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Bluetooth Smart Glove for Disabled

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Abstract

With the advancement of technologies in today's date, the mankind is developing. And to bring more progress we need to take everybody together. We can speak and hear which makes opinion sharing easy for us, but some people can't. For them sign language is the only way to communicate. To understand this sign language easily, we have our Smart Glove. Smart glove is a device which can help especially disabled people to communicate easily with people around them.

Keywords — Flex sensor; Bluetooth Module; Arduino; MIT inventor; Mobile application; Deaf and mute

I. INTRODUCTION

A smart glove for the disabled is a wearable device that can help individuals with disabilities to perform certain tasks by controlling devices through hand gestures or other forms of input. Smart gloves typically use sensors, such as flex sensors, to detect movements and translate them into actions that can be carried out by connected devices, such as computers or smartphones. The need for creating a smart glove for the disabled is to provide an assistive technology that can enhance the quality of life for individuals with limited hand mobility by enabling them to perform daily activities with independence.

Smart gloves can be particularly useful for individuals with mobility or dexterity issues, such as those with spinal cord injuries or neuromuscular disorders like multiple sclerosis or cerebral palsy. By providing a way to interact with devices through natural hand movements, smart gloves can help these individuals to perform tasks that might otherwise be difficult or impossible.

Some potential uses of smart gloves for the disabled include:

- Controlling home automation systems, such as turning on lights or adjusting thermostats.
- Operating computers or smartphones by gesturing with the hand.
- Controlling prosthetic devices, such as robotic arms or hands.
- Playing video games or other forms of entertainment that require hand movements.
- Controlling wheelchairs or other mobility aids.

Overall, a smart glove for the disabled has the potential to greatly improve the quality of life for individuals with disabilities by providing them with greater independence and control over their environment.

II. LITERATURE SURVEY

The first study [1] that was analysed in the review had a glove which could decode sign language and presented the output on the lcd screen. It used microcontroller as the brain of the device.

The second study [2] that was looked at incorporated Accelerometer and skipped flex sensors. Here the output obtained was both text and speech. Separate lcd and speaker were attached. As they did not used flex sensors, there were many wires present which made the glove messy and less efficient. The main controller used was Arduino UNO here.

In the third paper [3], The device "Sign Language Interpreter Using a Smart Glove" uses hand gestures along with the facial expressions and the body language to convey the intended message. The smart glove recognizes the signing gesture and text representation of the signed gesture is created. Then text is converted to audio output

The fourth paper [4] details the design of a unique glove to control universal IR sensors. It acts as a universal remote control. The glove has inbuilt contact sensors to detect our gestures which will be sent to the devices via radio frequency. Here a smart glove which will act as a sign language interpreter. The LED-LDR pair will be used to detect the gesture and the appropriate message will be printed on the LCD screen.

