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Survey on Gesture Vocalizer for Speech and Hearing Impaired

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Abstract: ***Sign language is a natural way for communication between normal and dumb person, but often they find difficulty in communicating with normal people, as we don't understand their sign language. Therefore, there always exists a language barrier. To minimize this communication problem, we propose a device which can convert their hand gestures into voice, which a normal person can understand. This device consists of a glove, consisting of flex sensors and accelerometer. These sensors sense the hands and fingers movement. This system consists of a speech synthesizer circuit, which convert these movements of hand gesture into real time speech output and the display will give the text for the corresponding gesture. The text and voice output being in any language, this device provides efficient way of communication for both deaf-dumb and normal people.***
Keywords – sign language, communication, gesture, speech, voice.

I. INTRODUCTION

Generally impaired or disabled people use sign language for communication; this paper aims to lower the communication barrier between impaired and normal people by developing an electronic device that can translate sign language into speech in order to make the communication effective. Sign Language is the only way of communication for deaf people. With advancement of science and technologies, many techniques have been developed not only to minimize the problem of deaf and dumb people but also to implement the same in different fields. Sign language is a language which instead of voice or sound patterns uses manual communication and body language to convey the meaning. This involves mostly the combination of various shapes, orientation and movement of the hands. Sign language is not only used by deaf people, but also who can hear and cannot physically speak. All India Federation of the Deaf (AIFD) estimates around 4 million deaf people and more than 10 million people have hearing problem in India. In this paper a wireless data gloves is used which is normal cloth fitted with flex sensors along the length of each finger and the thumb. Dumb people can use the gloves to perform hand gesture and it will be converted into speech and text so that normal people can understand their expression. In this system there are two sections, the transmitter part and the receiver part. The transmitter part receives inputs from flex sensor used to determine gesture and from heart beat sensor used to measure the pulse rate. The input received is recognized and transmitted wirelessly to the receiver section where the text relevant to the gesture is displayed on LCD and corresponding voice played through speaker.

II. LITERATURE REVIEW

The paper titled "Smart Glove Based Gesture Vocalizer for Deaf and Dumb" is useful for dumb, deaf and blind people to communicate with one another and with the normal people. This system converts the sign language into voice note, which is easily understandable by blind and normal people. The sign language is translated into the text format, to facilitate the deaf people as well. This text is displayed on LCD in order to improve and facilitate more gesture recognition. The GSM modem incorporated with this project help in emergency conditions. The home automation system also helps to the physically disabled person, to control the home appliances easily. With the implementation of more kinds of sensors, we can achieve a system comprising of all the alphabets. This glove can also be used to control various other appliances like a TV, Computer, etc. Just like the microcontroller is programmed to convert the finger movements into recognizable alphabets, it can also be programmed to do various other things upon certain movements of the hand.

A. Advantages of Innovation

1) It is a social cause project
2) Deaf people can easily communicate with normal people
3) Easy to implement
4) Easy to make change in sensor windows according to wearing hand
5) Portable design works on 9V small Radio battery
6) Audio as well as Visual output.

B. Limitations of Innovation

Currently due to cost of sensors and funds limitation we choose limited gestures which can perform by single hand. [1]

In the journal "A Review on Gesture Vocalizer", they have encapsulated a survey on the different systems implemented for gesture recognition and Gesture Vocalizer. The layout and functioning of the system are presented in brief. This system facilitates communication between silent, hearing-impaired and blind people and normal people. It also helps the mute, hearing-impaired and blind to interact among themselves. It is not an easy task for the normal people to perceive the intended meaning of this sign language used by the hearing-impaired and silent. Moreover, the blind people cannot watch their gesture. Official sign language is used by the dumb and deaf but is not familiar with the normal world and the people who are blind cannot follow sign language. This device converts gestures into voice and vice-versa which is suitable for both disabled and normal people. To help the deaf people the gestures are converted into text. This text gets displayed on a screen.

