

**Fig-3:** Block diagram of Audio and Playback.

3.4 Mode 2
This mode enables the user to operate household appliances, which is a significant component of the project. The sensor's output is received by the Arduino, and this value is compared to the program by the Arduino. The Arduino checks and matches the value with the program, and the output can be observed on the LCD screen that is connected to the Arduino. The output value is transmitted using a transmitter. The transmitter is connected to the HT12E integrated circuit, which encodes the data and transmits it through the antenna. At the receiver end, the data is decoded using the HT12D integrated circuit and sent to the relay to activate the switch. The relay is solely used to switch on or off the switch.

![Block diagram of controlling home appliances](image)

**Fig-4:** Block diagram of controlling home appliances.

### IV. RESULTS AND DISCUSSION
Compared to the claims made in other research papers, our solution to the problem is more practical and cost-effective. Our Smart Gloves Prototype not only translates gestures into text but also can convert them into speech. The following section outlines the outcomes of our prototype.

4.1 Mode 1
As per the code written for different gesture patterns, the voice and playback system responded with recorded voices on the LCD as follows:
First gesture:
Fig-5: First gesture command for the first voice

Second gesture:
Fig-6: Second gesture command for the second voice

Third gesture:
Fig-7: Third gesture command for a third voice

Fourth gesture:
Fig-8: Fourth gesture command for fourth voice

Fifth gesture:
Fig-9: Fifth gesture command for fifth voice

Sixth gesture:
Fig-10: Sixth gesture command for sixth voice

4.3 Mode 2
Folding all fingers at a time will change to home automation mode. Results of operating appliances as per the different gesture sets are obtained below:
Fig-11: Home automation
First gesture command for the first Appliance:

a) For switching BULB ON:

Fig-12: Switching ON the BULB

Second gesture command for the first Appliance:

b) For switching BULB OFF:

Fig-13: Switching OFF the BULB

Third gesture command for the second Appliance:

c) For switching FAN ON:

Fig-14: Switching ON the FAN

Fourth gesture command for the second Appliance:

d) For switching FAN OFF:

Fig-15: Switching OFF the FAN

V. CONCLUSION

This paper introduced the Smart Hand Gloves for Disabled People. It will provide a more reliable, efficient, easy-to-use and lightweight solution for the user as compared to other proposed papers. This will be responsible to create meaning in the lives of Disabled People.

During this project, we face various types of challenges. We have tried to minimize the problem. One problem is there to make it wireless. So, we observed and analyzed different research papers and products available in the market which are bulky, difficult to handle, and delicate in structure. Since this was a prototype our focus was to build a model, which can solve or minimize the communication problem for disabled people.

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VI. REFERENCES