III. CIRCUIT DIAGRAM AND SCHEMATIC

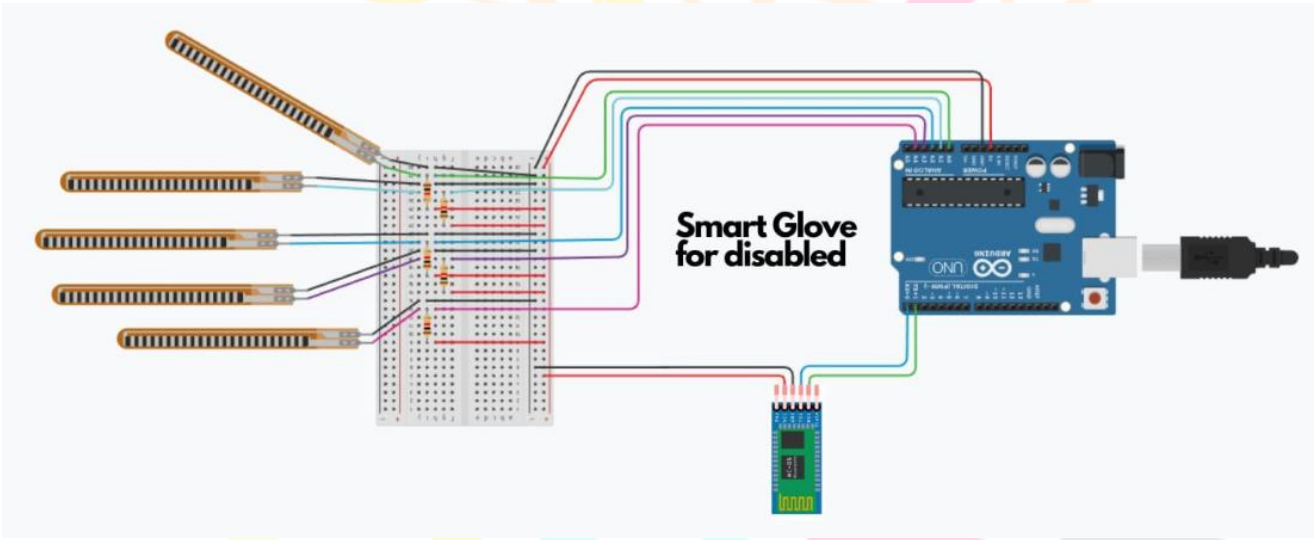


Fig. 1. Circuit Diagram

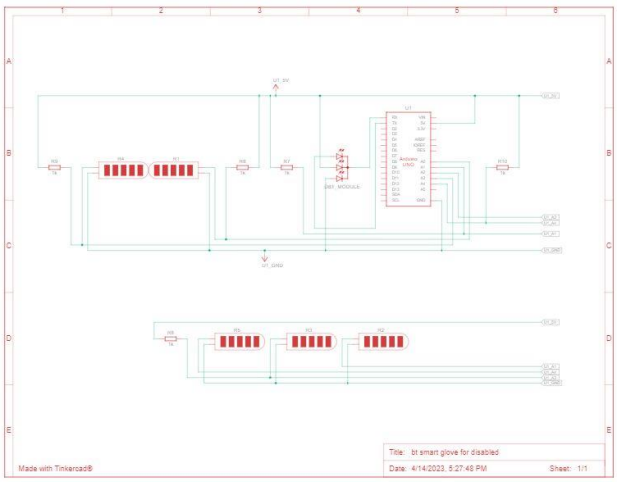


Fig. 2. Schematic Diagram

IV. DESCRIPTION OF SYSTEM

1. *Block Diagram*

Gestures, the input is given by the user. The flex sensors on the glove reads the gestures given by the user. These gestures are sent further. Then these are received by the brain of our device that is the Arduino. Arduino has all the gestures stored with the following data, where each gesture is assigned with a specific command. The recognized gesture sends the output to the Serial Monitor. Serial print is a command used in Arduino to print on the Serial Monitor. It is commonly used in embedded systems, such as Arduino boards, to Print data to the serial port as human-readable ASCII text.

The System is designed in such a way that the Output in the Serial Monitor is sent to the App through the Bluetooth Module. The Bluetooth module then sends the output over to the Application where the output is in the form of text, which can also give text to speech output.

