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"Hand Gesture Analyzing and Speaking System for Mute People"

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Abstract
Communication between mute and a normal person have always been a difficult task. Manufacturers around the world have formulated various sign language systems but they are not adaptable and cost effective for all the people. By using hand motions and gestures we put forth a smart speaking system which will help deaf people to communicate with normal people. The system is provided with sensors like motion and flex consisting of hand motion reading system in addition with a unit of speaker. In this project the hand gesture which is also known as sign language will be converted into voice for mute people

Keywords: *Flex sensor, Accelerometer Sensor, Raspberry pi, Arduino Uno, Bluetooth Module HC-05, LCD 16X2, Speaker , Power Bank.*

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I. INTRODUCTION

In the whole world approximately about nine thousand million people are mute (deaf). How frequently will we come across the mute people communicating with the normal people? On comparison of communication between the blind and a normal sight person, the communication between a deaf and normal person is a serious problem. Amongst the deaf people in world, sign language is a nonverbal form of intercommunication. This sign language doesn't have a common origin and hence it is difficult to understand and translate for normal people. A device that translates the sign language to hand gestures is a mute communication interpreter. As hand sign language will not be trained by regular people, the communication between the deaf people and regular people becomes very difficult. During emergency, a mute person who is travelling amongst new people and if he/she wants to communicate with them becomes a difficult task. For the operation of the system and processing the data raspberry pi is used. Battery powered circuit is used to power the system and to run it. The system comprises of about stored messages which will help deaf people to communicate their primary messages like "need help", "Where is the particular address located?" and so on. For different variations of hand movement the system reads persons hand motions. Whenever the person wants to speak something. Whenever the mute person makes hand. motions just impulsively, the system ensures that it does not speak. The brain of the system i.e. raspberry pi processor processes the input sensor values which are constantly received. Now for the set of received sensor values messages are matched. From memory the message is retrieved once it is found, and through the speaker it is spoken out using text to speech process. Thus a smart speaking system which is fully functional is useful which helps deaf people convey their messages with normal people using wearable system.

1.1.1 Literature Review

Shweta S. Shinde, Rajesh M. Autee and Vitthal K. Bhosale have proposed a method in which the angle and peak calculation approach is used to extract the features of hand gestures by using MATLAB and then they convert the recognized gesture into speech using MATLAB inbuilt command. Sangeetha .R.K, Valliammai .V and Padmavathi .S have proposed a system based on the Indian hand sign language which contains both hands to create a gesture. Their system is implemented using MATLAB without using any other external hardware for the user, here the runtime live image is captured after which image frames are extracted and image processing is applied using HIS model and then the feature extraction is done by distance transform method. In paper Sign language recognition using sensor gloves by Mehdi, S.A.; Khan, Y. N. [5] 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 principle 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. In paper signal processing robotics by Ata-

UrRehman, Salman Afghani, Muhammed Akmal and Raheel Yousaf [2] 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.

1.2 Problem definition

It's very difficult for mute people to convey their message to regular people. Since regular people are not trained on hand sign language, the communication becomes very difficult. In emergency or other times when a mute person travelling or among new people communication with nearby people or conveying a message becomes very difficult. Here we propose a smart speaking system that help mute people in conveying their message to regular people using hand motions and gestures.

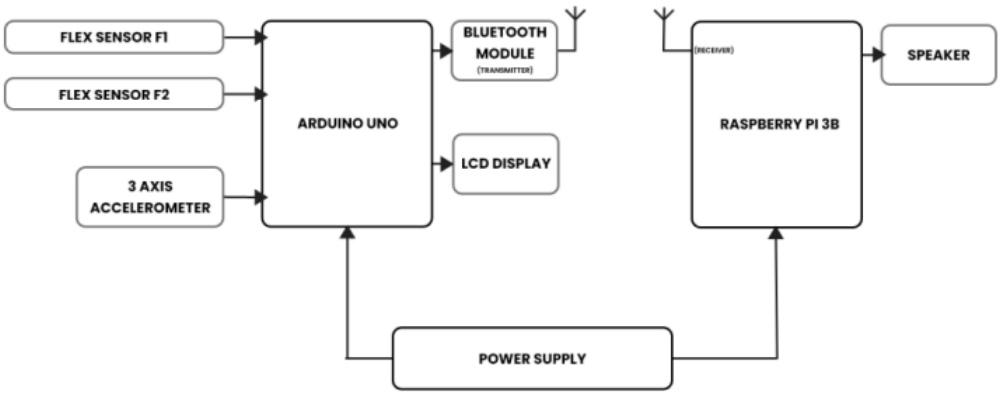
1.2.1 Need and Scope of the Project

The proposed system will be beneficial to voice impaired people as a reason to bridge the communication gap with their fellows who are normal, since communication is very important. Therefore, inability for the dumb and deaf people to deliver their message or effective communication, will be simplified to minimum Design Methodology

