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HAND GLOVE TO ASSIST DISABLED PEOPLE IN COMMUNICATION & HOME AUTOMATION

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Abstract:

In the recent years, there has been rapidincrease in the number of deaf and dumb victims dueto birth defects and accidents Since deaf and dumb people cannot communicate with normal persons they have to depend on some sort of visual communication. Primary motive of proposing the new system of hand gesture remote control is to remove the need to look in to the hand held remote and to search for a specific key for specific function. A glove will be used as a transmitter which transmits the controls to receiver to control the appliances using gestures.

This project also aims to solve the daily challenges faced by the disabled people, who are unable to speak. It can also be used by elderly people, who find difficulty in speaking. With this wearable smart glove, dumb people or patient can easily communicate by just tapping the points on the glove by their thumb that results in 8 different commands that are both visible and audible audio on any Android smartphone via an app. The data communication is done via Bluetooth communication to the target device to speak out.

Keywords **– Smart Glove, Gesture to Voice, Gesture to Text, Home Automation, Multi-diasabled, Text to Speech.**

I. INTRODUCTION

In our life we meet many disable people, some of them are partially and some are completely disables. The partially impaired people like dumb, deaf, paralysis in one leg or hand manages their life with difficulties and feel separate from others. Here communication plays major role to feel someone better and indulging them in an activity where they may say themselves as independent person. By this thought the project Smart Hand Gloves for Disable People is developed so that disable person can live his life as he wants.The touch sensors give output in the form of voltage variation that varies with degree of bend. This touch sensor output is given to the ADC channels of microcontroller. It processes the signals and perform analog to digital signal conversion. Further the receiver section. In this section the gesture is recognized and the corresponding output is displayed on LCD and simultaneously a speech output is play backed through speaker. The portability of this project is a major advantage. Thus with the help of this project, the barrier faced by these people in communicating with the society can be reduced to a great extent.

The Internet of things (IoT) is the network of devices, vehicles, and home appliances that contain electronics, software, actuators, and connectivity which allows these things to connect, interact and exchange data. IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smartphones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled.

One key application of IoT is to provide assistance for those with disabilities and elderly individuals. These smart systems use assistive technology to accommodate an owner's specific disabilities. Voice control can assist users with sight and mobility limitations while alert systems can be connected directly to cochlear implants worn by hearing impaired users. They can also be equipped with additional safety features. These features can include sensors that monitor for medical emergencies such as falls or seizures.

Arduino is a microcontroller for building digital devices and interactive objects that can sense and control objects in the physical and digital world. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that maybe interfaced to various expansion boards or breadboard(shields)and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the

programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

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II. EXISTING SYSTEM

In existing system , flex sensors, accelerometer is used to detect the hand gestures which are mounted on the hand glove of the user. The main control unit of this system is microcontroller. Various resistance values of each sensor are detected and sent to microcontroller. Then gestures are

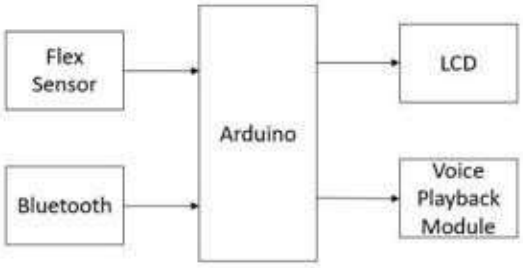


Fig. 1. Block diagram of existing system

matched to the data base based on the gesture shown. The gestures are detected using colors which will be mapped and compared with the image stored in the data base, if the image is matched then particular gesture is displayed.

Complex calibration process: Accelerometer and touch sensor-based hand gloves require a complex calibration process. The calibration process needs to be repeated each time the gloves are used, which can be time-consuming.

Low recognition accuracy: Accelerometer and touch sensor-based hand gloves may have low recognition accuracy due to variations in hand movements and the complexity of the gestures. The accuracy can be affected by external factors such as noise and vibrations.

Limited gesture vocabulary: Some accelerometer and touch sensor-based hand gloves may have a limited vocabulary of recognized gestures, which can limit their applicability in different contexts.