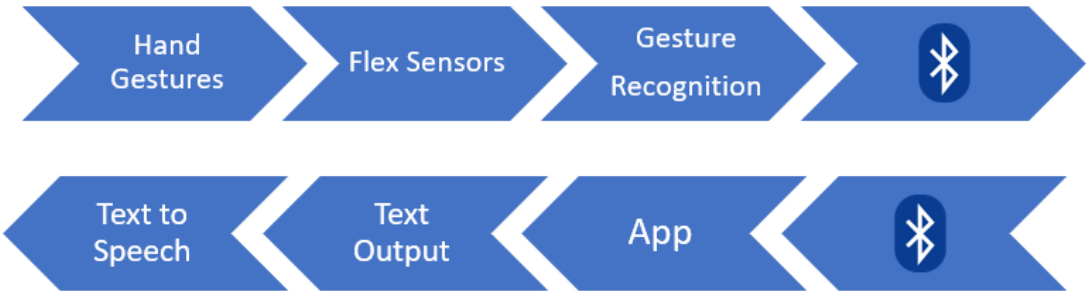


Fig. 3. Block Diagram

2. *Flowchart*

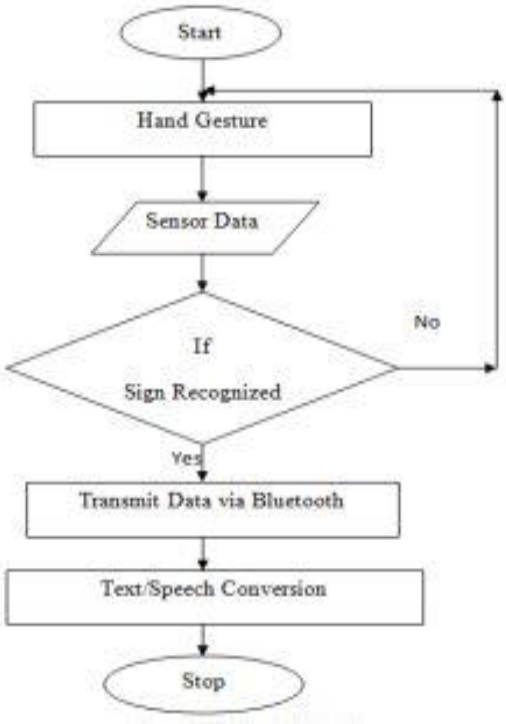


Fig. 4. Flow Chart

3. *Electronic System*

- ***FLEX SENSOR***

A flex sensor is a type of sensor that is designed to detect bending or flexing. It typically consists of a thin strip or ribbon of flexible material, such as plastic or rubber, that changes its resistance when bent. The change in resistance is then used to measure the degree of bending or flexing. Flex sensors are commonly used in a variety of applications, such as robotics, gaming, medical devices,

Fig. 5. Flex Sensor

and wearable technology. They can be used to detect the motion of joints in the body, such as the fingers, and can be used as input devices for controlling electronic devices. Flex sensors are available in a range of sizes and shapes, and can be customized for specific applications. They can be incorporated into wearable devices, such as fitness trackers and smart watches, to monitor movement and activity. They can also be used in medical devices, such as prosthetic limbs, to provide feedback to the user and control the movement of the device. Overall, flex sensors are a versatile and useful type of sensor that can be used in a wide range of applications to detect bending or flexing.

- ***ARDUINO UNO***

Fig. 6. Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328P microcontroller. It is one of the most popular boards in the Arduino family and is widely used in a variety of electronic projects and prototyping. The Arduino Uno board features 14 digital input/output pins, six analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. It is compatible with a range of shields and modules that can be plugged into the board to extend its functionality. The Arduino Uno is programmed using the Arduino IDE (Integrated Development Environment), which is a simple and easy-to-use software platform that allows users to write, compile, and upload code to the board. The IDE is available for free download from the Arduino website and is compatible with Windows, Mac OS X, and Linux. The Arduino Uno board can be used to create a wide range of projects, from simple LED blinking to complex robotics projects. It is popular among hobbyists, students, and professionals alike, and is often used in education to teach programming and electronics. Overall, the Arduino Uno is a versatile and popular microcontroller board that is widely used in

the maker and electronic communities. Its ease of use, low cost, and wide range of capabilities make it an ideal choice for a wide range of projects and applications.

- ***BLUETOOTH MODULE***

Fig. 7. Bluetooth Module

A Bluetooth module is an electronic device that allows for wireless communication between devices using Bluetooth technology. Bluetooth is a short-range wireless technology that allows devices to communicate with each other over distances of up to approximately 100 meters. A Bluetooth module typically consists of a radio transceiver, a microcontroller, and an antenna. The radio transceiver allows the module to transmit and receive data wirelessly using Bluetooth technology. The microcontroller controls the operation of the module and interfaces with other devices, such as microcontrollers or computers. The antenna allows the module to communicate wirelessly with other devices. Bluetooth modules are commonly used in a variety of applications, such as wireless sensors, smart home devices, and wearable technology. They can be used to create wireless connections between devices, such as connecting a smartphone to a wireless speaker or connecting a sensor to a microcontroller.

- ***RESISTOR***

A resistor is an electronic component that is used to limit the flow of current in a circuit. It is a passive component, which means that it does not amplify or generate signals like active components (such as transistors or op-amps). A resistor is typically made of a material with a high resistance, such as carbon or metal. The resistance value of a resistor is measured in ohms (Ω) and is indicated by a color code or a numerical value printed on the resistor. The higher the resistance value, the more it restricts the flow of current in the circuit.

