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IMPLEMENTATION OF VOICE BASEDSYSTEM FOR DUMB PEOPLE USING HAND GESTURES

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ABSTRACT

Speech is the easiest way for communication in the world. It becomes difficult for speech impaired people to communicate with normal people as they use sign language for communication. When a speech-impaired person communicates with normal person, the bridge gap between speech impaired person and normal people is too much to fill. The Objective of the project is to design a voice-based system that makes an easy way of communication for speech impaired people. In this project, Arduino board is equipped with sensors such as Flex sensor, Accelerometer sensor. Flex sensors are placed on fingers which measures the bending of fingers according to a gesture made. The sensed data from sensors is sent to Arduino UNO board for further processing and transfer data to an android phone via Bluetooth module. The data we get will be in the form of text. This text data is then converted into speech. The proposed system also provides the feature to control home appliances like light and fan through gestures.

Keywords: *Gesture Recognition, Hand gloves, Flex sensor, Arduino.*

I. INTRODUCTION

It becomes difficult for dumb people to talk with the ordinary people as speech impaired people lacks the amenities which a normal person has. It becomes the same problem of two persons who knows two different languages, no one of them knows any common language so, it becomes a problem to talk with each other and so they require a translator physically which may not be always convenient to arrange, and this kind of problem occurs in between the Normal Person and the Dumb person.

Although, technology has been evolving rapidly dumb people still use sign language as their only way of communication. Using sign language as a communication tool can be beneficial among those who are familiar with this language, but the problem remains when communicating with the wider community. The proposed system makes use of a smart speaking system that help dumb people in conveying their messages to regular people using hand motions and gestures. The system makes use of a hand motion reading system equipped with motion and flex sensors along with a speaker unit. Arduino UNO is used for processing the data and operating the system. The system reads persons hand motions for different variations of hand movement.

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II. LITERATURE REVIEW

`The communication between a dumb and regular person poses to be an important disadvantage compared to communication between blind and ancient visual people. This creates an extremely little house for them with communication being associate degree elementary aspect of human life. The blind people can speak freely by ancient language whereas the dumb have their own manual-visual language referred to as sign language. Sign language is also a non-verbal form of intercourse that's found among deaf communities. The sign languages haven't got a typical origin and hence hard to interpret. A gesture in associate degree extremal language is also a certain movement of the hands with a particular kind created out of them.

A gesture is a particular movement of the hands with a specific shape made from them. A sign language usually provides sign for whole words. It can also provide sign for letters to perform words that don't have corresponding sign in that sign language. It is electronic device that can translate sign language into speech to make the communication take place between the mute communities with the public possible. A hand gesture recognition system is also used to recognize real time gesture in unconstrained environments. The system consists of three modules: real time hand tracking, training gesture and gesture recognition using pseudo two-dimension hidden Markov models. Using Kinect sensor, Shweta S. Shinde, Rajesh M. Autee and Vitthal K. Bhosale have proposed a method in which image processing is applied using HIS model and then the feature extraction is done by distance transform method.Sign language recognition using sensor gloves by Mehdi S.A. Khan, Y.N. States that, finger of the mute person will be placed with particular action in front of the flex sensor. When the gestures are made by the person, the exact positions of the fingers will be captured and image processing using principal component analysis algorithm will be performed. The captured images will be mapped with the one previously stored and accordingly exact phase angle from the database will be identified. Signal processing robotics by Ata. UrRehman, Salman Afghani, Muhammed Akmal and Raheel Yousaf states that, a scheme using a database driven hand gesture recognition based upon skin color model approach and thresholding approach along with an effective template matching with can be effectively used for human robotics applications and similar other applications.. Initially, hand region segmented by applying skin color model in YCbCr color space. In the next stage thresholding is applied to separate foreground and background. Finally, for recognition Principal component analysis is used for template-based matching.

