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An Assistive Device For Deaf And Dumb People

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Abstract.. This system describes a speech enabled hand glove system which aims at translation of sign language to analyze text input and voice. A system is designed that translates the hand finger motion to corresponding letters, using HC -SR04 ultrasonic-sensors and an arduino mega board. We mount HC -SR04 Ultrasonic sensor on a hand glove and propose and efficient methodology to convert these sign languages with the help of Arduino Mega . This system is capable of setting up an interface between the deaf or dumb and normal people to improve the communication.

Keywords - Speech enabled hand glove system , HC -SR04 Ultrasonic sensor, arduino mega board , text to voice conversion
,TTS.

INTRODUCTION

Language is the method of human communication, either spoken or written, consisting of use of words in a structured and conventional way. In a situation involving communication between two different person from different region and language it is much more difficult to convey their ideas and views. Hence an involvement of a third person may be a translator is required. Such a scenario exist in communication between a normal person and a person with hearing and speaking difficulties . To overcome this problem, we introduce a hand Glove. Our modelis a acts as an interpreter which translates sign language to text and then into voice[5].

This model has a a sensor embedded glove that has the capability of converting the hand sign language used by hearing-impaired into alphanumeric characters and which will also be converted to a voice output. Communication among participants can be done effectively if all are bounded by a common language.. In addition, it ensures that hearing impaired people are able to obtain the best possible education and services within the community. Thus we aim to design a device in the form of a wearable hand glove which recognizes the Sign Language and converts it into text on any hand-held device and finally gives a voice output[1][2].

LITERATURE REVIEW

The various approaches that have been used to build an interface for differently abled people are discussed in this section. Gunasekaran et all [3] proposes a system that integrates a sensing unit, a processing unit, a voice storage unit and a wireless communication unit. Through integrating a flux sensor and an APR9600 with PIC16F877A we are able to build an interactive system. Pratibha Pandey et all [4] have modelled a gesture recognition system that does feature detection and feature extraction of hand gesture with the help of SURF algorithm using image processing. Similarly Shweta S et all[6] has modelled a similar recognition system using a Atmega controller(8&16 or 168 or 328 or 2560),ARM processor(LPC2148), PIC controller,8051 instead of a raspberry pi , and the output is displayed in a lcd or on a mobile using a wifi module or bluetooth.

METHODOLOGY

The methodology and component incorporated in this prototype is explained in the following sequence. The **Arduino Mega 2560** used in our work is a microcontroller board based on the ATmega2560. It is available with 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.[8]

A.Detection of sign

The design of ultrasonic sensors is being used for detection of bending movements of fingers. This is the HC- SR04 ultrasonic distance sensor shown in Fig1 (a). This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm.Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit.

B Orientation of hands

To detect the orientation of the hand, an accelerometer is being used. Accelerometer is a device that measures acceleration across three axes (x, y, z) to determine orientation i.e. hand gestures shown in Fig1 (b). The output of the accelerometer is obtained in terms of angle i.e. orientation in x, y, z directions obtained in the form of analog readings.

C Wireless Communications

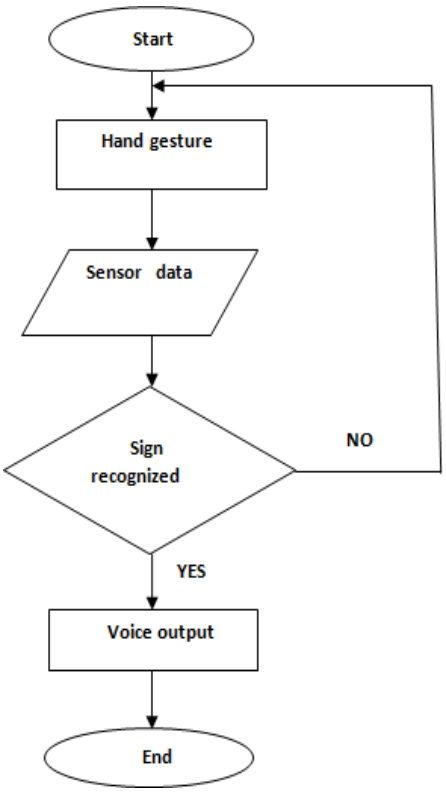
HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup shown in Fig 1(c) .HC-05