- ***MIT APP INVENTOR***

MIT App Inventor is a web-based integrated development environment (IDE) that allows users to create mobile applications for Android devices. It was developed by the Massachusetts Institute of Technology (MIT) and is available as a free and open-source software. MIT App Inventor uses a visual programming language that is based on blocks, which are graphical elements that represent different programming concepts. Users can drag and drop these blocks to create the logic and functionality of their app, without needing to write any code. The blocks are organized into categories, such as user interface, logic, and storage, and can be customized to suit the needs of the app.

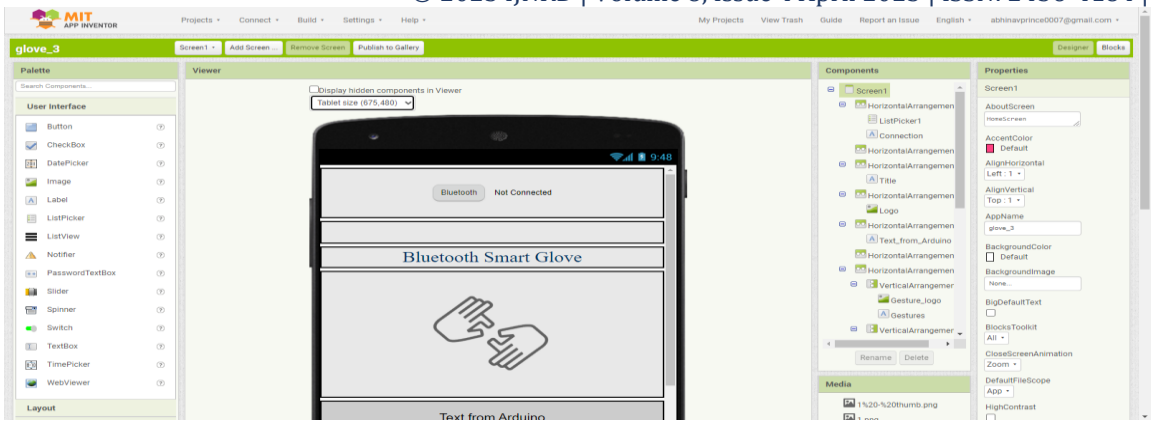


Fig. 8. MIT App Inventor UI

V. METHODOLOGY

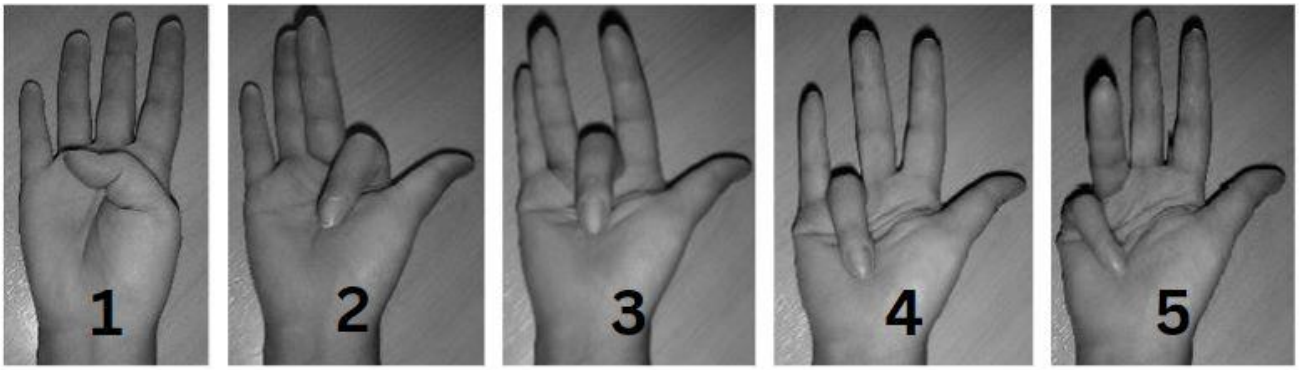


Fig. 9. Hand Gestures

The Glove connected with the flex sensor will read the hand gestures of the user. The degree of bend, or the threshold at which a bend is recognized is predetermined, and when the user gestures using their hand, they cross their threshold after which the recognized gestures are matched with prefeeded data and if it matches given to the speaker using the voice section. The gesture would be then converted into the text and further it will be converted to speech.