III. PROPOSED METHODOLOGY

The proposed system makes use of a smart speaking system that help dumb people in conveying their messages to regular people using hand motions and gestures. The system makes use of a hand motion

reading system equipped with motion and flex sensors along with a speaker unit. Arduino UNO is used for processing the data and operating the system. The system consists of around 10 stored messages like “need help”, “where is the toilet/washroom” and so on that help dumb people to convey basic messages. The system reads persons hand motions for different variations of hand movement. It also consists of a accelerometer sensor in order to indicate that the person wishes to activate the system and speak something. This ensures the system does not speak when the person is just involuntarily making hand motions. The Arduino UNO constantly receives input sensor values and then processes it. Now it searches for matching messages for the set of sensor values. Once, it is found in memory this message is retrieved and is obtained out using text to speech processing through the interfaced speaker. Thus, a fully functional smart speaking system was developed to help dumb people to communicate with regular people using a simple wearable system.

Block Diagram

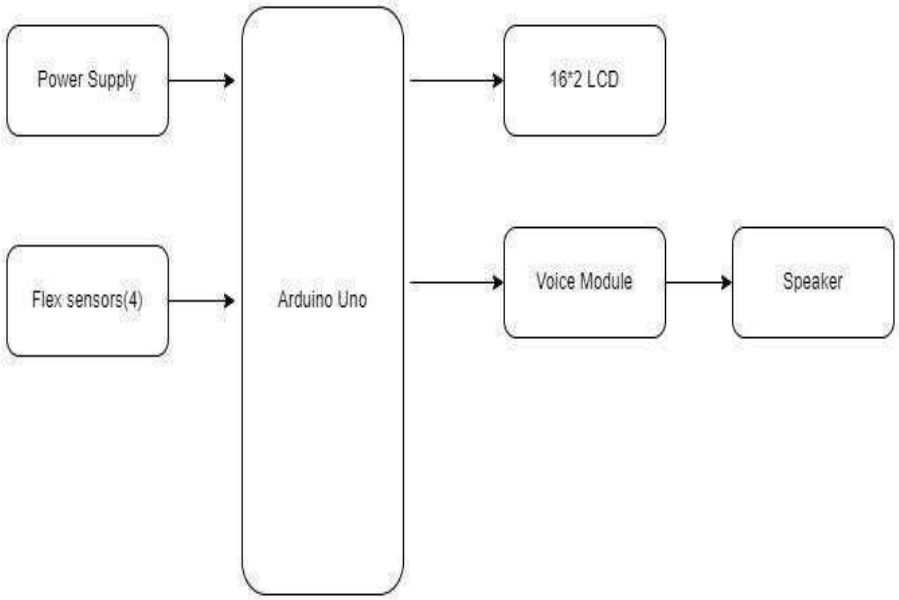

Fig 1. Block Diagram of Proposed System

The block diagram of voice-based system for dumb people using hand gestures is as shown in Fig 1. The system has both hardware and software. Hardware part includes flex sensors, Arduino, LCD display, Bluetooth module. Software includes the programming of Arduino according to the gestures. The proposed system is divided into three parts:

1. Gesture input
2. Processing the data
3. Voice output

Gesture input

Flex sensors are used as gesture input. They are placed on the hand which can be easily operated by the user by making gestures. According to the gesture made by the user the resistance values will change, and sensor produces voltage correspondingly.

Processing the data

The output voltage of flex sensors is in the analog form which is converted into digital form by using inbuilt ADC of Arduino UNO ATmega328. Predefined gestures with corresponding messages are stored in the database of the microcontroller in different languages. Arduino UNO ATmega 328 checks whether the input voltage from the flex sensors exceeds the threshold value that is stored in the database.

Voice output

The output from the Arduino is sent to LCD. LCD displays the message that was assigned to the gesture in the database. Speech signal is produced using (Auto Playback Recorder) through speaker.

Power Supply

5V power supplies (or 5V DC power supplies) are one of the most common power supplies in use today. Linear regulated 5VDC power supplies regulate the output using a dissipative regulating circuit. They are extremely stable, have very low ripple, and have no switching frequencies to produce EMI.