Bluetooth module is available with switching mode between master and slave mode which implies that it is able to use neither receiving nor transmitting data.[7]

FIGURE 1. Components used (a) HC-SR04 ultrasonic sensor (b) (c)

SYSTEM FLOWCHART

The flow chart is used to explain the process in detail. The system gets started when we enable it , in the hand gesture mode (Fig 2) . In this prototype the ultrasonic and accelerometer sensors are used. The ultrasonic sensor will transmit data with the movement of fingers . This will then get generated to sign recognition where each finger has its own unique value ,with the help of an arduino mega duplex board we can store the collected data . Based on certain conditions and rules the data collected gets parsed based on which letters and words are formed as text and the same is read out TTS conversion.. If the model could not recognize the input hand gesture then the model asks to show the gesture again.



(a)

FIGURE 2 Flow Chart

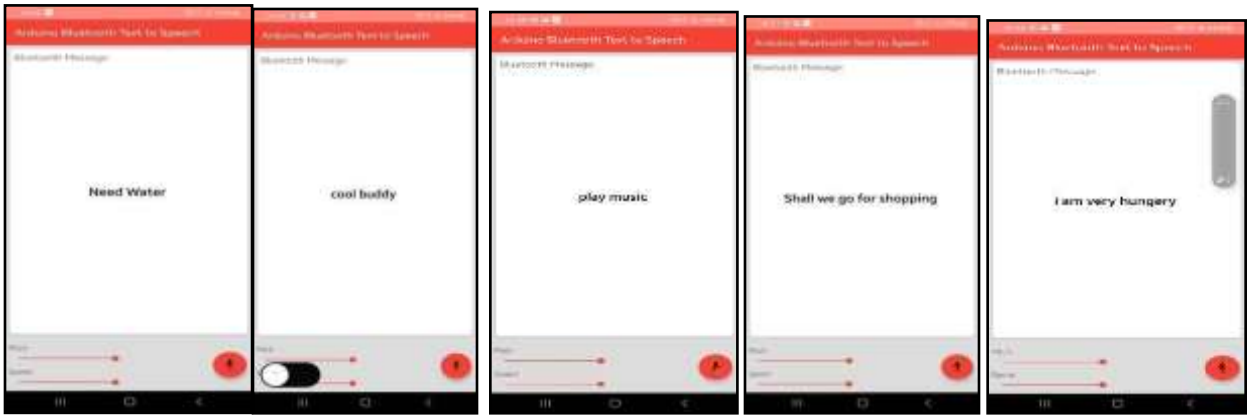
SYSTEM PROTOTYPE EXPERIMENTATION & RESULT

The prototype is designed as shown in Fig 3 (a). These sensors are used to reduce the power and cost. It is used to detect the hand motion that depends on the stress. And also it is possible to easily embed with any component or circuit. The hand motions are detected by the HC-SR04 ultrasonic distance sensor and the values are stored on the Arduino Mega. Earlier the output voices are stored on the voice processor unit. By using LCD the output will be displayed depending on the hand motions and also displayed in a mobile app called Arduino Bluetooth text to speech app. The sign language to speech translator as shown in the Fig 3 (b). will be very useful to the inarticulate people and will help them to communicate with the common people. This project provides aid to those who have special needs and will help them to express their ideas, thoughts.

(a) (b)

FIGURE 3 Experimental Setup

Taking the example of Hello Sign, if someone does the hello gesture then the corresponding terminal readings which are already observed and saved for that particular sign, flow of execution shown in Fig 2. will be obtained and we will get the audio output .Similarly, for each of the signs, output have been obtained. Sample data are shown in Fig 4.



(a) (b) (c) (d) (e)

FIGURE 4 Experimental Setup

CONCLUSION AND FUTURE WORK

The proposed method translates sign language to speech automatically and help differently abled people to convey their thoughts on their own. The proposed system overcomes the real time difficulties faced by hearing- impaired people and helps them to improve their lifestyle. System efficiency is improved with the help of Arduino Mega 2560 is a microcontroller board also integrated with HC-05 Bluetooth Module that helps in long distance communication. Compared with existing system it is possible to carry to any place as it is light weight. We have currently developed a more reliable and flexible system

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