Speaking System for Mute People Using Hand Gestures

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***Abstract*: Sign language is only way of communication for speech impaired people. It will become difficult for the normal people because they cannot understand the sign language. To deal with problem we implement a model that will help in reducing the communication gap between dumb-deaf people and society. Therefore, we suggest a speech device that will make possible for mute people to convey their messages to normal people through hand gestures. A Speaking system is incorporated with flex sensors whose, resistance value changes according to the gestures specified by the user. This gesture information is processed by the Arduino UNO microcontroller and corresponding voice output is given through speaker in the desired languages. In case of emergency message is sent to the user through GSM.**

Keywords:* Arduino UNO, Flex sensors, Accelerometer, GSM, LCD, Power supply, Battery, APR Module, Speaker *etc.

INTRODUCTION

According to the recent statistics about 7.5% of Indians are speech challenged. Indian Sign Language is the only mode of communication used by them. Sign languages are not easy to recognize as they are difficult to understand and highly complex to learn. The day-to-day functioning of people with disabilities as well as their independence can be developed and improved by use of products based on Assistive Technology. A cogently operating sign language recognition system can provide a room for a speech challenged person to communicate with non-signing people without the need of a decoder. It can be used to accomplish speech or text, making the mute more self-dependent. Sadly, here hasn't been a system with these facilities so far. All research till now have been restricted to small scale systems competent of recognizing only a nominal subgroup of a full sign language. However, these systems have not been effective enough to make them independent. 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. The system consists of trigger sensor, which helps in automatically activating the system 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., Microcontroller 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. In this paper we propose a Sign Language Glove which will assist those people who are suffering for any kind of speech defect to communicate through gestures i.e. with the help of single handed sign language the user will make gestures of alphabets. The glove will record all the gestures made by the user and then it will translate these gestures into visual form as well as in audio form. This paper uses microcontroller to control all the processes and flex sensors along with accelerometer sensors will track the movement of fingers as well as entire palm. A LCD will be used to display the user's gesture and a speaker to translate the gesture into audio signal is planned if possible for execution.
This paper can be further developed to recognize complex like food, water, etc.

RELATED WORK

Many smart gloves are proposed in recent years where preferred technology was wireless mode with many distinct features, but those were not reliable, light weight, cheap, Easy to use, plug and play type prototypes. It is because of components used for fabrication which are normally available in market such as flex sensors, microcontroller, and wireless transmitter, and these were powered by battery which was little heavy as compared to other components. Therefore, these kinds of assemblies are bulky, and difficult to use. In an attempt to open up the lines of communication and to spark a conversation between people who are hearing-impaired or have speaking disabilities, a student and designer at Goldsmiths University in London has developed a futuristic smart glove named "Sign Language Glove" that is capable of translating sign language from hand gestures into a visual on-screen text as well as audible dialogue. Advantages and disadvantage are as follow: -

It is wireless with displays and voice device.

- It is portable and having inbuilt battery.
- It is bulky in wearing.
- Difficult to handle.
- It is delicate and components are expensive.

"Design of Smart e-Tongue for the Physically Challenged people"

Here they designed a system which converts their sign symbol to text as well as voice output and normal person's voice to corresponding sign symbol for two-way communication. This system has flex sensor and IMU (Inertial Measurement Unit) to recognize their sign symbol, speech synthesis chip for voice output and speech recognizing module for converting voice to sign symbol. These are interfaced with microcontroller, which is programmed to obtain corresponding output.

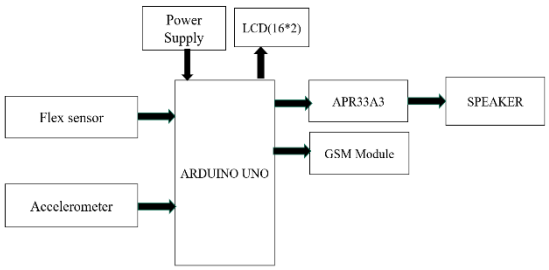
"PiCam: IoT based Wireless Alert System for Deafand Hard of Hearing"
The objective of this paper is to design and implement a low-cost stand-alone device for deaf people to notify doorbell ringing who live alone in their house. The system is based on Raspberrypi which includes camera, vibrator, wireless GSM, and Bluetooth. When the visitor presses the door bell, captured image is transferred to the wearable device which helps to know the right persona the dooror intruder. After transferring image, wearable device vibrates to notify. Also ,the message is sent to the owner through GSM. Visitor's image along with the date and time is sent to the server for retrieving information later. The system is reliable, effective, and easy to use and enhances the security of the user.