C. Some of The Applications Encapsulated In This Paper Are

1) Gesture recognition and conversion.
2) It is useful to convert sounds into sign language for Mute people.
3) It can be used for Mobiles for SMS sending.
4) Conversion of sign language into a language that can be easily understood by the local people.
5) To use as an interpreter for Mute people. [2]

According to "Gesture Vocalizer for Dumb People", it translates sign language to speech automatically and satisfy dumb by conveying thoughts on their own. The system overcomes the real time difficulties of dumb people and improves their lifestyle. Compared with existing system it is possible to carry this to any place with ease. The main advantage of this approach is less computational time and fast response in real time applications. Data transmission to the LCD and recorder, makes the user to handle it easily. It can be used in any public place very conveniently. [3]

In "Smart Glove: Gesture Vocalizer for Deaf and Dumb People", it is useful for dumb, deaf and blind people to communicate with one another and with the normal people. The impaired people use their sign language which is not easily understandable by normal people and blind people cannot see their gestures. This system converts the sign language into voice note which is easily understandable by blind and normal people. The sign language is translated into the text format, to facilitate the deaf people as well. This text is display on LCD. In order to improve and facilitate the more gesture recognition, motion processing unit can be installed which comprises of Gyroscope as well and with the help sensor fusion technique, we can accommodate a number of other gestures as well for better and efficient communication. [4]

In the paper developed by unsupervised facial point detector (a rarely explored topic), regression based AU intensity estimation and emotion clustering for the recognition of the eight basic and compound emotions from posed and spontaneous facial expressions. The proposed facial point detection model is able to perform robust landmark extraction from images with illumination changes, head rotations, pose variations, scaling differences, partial occlusions and background clutter. Facial point detector has achieved an averaged accuracy rate of 80%, 73%, 78%, 85% and 85% respectively for the evaluation of 200 diverse images. On average, it has outperformed AAM and CLM respectively by 13% and 9%.It also has optimal computational cost and is significantly fast than AAM and CLM with comparable computational costs to GNDPM. [5]

According to Kiran R, gesture vocalizer is a hand gesture based interface for facilitating communication among normal people and people with speech and hearing disabilities. In this system a data glove is used as input device which is normal cloth driving gloves fitted with flex sensors along the length of the index finger and the thumb. In this project, a microcontroller and sensor based gesture to voice converter is created so as to recognise six commonly used gestures and convert them into voice message as well as a text message for the benefit of the Deaf.

Flex sensor based glove can detect all the movements of hand and the microcontroller based system converts these specified movements into human understandable voice and text display through the LCD display. [6]

The Indian sign language translation to text and voice messages using flex sensors are more reliable, user independent and portable system to convert the sign language to text message form which consumes less power because of the low ultra-power AT89S52 microcontroller is designed. This text message can be translated to voice using a simple mobile app. It helps to overcome the limited communication between the dumb/deaf people with the rest of the world. The sign will be converted to letters and it will be displayed on LCD screen and the letters can be transmitted using Bluetooth Module to a smart phone where text to speech conversion takes place. [7]

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The paper can eliminate the complexity of the previous implementations by eliminating the Bluetooth module and addition of some other modules which are useful for efficient functioning. Some of the major disadvantages of using complex systems are:

a) Complex structure of the circuit
b) Unnecessary usage of components
c) Increase in the cost the project
d) It requires developing of complex computational algorithms in order to detect the gestures
e) Interpreters were very costly and they are difficult to acquire on a moments' notice.

D. These Disadvantages Can Be Overcome By Implementing The Following

1) Reducing the complexity of the circuit
2) Using simple algorithms for implementations
3) Utilising component usage
4) Using efficient microcontrollers to reduce the processing time and increase the efficiency of the system.