III. PROPOSED SYSTEM

Hand touch button sensors are integrated into a hand glove, and connected to an Arduino board. The Arduino board is programmed to read the input from the hand touch button sensors and convert it into a signal that can be transmitted wirelessly via Bluetooth. An Android app is used to receive the Bluetooth signal and convert it into audible speech output. The Android app includes a speech synthesis engine that can convert the input signal into spoken words. The user wears the hand glove and presses the appropriate button to select the desired word or phrase. The signal from the hand touch button sensors is transmitted wirelessly via Bluetooth to the Android app. The Android app converts the input signal into audible speech output, which can be heard by the user and those around them. Some touch sensor buttons are allocated for home automation, i.e, control of home appliances using gestures. The communication between glove and appliances is done using RF communication (RF TX & RX).

Fig.2 Proposed TX Block Diagram

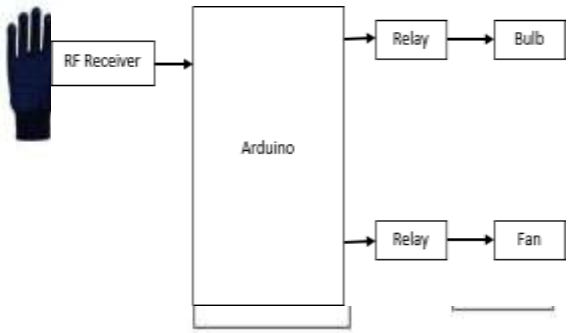


Fig.2 Proposed TX Block Diagram

Hardware components:

- Aurdino Nano
- Touch button sensors
- Radio frequency RX and TX
- Relay
- Bluetooth

Software components:

- Aurdino IDE
- Programming language C
- Text to speech app

3.1 AURDINO NANO: The Arduino Nano is a small yet powerful development board that brings the versatility and ease of use of Arduino to compact projects. Designed for prototyping and DIY electronics enthusiasts, the Nano offers

a balance of performance, size, and features. Whether you're a beginner learning the basics of electronics or an experienced maker creating intricate projects, the Arduino Nano provides a robust platform for bringing your ideas to life.

Fig.3.Aurdino nano

Specifications:

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 8
- Flash Memory: 32KB (of which 2KB is used by the bootloader)
- SRAM: 2KB
- EEPROM: 1KB
- Clock Speed: 16MHz
- Dimensions: 45mm x 18mm
- Weight: Approx. 5 grams

3.2 TOUCH BUTTON SENSORS:

The interface for button sensors on a hand glove designed to assist disabled people in communication is a sophisticated system that combines cutting-edge technology with thoughtful design to enable individuals with physical disabilities to interact with their environment and communicate effectively. This innovative solution integrates various components, including sensors, microcontrollers, and communication modules, to create a seamless interface between the wearer's hand movements and the communication device.The hand glove is specifically designed to be worn comfortably on the user's hand, with sensors strategically placed on different parts of the glove to capture the wearer's movements. These sensors may include pressure sensors, touch sensors, or capacitive touch sensors, depending on the specific requirements of the individual user. For example, pressure sensors can detect when the user clenches their fist, while touch sensors can capture bending movements of the fingers. Capacitive touch sensors can detect when the user touches or releases specific areas of the glove with their fingers or palm.

The sensors are connected to a microcontroller, which processes the data received from the sensors and translates it into meaningful commands or signals. The microcontroller is programmed with customized algorithms that interpret the wearer's hand movements and convert them into specific actions or commands based on their intended purpose. These actions can include controlling a communication device, such as a speech-generating device (SGD), a smartphone, a tablet, or a computer, depending on the user's communication needs.The microcontroller also interfaces with communication modules, such as Bluetooth or Wi-Fi, which enable wireless communication between the hand glove and the user's communication device.

