HANDTALK : Interpreter for the Differently Abled: A Review

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***Abstract*—Many people can't talk due to speech problem like a dumb one or they have never heard the pronunciations of the word/symbol like a deaf one and that's why those people can't communicate with others who don't know the sign language. We have come up with a novel idea of a system that will convert the hand movements (Gestures) into the voice and display the message and allow the deaf and dumb to express them better. A sensor equipped glove needs to be worn on the hand and depending on the various gestures made by individual, the gesture will be interpreted to the corresponding voice and display message by the device. Further, that particular message can be transmitted as a voice or text to the doctor's phone as well as to the concerned person. For this we are using flex sensors, MEMS (Micro-Electro Mechanical System) accelerometer, microcontroller, speech IC, speakers, LCD display and GSM Module.**

Keywords— Accelerometer, Flex sensors, Gestures, GSM module, Microcontroller

I. INTRODUCTION

Gestures are natural and intuitive forms of interaction and communication used to convey messages using hand shapes, hand movements and orientations [9]. Technology has always been of great help to the disabled and given them a helping hand to allow them to live a normal and healthy life like others. We have come up with a novel idea of a glove named HANDTALK that will convert the hand movement (gestures) into voice and allow the individual to express themselves better.

The handtalk glove needs to be worn on the hand by the needy and depending on the variation of the hand movements the device will convert it intelligently into prerecorded voice and into a display message. The handtalk glove senses the movements through the flex sensors and the accelerometer which detects the different patterns of motion [5].The device can sense carefully each resistance and each movement by the hand. Currently the device can convert only few, but depending on the success of this device few more additional words can be added later onto this expressive system [1]. Here, the Gestures are converted into the voice by using a voice processor and also can be displayed on the LCD display.

The Heart of the system will be the 8051 Microcontroller (AT89C51) which is responsible for the conversion of hand movement signals to the corresponding codes which is further converted into voice and text message. This system needs the basic knowledge of embedded system.

Embedded systems are designed to do some specific task, rather than be a general purpose computer for multiple tasks [5].Some also have real time performance constraints that must be met, for reason such as safety and usability, others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs [2].

II. LITERATURE REVIEW

The first Hand Talk Glove was designed by Ryan Patterson in the year 2001[5]. He began his mission with his Sign Language. Sign Language Translator consists of two separate components, a leather golf glove that has ten flexible sensors sewn into it which monitor the position of the fingers by measuring the electrical resistance created by the fingers as they bend [6]. A small microcontroller on the back of the hand converts the change in the electrical current into digital signals and transmits them wireless to a computer. The computer then reads the numerical values and converts them into the letters which appear on the screen. The main disadvantage with this model was that a computer or a laptop was always required for its functioning which made it less portable [5].

III. METHODOLOGY

We are working on this project basically in Handtalk: Interpreter for the differently-abled translates finger and hand gestures into spoken words. Sensors in the glove pick up gestures and transmit the data wirelessly to the mobile phone via SMS or to the display device by the help of microcontroller or the GSM Module. The sensor data are converted first into text and then to voice output and text output. A person not knowledgeable in Sign language and gesture can listen and

read via the cell phone or on LCD what the other person is saying in Sign language form or in the gesture[4]. The main advantage with this design was its simplicity and the cheap components and this project can help to improve greatly the communication barrier between Diffently Abled persons.

IV. WORKING

The Fig 1.1 shows the working block diagram of the Handtalk. It consists a microcontroller 8051 (AT89C51), ADC (Analog to digital converter), Accelerometer, Flex sensors, Voice Processor, LCD, GSM Module and Speaker.

The latest sensor being used for the Handtalk glove is the accelerometer and Flex sensors. That is the device can now work in X-Y, Y-Z and X-Z planes [3]. It is more reliable than the system that uses flex sensors only and the main advantage is that only one accelerometer is required for one glove. More number of programs can be fed into it so it can accommodate more number of sounds in it.So in the Handtalk: Interpreter for the Differently Abled for making the handtalk glove both sensors are used for better accuracy and more relevant output responses.Fig.1.2 shows the handtalk glove.