III. FLOWCHART

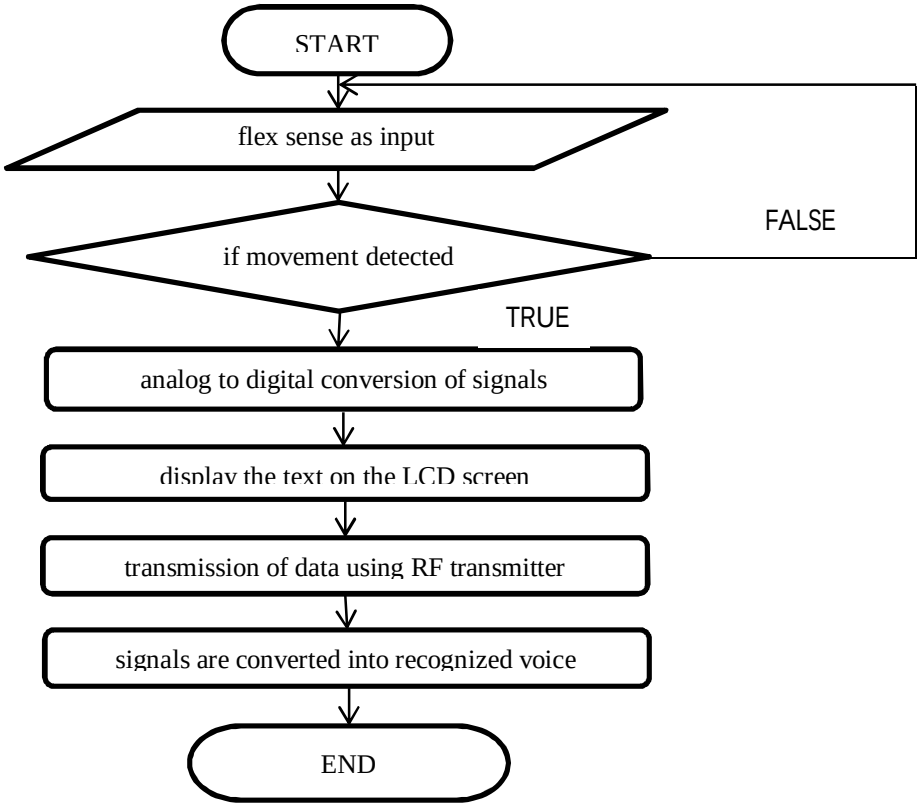

Fig. 1 Flow diagram of the working of gesture vocalizer

In the above flowchart (fig. 1), the working of the gesture vocalizer is shown. Initially, the flex sensors attached to the glove will sense the movement of the fingers. If the movement is detected, it will convert the flex senses to the analog-to-digital convertor (ADC). The ADC will send these senses as signals to the microcontroller. If the movement is not detected, then again sense the movement if fingers using flex sensors. After the detection and conversion of the senses, the text about a particular movement of the sense will be displayed on the LCD screen. The data will be then transmitted from the RF transmitter and then these transmitted signals are converted into recognized voice. Hence, text and voice will produce the output to the sensed movements.

The electric board contains a microcontroller that controls all the program used to check the analog voltage levels that has been captured from the sensors, converts them to digital using the ADC of the microcontroller, makes the recognition of the letter signed. Microcontroller will compare the input voltage with predefined program voltage and accordingly it will display the output characters on the LCD screen.

IV. CONCLUSION

This system is useful for dumb, deaf, and blind people to communicate with each other and with the comman people. The impaired people can use their standard sign language which is not easily understandable by normal people and blind people cannot see their gestures. Thus this system converts the sign language into recognizable voice which is easily understandable by impaired and normal people. The sign language is converted into some text form which will facilitate the deaf people as well. This text will be displayed on LCD.

V. FUTURE ENHANCEMENTS

A. Designing of wireless transceiver system for microcontroller and sensor based gesture vocalizer.
B. Perfection in monitoring and sensing of the dynamic movements involved in microcontroller and sensor based gesture vocalizer.
C. Designing a whole jacket using this module, which would be capable of vocalizing the gestures and movements of animals.
D. Virtual reality applications like replacing the conventional input devices like joysticks in video games in the data glove.
E. The robot control system which will regulate the machine activity at some remote sensitive sites.
F. Integrating home automation system with the gesture vocalizer.

