

Intelligent System for Human Computer Interface Using Hand Gesture Recognition

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Abstract: Around the nation there are many hearing and speech impaired people. Because of their powerlessness they are confronting numerous issues to speak with others. To evacuate the communication boundary between them, this paper proposes a new strategy that will go about as a fake mouth for such disabled people. This paper additionally proposes a procedure that will be useful for others to speak with the impaired people by converting over speech to text and gestures to speech. Through this full duplex communication can be accomplished.

Index Terms: Arduino, flex sensors, gesture recognition, gesture to speech, speech to text.

I. INTRODUCTION

in regular day to day existence communication is a basic thing. regularly individuals convey their thoughts and feelings through speech. as hearing and speech disabled individuals can't talk, the main methods for communication between them is communication through signs. this gesture based communication can be effectively comprehended while the communication is between them, however the issue emerges when these individuals need to share their thoughts and emotions to normal people. to expel this correspondence boundary this paper proposes two methods, one is communication via gestures is changed over to speech utilizing flex sensors and arduino uno and the other speech to text transformation utilizing voice recognition module and alcd. a full duplex communication can be accomplished by actualizing these two methods.

II. LITERATURE REVIEW

[1] proposed a strategy in which home machines were constrained by hand signals with a framework called handmote which is fundamentally similar to a remote to work utilizing hand gestures. The framework proposed comprises of IR cameras and IR sensors to operate the home machines.

Another such methodology is made in [2] has utilized an innovation where accelerometer is utilized to identify the

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movement of the hand and image classification to distinguish the signal that is appeared. Later it is changed over to speech. The time taken to distinguish the gesture is more which causes a delay in communication. To evacuate this the proposing technology have flex sensors associated with arduino microcontroller to limit the delay.

Rather than using accelerometer [3] utilized matlab programming for gesture recognition. Image segmentation and feature extraction techniques are utilized to distinguish the gesture and once if it is identified corresponding playback sound will be generated.

A real time speech to text conversion system is proposed by [4] using bidirectional kalman filter in matlab. The kalman filter enhances the real time recognition, this system is more robust than existing Hidden markov method (HMM). A TIGIDIT data base is created to compare the accuracy.

Different algorithms for speech to text conversion are described in [5] like isolated word, connected word, continuous speech, spontaneous speech. By integrating both gesture to speech conversion and speech to text conversion a full duplex communication can be achieved.

III. SYSTEM OVERVIEW

The intelligent system for human computer interface comprises of following components.

- Arduino uno Micro-controller
- Flex sensors
- 16x2 ALCD display
- Speaker
- Hc-05 Bluetooth module
- Voice recognition module

A. Arduino uno micro-controller

Development board Arduino Uno incorporates ATmega328P which comprises of 14 digital and 6 analog pins for interfacing equipments with it. The board works at a frequency of 16MHz which facilitates UART Communication, has PWM output facility and many more similar functionalities. The board can be operated using Arduino IDE which comes along with a vast number of libraries to tailor make complex designs and functions.

B. Flex sensors

Flex sensor is a sensor that measures the bend produced. This sensor is placed on on a glove and depending on the bend the value of the resistance changes. Here resistance is directly proportional to amount of bend produced, when the sensor is in straight position it



has high resistance and when it is bend the resistance becomes low making flex sensor as variable potentiometer.

C. 16x2 ALCD display

This is a alphanumeric liquid crystal display, as this name 16x2 says that there are 16 columns and 2 rows. There are various combinations such as 8x1, 8x2, 10x2, 16x1, but 16x2 is very popular since it has 32 characters and each character is made of 5x8 pixel. There are total 16 pins in which 8 pins are called data pins used to send data to the micro controller.

D. Speaker

Speaker is a electro-acoustic transducer that converts a electric audio signal into corresponding sound. Once the flex sensor is bend corresponding resistance value is sent to the micro controller. Then the micro controller identifies the gesture and audio signal is sent to speaker which convert it into sound.

E. HC-05 Bluetooth Module

HC-05 Bluetooth Module is a Master/Slave wireless serial communication setup which has a sensitivity of -80dBm and a transmitting power of +4dBm. The module is equipped with Programmable Input/Output controls (PIO) which handles UART communication over a programmable baud-rate. The Serial port of the Bluetooth V2.0+Enhanced Data Rate module operates as 2.4GHz radio frequency transceiver.

F. Voice Recognition Module

Voice recognition module has two functions one to record the audio so that when the gesture is identified this audio signal is sent to speaker and converted into sound. Second to recognize the speech, when we speak using microphone this signal is sent to the recognition module through Bluetooth module and the text is recognized and displayed in ALCD.

IV. PROPOSED SYSTEM

The proposed design can be explained in two sections – gesture to speech conversion using flex sensors and arduino micro controller and speech to text conversion using voice recognition module, microphone, ALCD, and Bluetooth module. By integrating both designs full duplex communication can be achieved.

A. Gesture to Speech conversion

In this proposed procedure the flex sensors are associated to the digital pins of the arduino micro controller and the output from the micro controller is the speech signal that is sent to the Bluetooth speaker through Bluetooth module. The system for this change is as per the following, the flex sensors are put on the hand glove to create the hand signal. The output of the flex sensors relies upon the measure of twist delivered along x, y, z axis. As the hand motion is produced, some twist in the flex sensors is also produced, this value is to be estimated. These values are fed into the ATMEGA32 micro controller where the rest of the procedure happens and changes over these values to digital values. Then these values are compared with the predefined incorporated values in the database and corresponding text word is generated in the ALCD. Then the corresponding voice file is sent to the speaker for the voice output.