Flex Sensors

A **flex sensor** or **bend sensor** is a low-cost and easy-to-use sensor specifically designed to measure the amount of deflection or bending. It became popular in the 90s due to its use in the Nintendo Power Glove as a gaming interface. Since, then people have been using it as a goniometer to determine joint movement, a door sensor, a bumper switch for wall detection or a pressure sensor on robotic grippers.

Fig 2. Flex Sensor

Arduino Uno

The Arduino Uno is an open-source microcontroller board based on the Microchip

ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

Fig 3. Arduino UNO

16*2 LCD

An LCD screen is an electronic display module and has a wide range of applications. 16*2 LCD means, it can display 16 characters per line and there are 2 such lines. So, total 32 characters are displayed in the LCD. Messages are displayed on the 16*2 LCD display.

Fig 4. 16*2 LCD

Voice Module and Speaker

Voice Module is a speaker-dependent module. Voice module acts as a transmitter between Arduino UNO and Speaker unit. The messages received from Arduino UNO are spoken out through the speaker unit**.**

Fig 5. Voice Module

Arduino Software

It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Arduino is a prototype platform (open source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the

computer code to the physical board. Arduino provides a standard form factor that breaks the functions of the micro- controller into a more accessible package.

IV. RESULT ANALYSIS

During the implementation, the two sensors are connected to Arduino Uno board using jumper wires. Once the connections are made perfectly, then Arduino takes inputs from sensors (Flex sensor, accelerometer sensor). Flex sensors are placed on fingers which measure the bending of fingers according to the gesture made with the glove. An accelerometer is placed on the hand. Initially, only flex sensors are implemented in this sign language transition. But some hand gestures are similar to other gestures. To distinguish these types of gestures an additional sensor Accelerometer is also implemented. This is very important in distinguishing two signs when they have the same bend in the fingers but different bends in the palm.

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. From the convenience of simple flex sensors, a user is able to interact with others in more comfortable and easier manner. This makes it possible for the user to not only to interact with their community but with others and they can also live normal life also.

Fig 6. Output message according to the hand gesture

As shown in the above fig the message “what is the time” is obtained through speaker and displayed on the LCD screen, according to the gesture made.

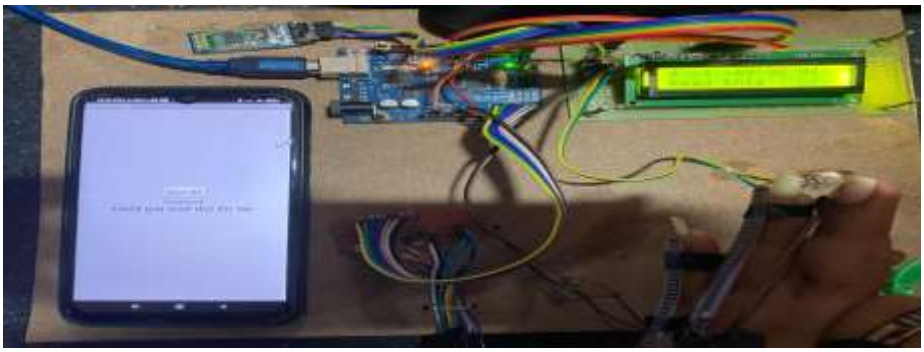

Fig 7. Output message according to the hand gesture

As shown in the fig the output message “could you read this for me” is obtained through speaker and displayed on the LCD screen.