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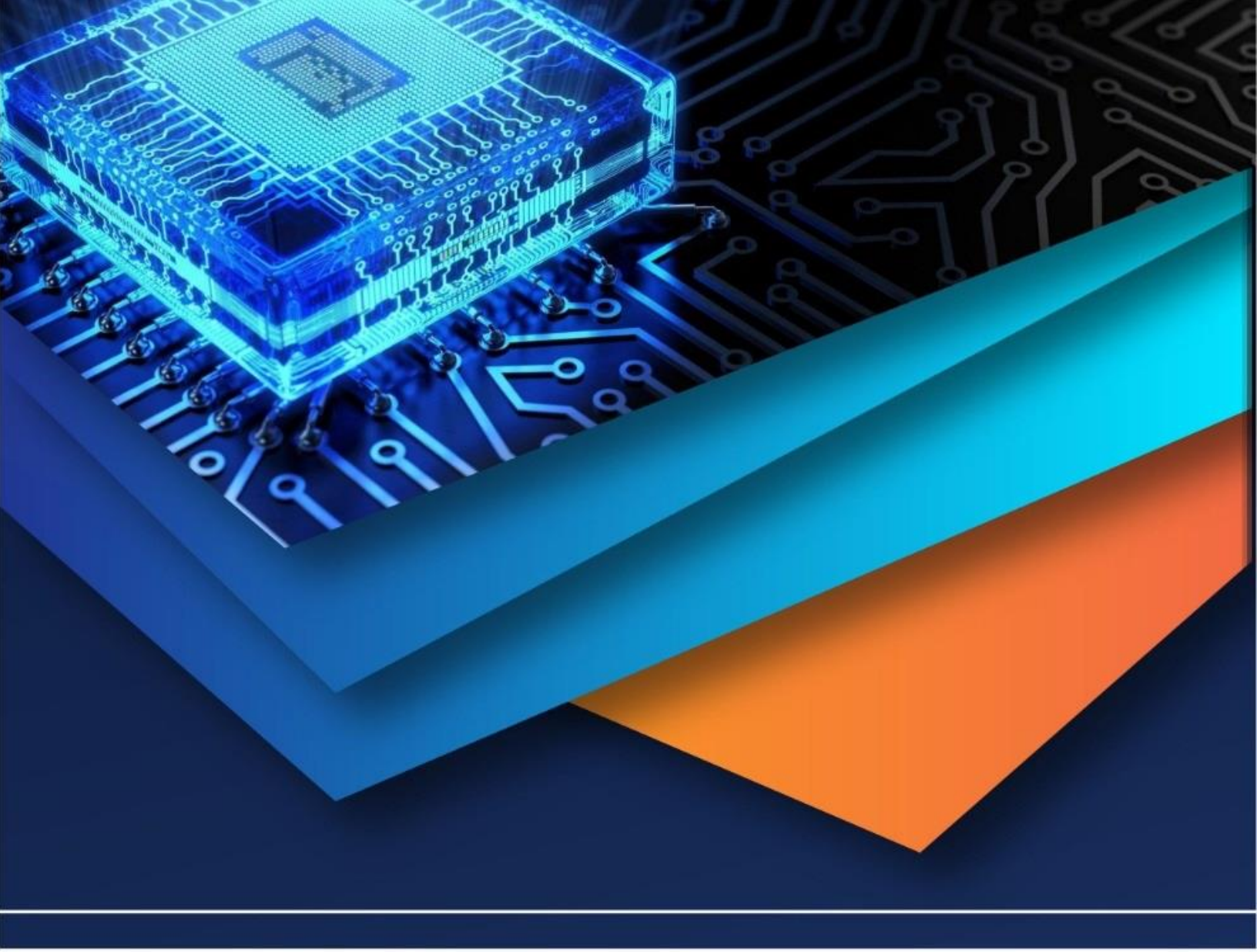

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