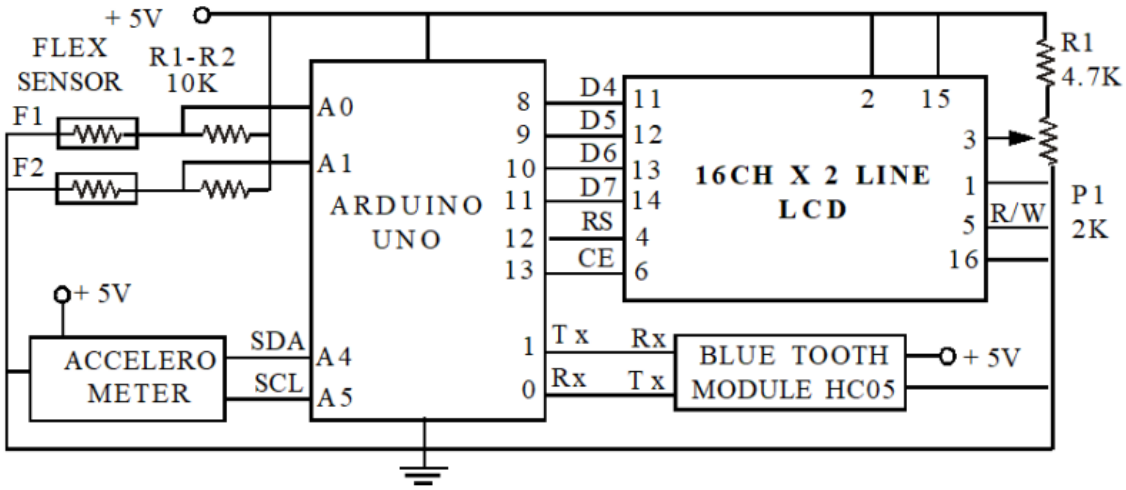
1.2.2 System Design

The proposed work involves three primary sub-sections i.e. Sensor Interfacing, Gesture Recognition, Data Collection and Transmission. A) Sensor Interfacing, Flex sensor and Accelerometer are the primary components used in this work. The hardware prototype with flex sensors mounted on fingers and accelerometer on the wrist. The analog output is generated when the flex sensor is bend on the other side the analog output is generated as the accelerometer orientation (position) is changed. B) Gesture Recognition After the above fundamental work, we proceed to next level that is taking the data from actual conditions of the flex sensors and accelerometer. i.e., when they are attached on fingers and the readings actually measure the bending of each finger. As predefined binary code for predefined messages are generated as we perform certain hand gesture, each binary code is of four bits. By this process data is recognized by the Arduino Uno board. C) Transmission and output, as the sensor data is generated and collected by arduino in the analog form, later processed by the arduino and converted to digital form so that it can be transmitted via a Bluetooth module. The Bluetooth module transmits the data and this transmitted data in binary form is received by raspberry pi We have programmed the Raspberry pi with binary code (0000-1111) according to the resistance value between straight and bending action of flex sensor and position of accelerometer, Raspberry pi contain some messages in it according to binary value (output received from Bluetooth module). Raspberry pi compares arduino output with stored messages and then according to binary code the audio file stored in raspberry pi is played via speaker connected to raspberry

1.2.3 Block diagram and Circuit diagram



Block Diagram



Circuit Diagram

1.2.4 Components

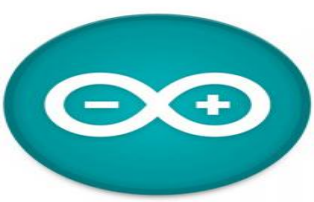
1. Accelerometer
2. Flex Sensor
3. Arduino UNO
4. Bluetooth Module HC-05
5. Raspberry pie 3 Model B
6. LCD 16X2
7. Speaker
8. Connecting wire