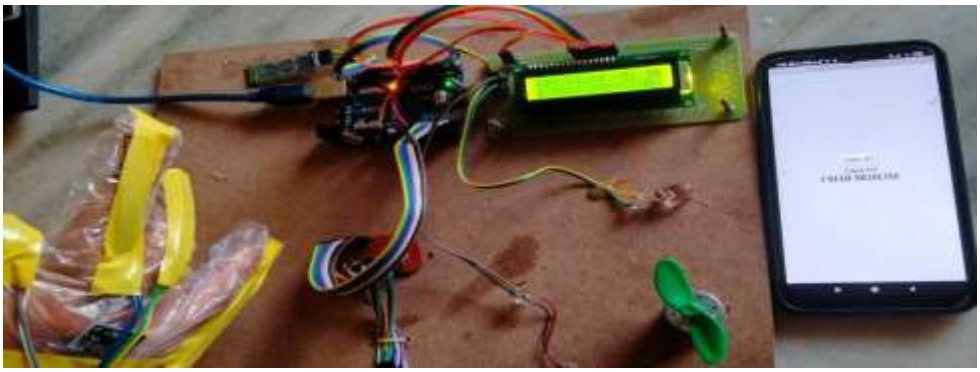

Fig 8. Output message according to the hand gesture

As shown in the fig the output message “I need medicine” is obtained through speaker and displayed on the LCD screen.

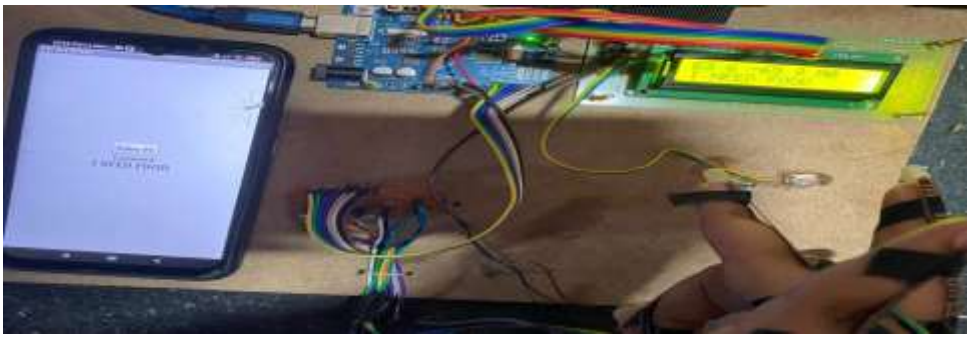

Fig 9. Output message according to the hand gesture

As shown in the fig the output message “I need food” is obtained through speaker and displayed on the LCD screen.

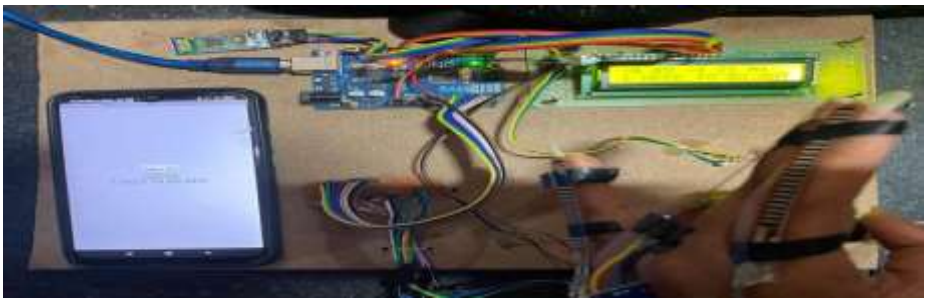

Fig 10. Output message according to the hand gesture

As shown in the fig the output message “I need to go out” is obtained through speaker and displayed on the LCD screen.

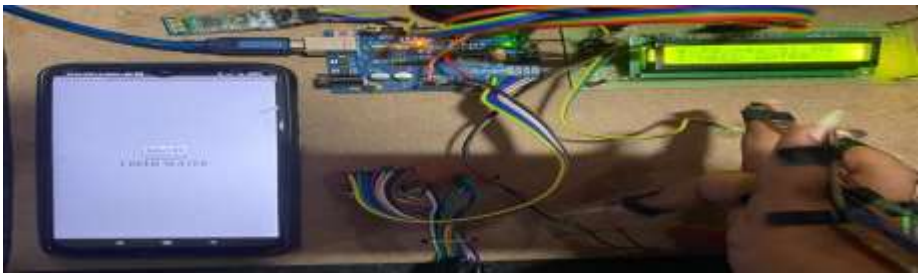

Fig 11. Output message according to the hand gesture

As shown in the fig the output message “I need water” is obtained through speaker and displayed on the LCD screen.