This wireless connection allows the user to communicate remotely without the need for physical wires or cables, providing them with greater mobility and flexibility in their communication.The hand glove interface also includes a user-friendly graphical user interface (GUI) that can be accessed on the user's communication device. The GUI provides a visual representation of the hand movements detected by the sensors, allowing the user to easily configure and customize the system according to their preferences and communication requirements. The GUI may also include options for adjusting sensitivity, setting up macros, or changing communication modes, providing the user with a high level of control over their communication system.

Fig.5.Touch button Sensors

3.3 RF TRANSMITTER AND RECEIVER:

This hybrid RF Transceiver Module provides a complete RF transmitter and receiver module solutionwhich can be used to transmit data at up to 3KHz from any standard CMOS/TTL source.

The transmitter module is very simple to operate and offers low current consumption (typical. 11mA). Data can be supplied directly from a microprocessor or encoding device, thus keeping the component count down and ensuring a low

hardware cost.

Fig.6.RF TX and RX

The RX – ASK is an ASK Hybrid receiver module. The RF Transmitter Receiver Module is an effective low-cost solution for using 433 MHz. The TX-ASK is an ASK hybrid transmitter module. TX-ASK is designed by the saw

resonator, with an effective low cost, small size and simple to use for designing.

An RF module (short for radio-frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio- frequency (RF) communication. For many applications, the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and a receiver. They are of various types and ranges. Some can transmit up to 500 feet. RF modules are typically fabricated using RF CMOS technology.

RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required to achieve operation on a specific frequency. In addition, reliable RF communication circuit requires careful monitoring of the manufacturing process to ensure that the RF performance is not adversely affected. Finally, radio circuits are usually subject to limits on radiated emissions, and require Conformance testing and certification by a standardization organization such as ETSI or the U.S. Federal Communications Commission (FCC). For these reasons, design engineers will often design a circuit for an application which requires radio communication and then "drop in" a pre-made radio module rather than attempt a discrete design, saving time and money on development.

TYPES:

The term RF module can be applied to many different types, shapes and sizes of small electronic sub assembly circuit board. It can also be applied to modules across a huge variation of functionality and capability. RF modules typically incorporate a printed circuit board, transmit or receive circuit, antenna, and serial interface for communication to the host processor.

Most standard, well known types are covered here:

- transmitter module
- receiver module
- transceiver module
- system on a chip module.

Transmitter modules

An RF transmitter module is a small PCB sub- assembly capable of transmitting a radio wave and modulating that wave to carry data. Transmitter modules are usually implemented alongside a microcontroller which will provide data to the module which can be transmitted. RF transmitters are usually subject to regulatory requirements which dictate the maximum allowable transmitter power output, harmonics, and band edge requirements.

Receiver modules

An RF receiver module receives the modulated RF signal, and demodulates it. There are two types of RF receiver modules: superheterodyne receivers and superregenerative receivers. Superregenerative modules are usually low cost and low power designs using a series of amplifiers to extract modulated data from a carrier wave. Superregenerative modules are generally imprecise as their frequency of operation varies considerably with temperature and power supply voltage. [*citation needed*] Superheterodyne receivers have a performance advantage over superregenerative; they offer increased accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in the past tended to mean a comparatively more expensive product. However, advances in receiver chip design now mean that currently there is little price difference between superheterodyne and super regenerative receiver modules.

Transceiver modules

An RF transceiver module incorporates both a transmitter and receiver. The circuit is typically designed for half- duplex operation, although full- duplex modules are available, typically at a higher cost due to the added complexity.

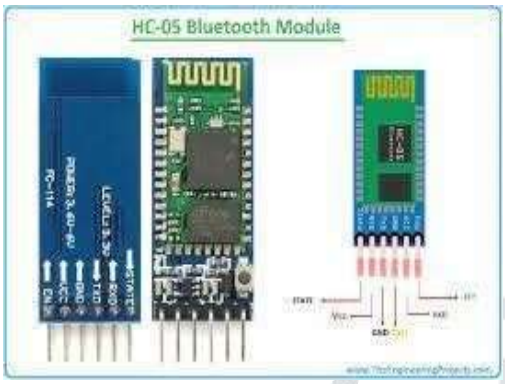
3.4 RELAY

The single-channel relay module is much more than just a plain relay, it contains components that make switching and connection easier and act as indicators to show if the module is powered and if the relay is active.