1.2.5 System Working

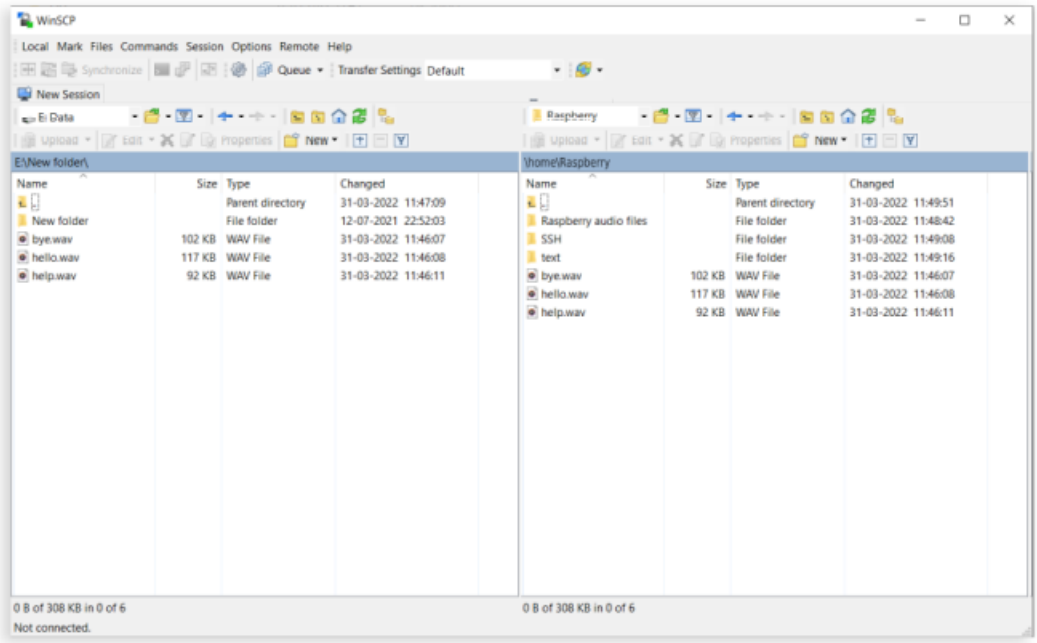
The system consists of three flex sensors and an accelerometer stitched on to the glove. This is done to measure the bending of the fingers (measured by the flex sensors) and the orientation of the hand (measured by the accelerometer). The combination of both the readings from flex sensors and accelerometer are send to the Arduino Uno which analyses these readings. The Arduino has been programmed with values which have a certain message related to it. For ex. if the binary readings are "0011" then the message "WATER " will get displayed on the 16×2 LCD. The LEDs also light up according to the binary. This binary data is then send wirelessly with the help of a Bluetooth module (HC-05) to the Raspberry Pi. The Raspberry Pi has audio files stored in its memory. When a binary is received by the Pi, a particular audio file relating to that binary is chosen and is played through a 5 V speaker. Thus result can be displayed both visually (through lcd) and through audio with the help of a speaker.

1.2.6 Software Implementation

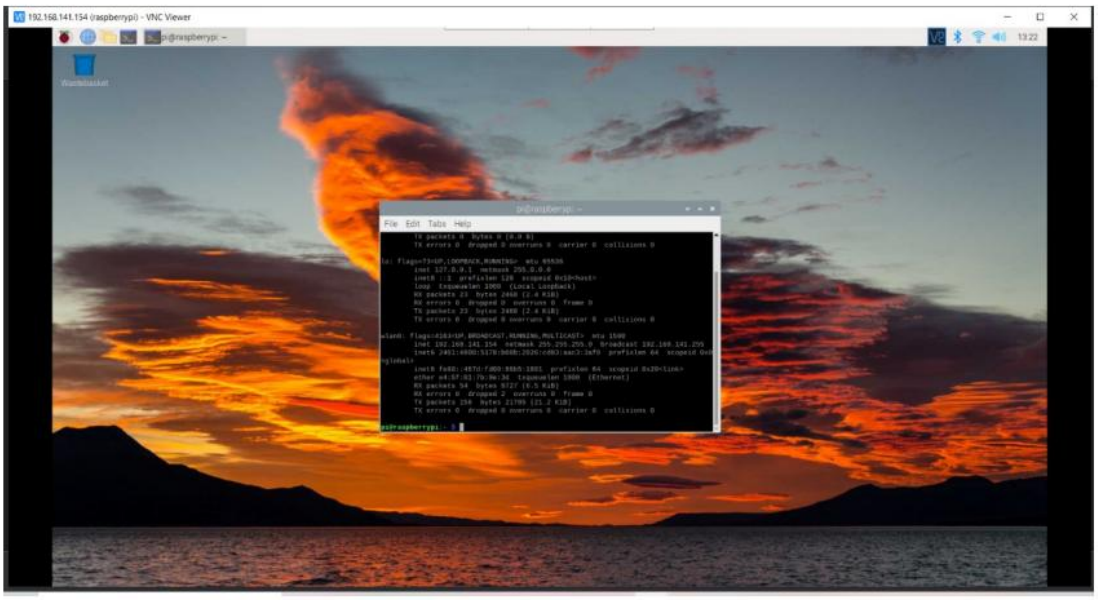
The arduino code is implemented by using the Arduino IDE software installed in a computer. To ensure the connection with sensors we first include the sensor libraries in the Arduino IDE, later as the sensors are defined we set particular parameters by using if and else commands in the code. Each parameter is set on particular values based on probabilities and combinations of the sensors. A binary code is also defined for particular position so that it can be transmitted