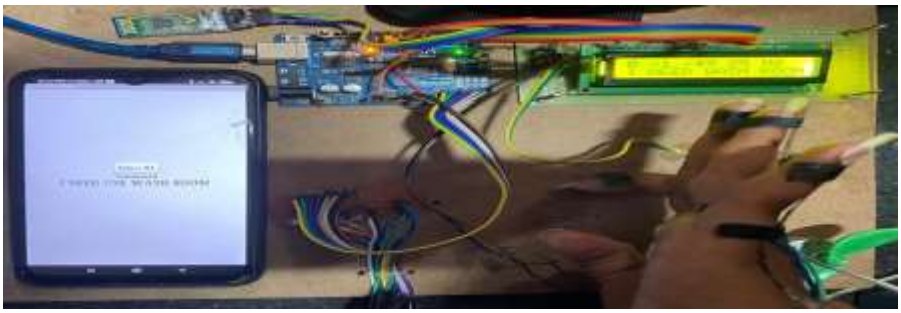

Fig 12. Output message according to the hand gesture

As shown in the fig the output message “I need use washroom” is obtained through speaker and displayed on the LCD screen.

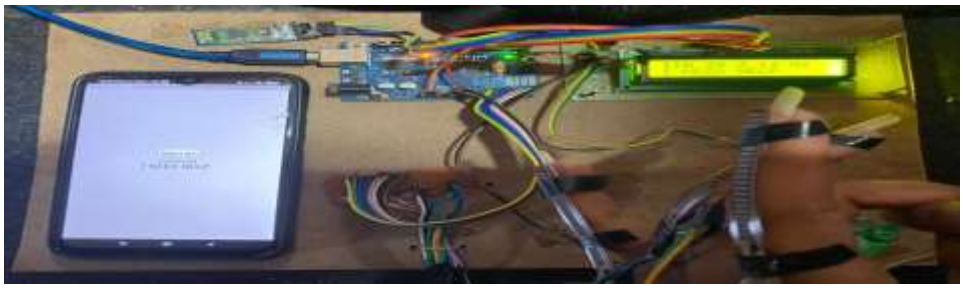

Fig 13. Output message according to the hand gesture

As shown in the fig the output message "I need help" is obtained through speaker and displayed on the LCD screen.

Discussions

During the implementation, every single part was tested alone the following points have been observed:

The flex sensor's function is made correctly and accurately. They can identify the correct variance emitted by each finger or hand gesture. The controller (Arduino) collects the data and sends it to the mobile application through the Bluetooth module in an appropriate way. The BT module can directly link to the needed device once the system is plugged into the power source or power bank in order to transmit and receive the number variance. One of the most important aspects of this project is the correct classification of the received input, which is forwarded by the mobile app, producing the expected output which is to be translated by the mobile app into speech and text. At first, the data should be sent from the Arduino to the BT that assures quick and reliable connectivity. The voice output could be understood clearly.

V. CONCLUSION *AND* FUTURE SCOPE

In this project, we constructed a voice-based system for supporting dumb people in communicating with normal people. The system can connect to Android mobile and facilitate exchange of messages. Whereas the android application can send and receive text messages from and to the system. The system is light, cheap, easy to use and no risk. We believe that the project is an effective and very useful for dumb people where they can communicate with their families and people around them.

As future scope of the project, the system may be extended to support other languages, and the system can use several way to communicate, it can use Wi-Fi connection, which enables a faster connection and better range from the base station or Bluetooth module. It is the most widespread and it's a cellular technology used for transmitting mobile data services, the most obvious advantage of it is widespread use throughout the world. It can also be extended to produce a product for blind people that convert the information in any handwritten notes, newspaper or books into a audio signal that these people can here.

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