First is the screw terminal block. This is the part of the module that is in contact with mains so a reliable connection is needed. Adding screw terminals makes it easier to connect thick mains cables, which might be difficult to solder directly. The three connections on the terminal block are connected to the normally open, normally closed, and common terminals of the relay.

The second is the relay itself, which, in this case, is a blue plastic case. Lots of information can be gleaned from the markings on the relay itself. The part number of the relay on the bottom says “05VDC”, which means that the relay coil is activated at 5V minimum – any voltage lower than this will not be able to reliably close the contacts of the relay. There are also voltage and current markings, which represent the maximum voltage and current, the relay can switch. For example, the top left marking says “10A 250VAC”, which means the relay can switch a maximum load of 10A when connected to a 250V mains circuit. The bottom left rating says “10A 30VDC”, meaning the relay can switch a maximum current of 10A DC before the contacts get damaged.The 'relay status LED' turns on whenever the relay is active and provides an indication of current flowing through the relay coil.The input jumper is used to supply power to the relay coil and LEDs. The jumper also has the input pin, which when pulled high activates the relay.

The switching transistor takes an input that cannot supply enough current to directly drive the relay coil and amplifies it using the supply voltage to drive the relay coil. This way, the input can be driven from a microcontroller or sensor output. The freewheeling diode prevents voltage spikes when the relay is switched off The power LED is connected to V_{CC} and turns on whenever the module is powered.



3.4.1 Single-Channel Relay Module Specifications

- Supply voltage – 3.75V to 6V
- Quiescent current: 2mA
- Current when the relay is active: ~70mA
- Relay maximum contact voltage – 250VAC or 30VDC
- Relay maximum current – 10A

3.5 BLUETOOTH

Fig.7. HC-05 Bluetooth Module

HC-05 is a Bluetooth module which is designed for wireless communication. This modulecan be used in a master or slave configuration. The HC-05 is a popular Bluetooth module used in electronics projects to add wireless communication capabilities to devices. It is a small, cost-effective device that operates on the Bluetooth 2.0 standard and provides wireless serial communication capabilities.

The HC-05 Bluetooth module is designed for use in embedded systems and can be easily integrated with microcontrollers such as Arduino, Raspberry Pi, and other similar platforms. It communicates with a host system via a serial interface and can be configured to operate as either a master or slave device.

The HC-05 module uses a low-power, Class 2 Bluetooth radio and has a range of up to 10 meters. It supports a data rate of up to 2.1 Mbps and provides a reliable wireless connection. It also has a built-in AT command set that allows the user to configure various parameters such as the device name, baud rate, pairing password, and other settings.

The HC-05 Bluetooth module has become popular in DIY electronics projects such as robotics, home automation, and remote control applications. It can be used to enable wireless communication between different devices, such as a smartphone and a microcontroller-based system, to create a wireless control system or to transfer data wirelessly. It is widely available from electronics suppliers and can be easily integrated into a project using standard serial communication protocols.

Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware. By default, avrdude is used as the uploading tool to flash the user code onto official Arduino boards.

Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default bootloader of the Arduino Uno is the Optiboot bootloader. Boards are loaded with program code via a serial connection to another computer.

Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable

USB-to-serial adapter board or cable, Bluetooth or other methods. When used with traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.

Fig 8:Aurdino IDE

3g.AURDINO TEXT TO SPEECH APP:

An Arduino text-to-speech app is an application that uses an Arduino board and a text-to-speech (TTS) module to convert written text into spoken words. The Arduino board is a microcontroller that can be programmed to control electronic components and perform various tasks. The TTS module, on the other hand, is a device that can produce human-like speech by converting written text into audio signals.

To create an Arduino text-to-speech app, you will need an Arduino board, a TTS module, a speaker or headphones, and a computer. The TTS module can be connected to the Arduino board using jumper wires or a shield. The shield is a board that can be attached to the Arduino board to provide additional functionalities.