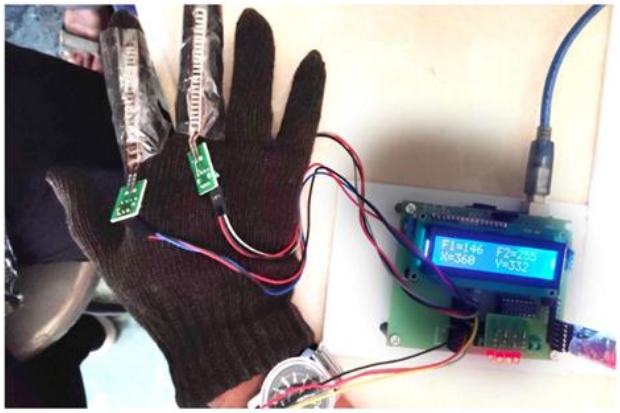
WINSCP We selected the local files or directories we want to upload. Before the upload actually starts, the transfer options dialog will show. There we have a chance to change the transfer options or the target directory. The target directory is by default the current remote directory. We have avoid the dialog being shown in preferences. In such case we have changed the transfer options by selecting preset on Transfer Settings toolbar. By using this process we transferred the data to raspberry pi 3B.



Raspberry PI OS Lite is a minimal operating system. It fits the needs for very light OS with a minimal set of packages. It is suggested only for experiences people able to see ssh connections and remote management with a Command Line Interface (CLI), without Graphical interfaces or Desktop Environment. This can figure Lite version as a Server Operating System. Lite version requires a very low amount of RAM and CPU usage. Raspberry PI OS Lite can become a Desktop version by installing required packages with built-in aptitude package manager.

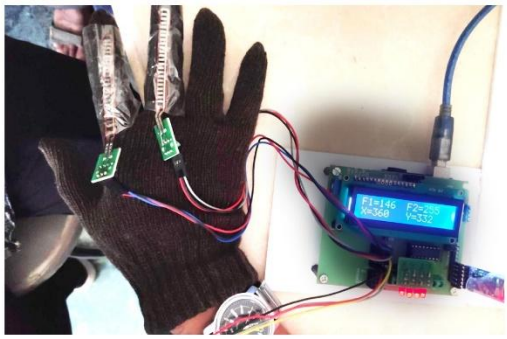


1.2.7 Hardware Implementation

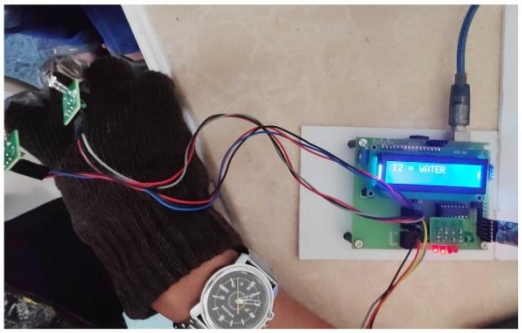


II RESULT AND DISCUSSION

The results obtained : -



sensor data is displayed
when hand is steady



"Water"
message displayed

"Hello"
message displayed

2.1 Application

1. It will help to bridge communication gap between regular people and voice impaired people.
2. It will help people with voice problem to get help as soon as needed from regular people.
3. It will help those voice impaired people who are studying to learn new things and enable Them to ask questions.
4. It will give a comfort to those voice impaired people to not feel discriminated.
5. It will help those people with voice problem to interact with the society.

III.CONCLUSION

In this project work, the sign language will be more helpful for the ease of communication between the mute people and normal people. The project mainly aims at reducing the gap of communication between the mute people and normal people. Here the methodology intercepts the mute signs into speech. In this system it overcomes the difficulties faced by mute people and helps them in improving their manner. The projected system is very easy to carry to any places when compared to existing systems.

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