Gesture Recognition System: The gesture manager is the principal part of the recognition system. It contains data to match with incoming data. The system tries to match incoming data with existing posture. The bend values of the fingers and for each posture definition the distance to the current data is calculated. Then, the position/orientation data is compared is a likewise manner.

VI. HARDWARE

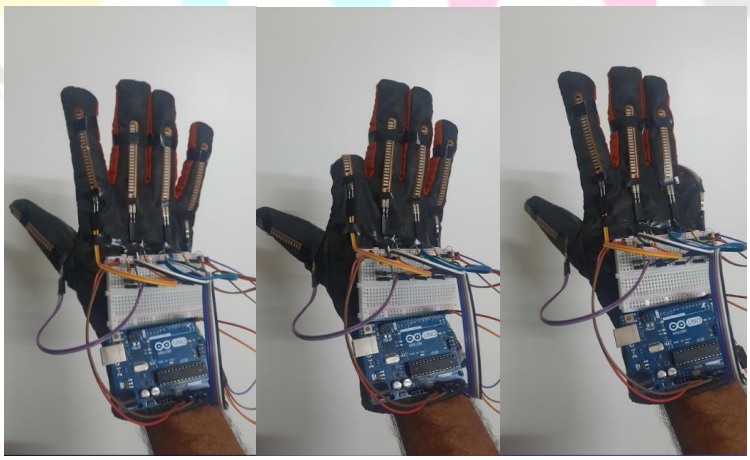
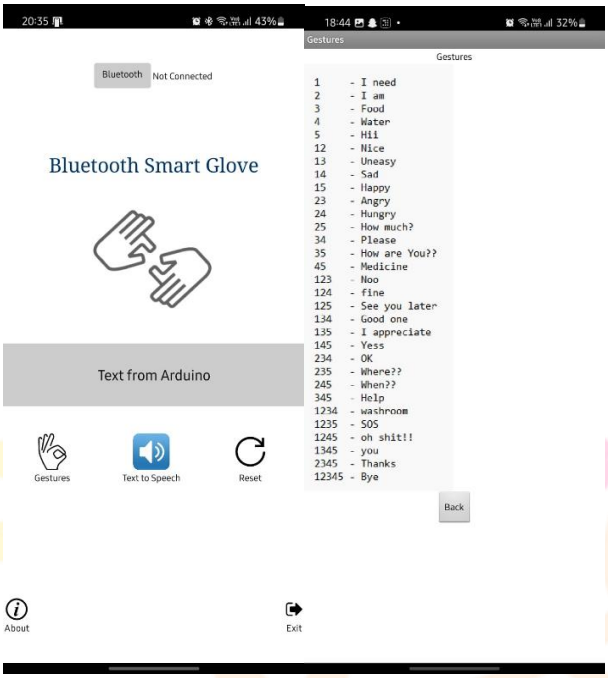


Fig. 10. Hardware

VII. APPLICATION

The Application runs on Android Devices. The Bluetooth Section shows whether the Bluetooth Module is connected to the Smart Glove or not. The Output from the Serial Monitor displays on the Grey Box. The Text can be then converted to Sound using the Text to Speech Button. The second screen (b) shows all the gestures that are stored in the Device.



(a) (b)

Fig. 11. App

VIII. RESULTS

The gestures given by the user are read by the flex sensors and processed by Arduino. These gestures given are matched with the already given information in the device. These gestures are then interpreted and seen on the app in text format and then this text to speech which makes it convenient for the user to use the sign language.

IX. CONCLUSION

Sign language is a method used for communication by disabled persons. Here we are converting sign language into text and speech so that communication is not limited between disabled and normal people. This glove is made more convenient by adding Bluetooth and connecting the glove with an application so that no other output devices are needed. This device is customizable as per the user. Using the smart gloves disabled people can grow in their career. Making their future better, making the nation better.

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