Once you have connected the TTS module to the Arduino board, you will need to write a code that instructs the Arduino board to convert written text into audio signals using the TTS module. There are several libraries available for Arduino that can be used to interface with TTS modules. For example, the "Talkie" library can be used to control a TTS module called "Speakjet."

To use the Talkie library, you will need to download it and include it in your Arduino sketch. You will also need to connect the TTS module to the Arduino board and specify the pins that the module is connected to. Once you have done this, you can use the library to convert text into speech by calling the "say" function and passing in the text that you want to convert.

Fig:9 Aurdino Text to Speech app

To use the Arduino TTS app, users need to write a code that sends the text input to the TTS module and controls the audio playback. The code can be written using the Arduino IDE, which provides a simple and easy-to-use interface for programming the board.

One of the main benefits of the Arduino TTS app is that it allows users to add voice output to their projects, making them more interactive and engaging. For example, users can build a talking robot or a voice-controlled home automation system using the Arduino board and TTS module.

In addition, the Arduino TTS app can be used for assistive technology applications, such as helping people with visual impairments or learning disabilities to access written information. It can also be used in education and entertainment, such as creating interactive audio books or language learning apps.

Overall, the Arduino TTS app is a powerful tool that adds a new dimension of interactivity and accessibility to Arduino projects. It enables users to create innovative and engaging projects that can be used in a wide range of applications, from education and entertainment to assistive technology and beyond**SYSTEM DESIGN :**

In first module the touch sensor is used to detect the commond. The controller used in the aurdino is ATmega328 Microcontroller .Here the aurdino is connected with RF transmitter and receiver and also connected with bluetooth module.The Bluetooth module will be connected to aurdino text to speech app through Bluetooth in mobile. Here we use 2 one relay modules connected to fan and light. The aurdino gets power through USB cable connected to devices .we use battery to supply for fan and light for the prototype..

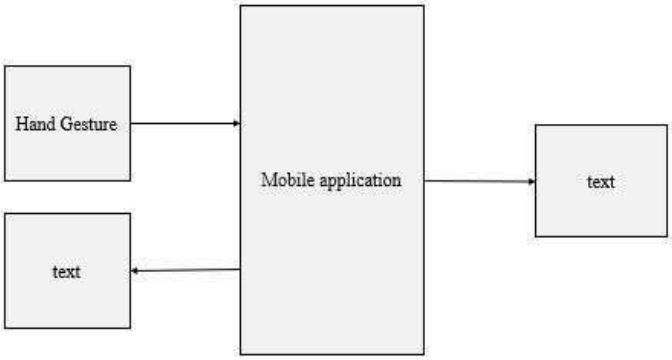


fig: .Block diagram of module

Finally the touch buttons interfacing with gloves will be given some commands .when we touch the button the respective commond appears in the mobile app.

Hardware setup

Fig.12. Prototype of the System

OUTPUTS:

Fig.13. Image of interfacing gloves with light and fan.

Here as a touch sensor is in contact with respective button the corresponding command will be displayed on the screen as shown in fig:14 and an audio output is also present which uses speakers.

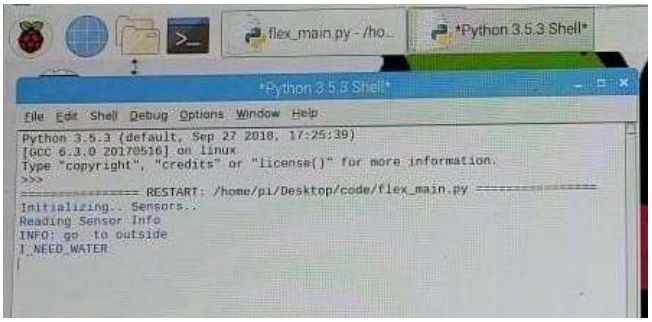


Fig.14. figure of respective command displayed on the screen

In this way, we have created a database which will give us the output, by comparing the resistance value of the sensor. Now all the command outputs are displayed in the below figure