In this we are getting the different outputs according to the different gestures from the Handtalk glove [4].As microcontroller accepts only digital input so an ADC (0808) is used for converting the analog signals (which is the output of the handtalk glove i.e. flex sensors) into the digital form. Let output of the adc is 8 bit binary data 10011000, then according to this output of microcontroller can be fixed or die sided. After getting these digital signals/data are fed to the Microcontroller (AT89C51). Hence the microcontroller gives the output to the Voice processor and to the LCD and also to the GSM Module. The Voice processor gives the output from the speaker according to the output of the microcontroller. These voice is preloaded into the voice IC or Voice processor.

In this project GSM Module is used for the transmitting the data or information, which are getting from the microcontroller to the doctor's mobile phone or relatives of the patient.

Fig.1.3, Fig. 1.4 and Fig.1.5 shows the examples of different gestures and corresponding output.

V. APPLICATIONS

The applications of the proposed technology are as follows:

- It can be used in hospitals that need several measurement systems which can investigate physiological parameters of the patients [4].
- It can act as a communication aid for the hearing- and speech-impaired persons.
- The hand gesture recognition system can be used in robotics, desktop and tablet PC applications and gaming [9].
- It can be used in military actions based on hand gestures, which can be used for squad communication.
- For gaming purposes like 3D gaming, at the place of joysticks.

VI. FUTURE ENHANCEMENTS

- With the help of different gestures commands, different other commands can be added.
- For more reliable and low complexity of the circuit microcontroller can be replaced by the Aurdino or other Advanced Microcontrollers.
- In this project many types of other applications can be added with using the different type of sensors in this.
- Using the Xbee Module we can create a wireless zone and this device may communicate with the other devices also.

VII. LIMITATIONS

As everything has two aspects (the positive and the negative). Although HANDTALK have many advantages but also have some limitations.

- Less Accurate and reliable (from gestures point of view) i.e. differentiation between the almost similar gestures.
- At the very first operation of the HANDTALK the patient has to learn about the working of it. So that he/she can made the required gesture as per his/her requirement/situation.

CONCLUSION

This project is useful for differently abled, speech-impaired and paralyzed patients who cannot speak properly. This work is done to check feasibility of recognizing sign language using flex sensor and accelerometer gloves and displaying the data, which proved to be an efficient system. The main feature of this research work is that the gesture recognizer is a standalone system applicable in daily life and for biomedical purposes. And it can be useful for the gaming or animation gaming or in the field of medical research.

It can also provide the better advancement in the field of medical and home automation. Patient can easily operate all the necessary machines or products with his finger or hand.

FIGURES

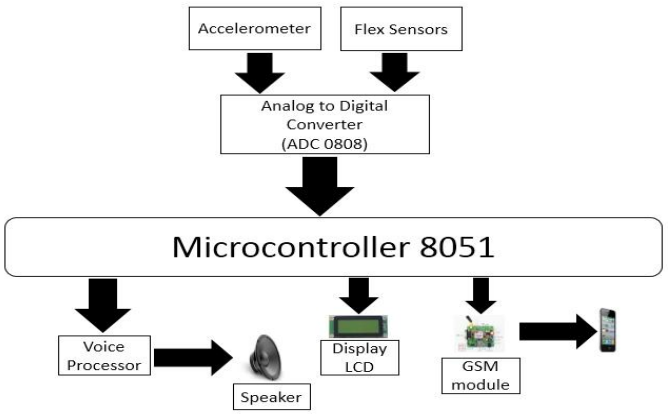

Fig. 1. Block diagram of the Handtalk.

Fig. 2. The Handtalk Glove.

Fig. 3. Gesture and Corresponding Output.

Fig. 4. Gesture and Corresponding Output.

Fig. 5. Gesture and Corresponding Output.

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