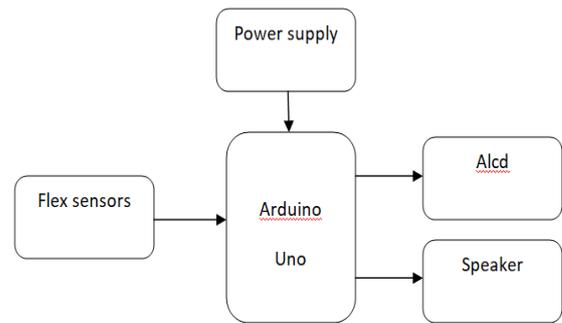


Figure 1. Block diagram of gesture to speech conversion.

The flowchart below describes the communication of the flex sensors with the arduino uno microcontroller. All the flex sensors are placed on the hand glove and if some gesture is placed the flex sensor will be bent. The value of the bend will be sent to a microcontroller and the corresponding output playback sound is the output from speaker. If the gesture is not recognised the system flow will get back to flex sensor.

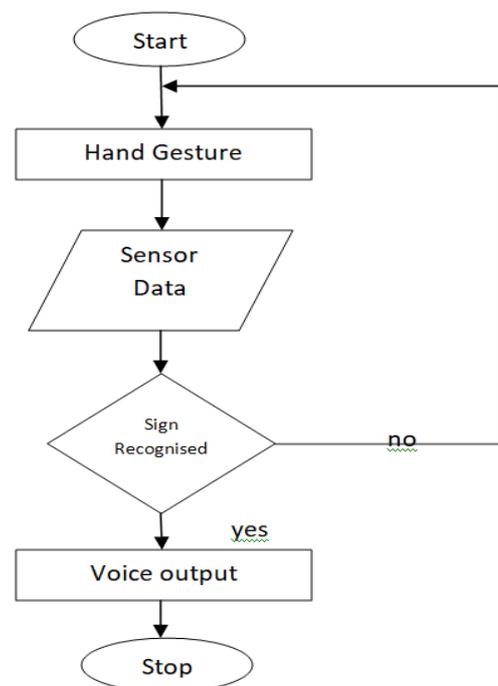


Figure 2. Flowchart of gesture to speech conversion.

B. Speech to Text conversion

Speech input is given with the assistance of microphone and this signal is sent to the voice recognition module through Bluetooth module. Here the speech input is recognised and the digital output is sent to the arduino micro controller from where this signal is sent as contribution for the ALCD show and the relating word will be shown.

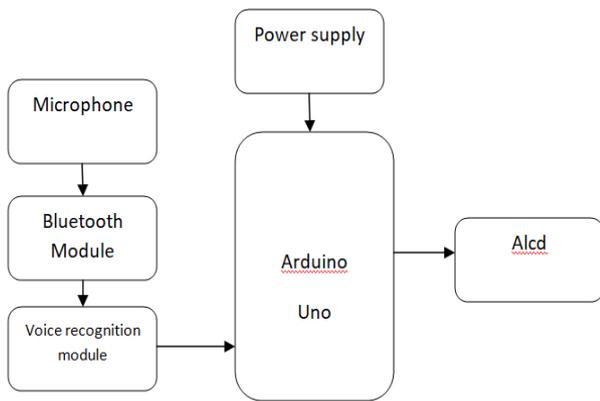


Figure 3 . Block diagram of speech to text conversion

During voice recognition phase an unknown speech signal is identified by comparing it with the known speech signals. In this approach speaker is used to give the input and the output of the recognition module is the digital output. This digital output is compared with the dictionary and the closest word is displayed as output. If the match does'nt found the procedure restarts. The flowchart for this conversion process is shown below.

V. RESULTS & DISCUSSION

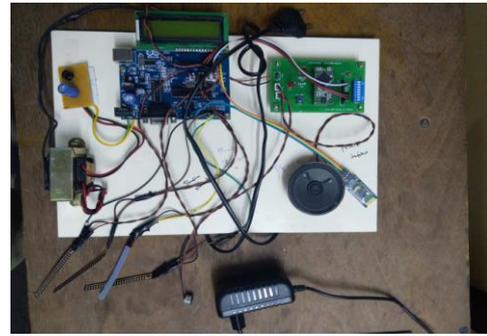
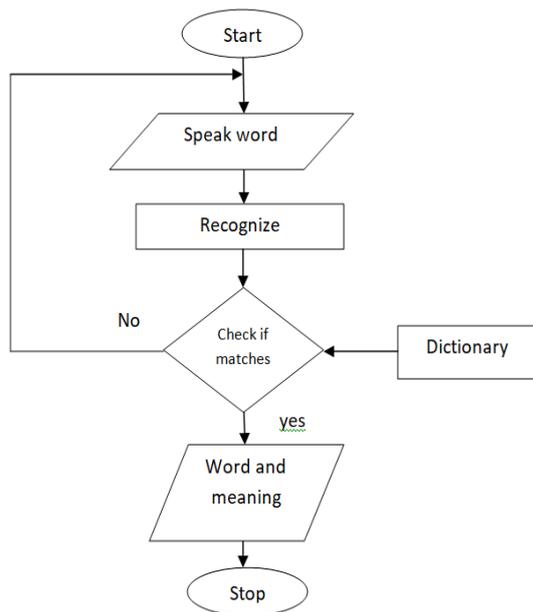


Figure 5. Hardware model

The hardware of this module is working successfully on the account that is it is able to receive the data from flex sensors and convert it into speech, and also speech input from microphone is been converted into text in ALCD display without any error which is the final aim of this .

VI. CONCLUSION & FUTURE SCOPE

The proposed module is mainly designed for the hearing and speech impaired people to overcome the communication boundaries with the normal people. But the project can be upgraded or be added with newer features to

- To control the robotic arms using the hand gestures.
- To send secret messages over a long distances using wifi modules.
- Home appliances and other electronics can be operated with speech.

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