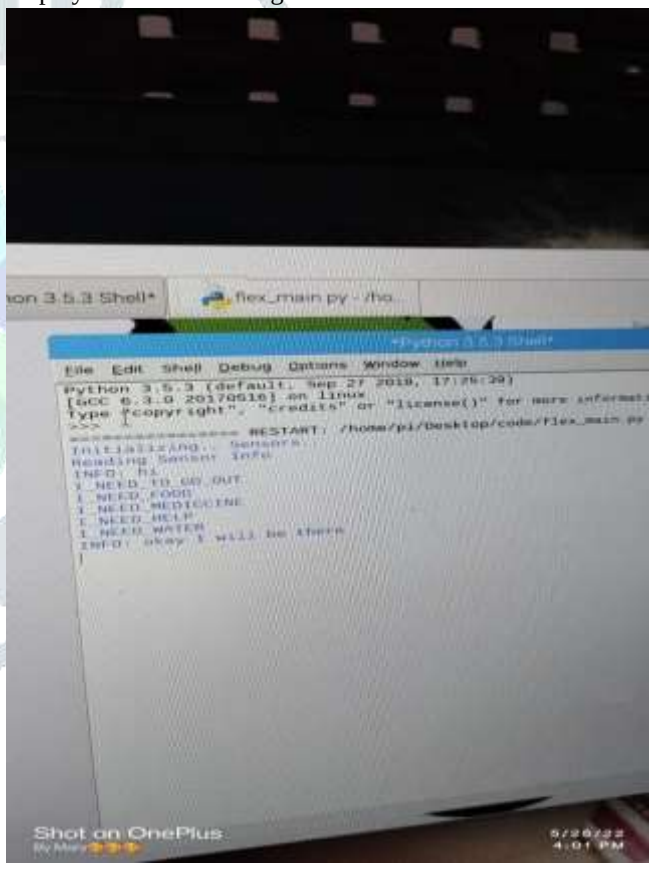


Fig.13. Output displayed on the screen

Here we can see the outputs on the screen As the button contacting respective butons is made the respective command is being displayed.

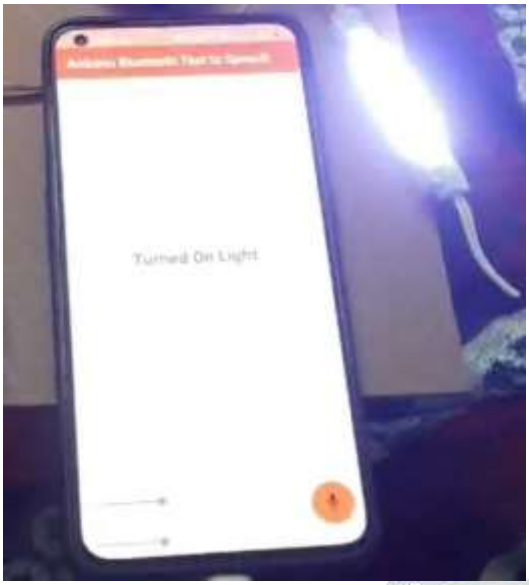


Fig.14. Output displayed on mobile app

Here a message is being displayed on the mobile app screen. And the person who received the message can help the person in time according to the command displayed on the screen.It will be helpful if the speech impaired person or a disabled person want to convey his/her message to the person who is far away

1. ADVANTAGES

Some of the advantages of this device are discussed below:

- The communication between an or malperson and a speech impaired person becomes easier
- Here we have an option for user input
- Device is portable
- Here we display the output on LCD. So that a mute person can speak with not only to a mute person but also to a deaf person
- Can work irrespective of Environmental Conditions

2. CONCLUSION

Sign language is a very useful to ease the communication between the deaf or mute people and the normal people.Yet there is a communication barrier between these deaf &dumb with normal people. This project aims to overcome the communication gap between the deaf or mute community and the normal world. Here This project was meant to be a prototype to check the feasibility of recognizing touch sensors using data gloves.

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