"Design of a communication aid for physically challenged"
The proposed work in this paper is to implemental system without handheld gloves and sensors and by capturing the gestures continuously and converting them to voice and vice versa, thus making the communications impler for Deafand dumb people by hand held embedded device along with the hard ware setup. The effectiveness of the work was verified under MATLAB environment and further in future dedicated voice output will be produced corresponding to the text and the gesture images captured.

METHODOLOGY

- It consists of microcontroller, LCD Display, Speaker, Flex Sensor, and Accelerometer.
- Flex sensors are used to detect hand posture.
- The five flex sensors are setup on the five fingers of the user.
- User makes a hand gesture to express a specific word the flex sensors get folded.
- As the posture of each finger is different, so resistance value of each flex sensor is also different.

Fig 1: System Architecture



The block diagram of speaking system for mute 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, GSM 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 gloves 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 ATmega328 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 APR33A3 and LCD. LCD displays the message that was assigned to the gesture in the database. Speech signal is produced using APR (Auto Playback Recorder) through speaker.

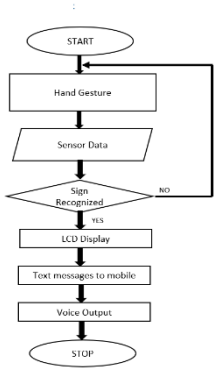


Fig 2: Data flow diagram

WORKING PRINCIPLE

In this system flex sensors are placed on gloves according to the gesture made by the user the resistance values will change, and sensor produces voltage. The output voltage of flex sensors is processed using Arduino Mega2560. Predefined threshold values for each gesture and its corresponding messages are stored in the database of the microcontroller. When the input voltage of the microcontroller exceeds the threshold value, LCD displays the message that was assigned to the gesture in the database and the speech signal is produced using APR33A3 through speaker (English and Kannada) in our system. Flex sensors areplacedon gloves 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. The output voltage of flex sensors is in the analog form which is converted into digital form by using inbuilt ADC of Atmega 328. Predefined gestures with corresponding messages are stored in the database of the microcontroller in different languages.Microcontroller matches the motion with the database and produces the speech signal using APR (Auto Playback Recorder). The output is given out through the speaker and GSM module is used to send text messages.

ADVANTAGES, DISADVANTAGES AND APPLICATIONS

ADVANTAGES:

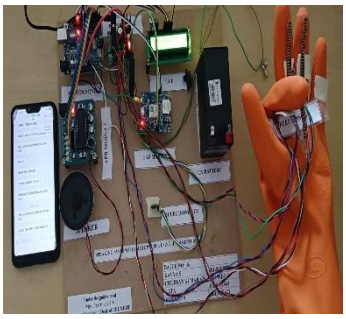
- Easy to operate
- Low power consumption
- It is user friendly
- It is a single equipment with multiple applications
- When extended further in the hardware section, numerous applications can be added
- The communication between a normal person and speech impaired person becomes easier
- There is an option for user input

DISADVANTAGES:

- Processing speed depend upon quality of processor
- Gesture must be stationary
- Recognition limited to numbers only

APPLICATIONS:

- It can solve the daily difficulties suffered by the people, who cannot speak or one who has recently undergone an accident.
- It can also be used by elderly people.
- This can also be integrated in the field of automation.
- Defense sector and war equipment.



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 toexisting systems. To help the mute people, the language gets converted into text kind and on the digital display screen it will be displayed. Who cannot communicate with normal people i.e., deaf, and dumb people the system is very much helpful.The primary feature of the project is the one which will be applied in common places thatthe recognizer of the gestures may be a standalone system.

FUTURE SCOPE

1. This device can be developed into a device that includes various sign languages in different countries.
2. We want to make it into a complete product that makes the dumb people to communicate like a normal people.
3. We want 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.
4. designing of wireless trans receiver system for “Microcontroller and Sensors Based Gesture Vocalizer”.
5. Perfection in monitoring and sensing of the dynamic movements involved in “Microcontroller and Sensors Based Gesture Vocalizer”.

RESULT

A Smart Speaking Glove for Speech impaired People is designed and implemented with four gestures. Each gesture specifies basic needs such as “NEED WATER”, “NEED MEDICINE”, “NEED FOOD”. This system is more reliable, efficient, easy to use and a lightweight solution to the user as compared to other proposed systems. This bridges the communication gap between speech impaired people and others. During this project we have faced various challenges and we have tried to minimize the problem. Since we observed that they cannot handle bulky and delicate in structure. We have minimized the communication problem as: The output is in the form of speech which is easily understood by others.This system will provide assistance to the speechless people to express their needs using gestures. The voice output can be manipulated in any language according to the user.

Fig 3: Hardware implemented

EMERGENCY MESSAGES

Fingers bent	Instructions
	Can you take me to this address
	I need some money
	I want to go rest room
	Thank you for your help
	I’m not feeling well
	I need rest
	Give me medicine

		Leave me alone
		I am ok
		Give me some food

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