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RESEARCH ARTICLE

HAND ASSISTIVE DEVICE FOR DEAF AND DUMB PEOPLE.

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Abstract

properly. Such people find it difficult to communicate with other people. They sense a gap of communication while interacting with other people, due to which they are not able to express their emotions and feelings openly. So the proposed idea is to develop a device called as hand assistive system for deaf and dumb people. This project tries to solve various problems faced by deaf and dumb people. The main idea of this project is to somehow reduce the barrier of communication between deaf-dumb and normal people. To minimize this barrier, the proposed device converts their hand gestures into voice which a normal person can understand. This device consists of gloves, flex sensors, accelerometer sensors, microcontroller, voice module and 16x16 LCD display. The voice module will basically convert the gestures into real time speech output and display will give text for corresponding gesture. So, this device provides an efficient way of communication for both deaf-dumb and normal people.

Introduction:-

In our country around 2.78% people are not able to speak properly. Disability is the biggest drawback in one' s life. According to 2011 census data of India a total of 26 million suffer from some kind of disability. In India there are about 1.5 million to 7 million deaf people alone and these people communicate through the help of interpreters and Indian Sign Language. Since India is a multilingual society and many of its population lives in villages they are not aware of these sign languages. Similarly, a large proportion are Speech disabled or Dumb people. The problems encountered by both deaf and dumb is tremendous as far as communication is concerned. Dumb people can communicate only through the use of sign conventions or with the help of interpreters .The difficulty with sign languages is that the normal person might not know the sign language at all and hence the communication between the deaf and dumb people can become impossible in such scenario. Thus, in order to make them self-reliant and give them the freedom to communicate with normal people without the use of interpreters can be made possible by developing a system which helps them communicate directly with the normal person without any interruptions and thereby expressing their feelings and emotions. The system developed should be portable as well as power efficient so that it can be utilized by every needful person. Henceforth, a device which is portable and translates the sign languages into speech output for dumb person and text output for deaf person would be proficient to bridge the communication gap. Thus, the main objective of this project is to develop a device which will be an embedded system comprising of the microcontroller,hand gloves, flex sensors, accelerometer sensor, voice module, speaker and amplifier primarily which will consume less power and will be highly accurate and will produce output based on the hand movements made by disabled people.

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Design:-
Goal of this project is to create a device that will work on hand gesture recognition and the Data Glove would be worn by the deaf and dumb person.The Gestures will undergo signal processing with the use of microcontroller and the corresponding output would be shown on the LCD display for the deaf person and via speaker for the dumb person. Our model will basically consist of the following components:

Hardware:-
1. PIC MICROCONTROLLER
2. FLEX SENSORS
3. ADXL335 Accelerometer Sensor
4. Voice Record(ISD1820) Module
5. JHD_16ALCD (16*2 LCD)
6. Hand Glove
7. Speaker
8. Amplifier(If needed)
9. Power Supply

Software:-
1. AVR STUDIO
2. PROTEUS

P**roposed System:-**

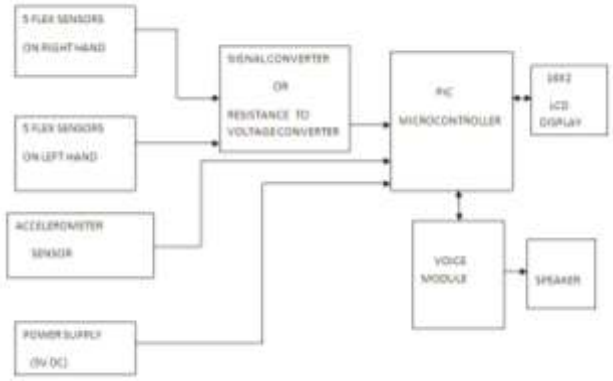

Fig 1:- Block Diagram

The system will consist of Flex sensors which is nothing but a variable resistor and it changes the value depending upon the angle with which the flex sensors are bent. Thus, flex sensors are also called as bend sensors. Flex sensors will be placed on the hand glove and the output of the flex sensors will be in the resistive form it needs to be converted in the form of voltage that will be given to PIC Microcontroller. Also, voice record module ISD1820 is interfaced with the Pic microcontroller. The 16X2 LCD display will display the output in text format. The Speaker will produce the output in the form of a voice which is prerecorded with the help of Voice module(ISD1820).

Flex Sensors:-
Flex sensors shows resistance as the output depending upon the bending angle.Thus,these resistance values are converted to corresponding voltages mainly high and low in case of microcontrollers.Since, microcontrollers are basically digital devices therefore, in this case the low value voltage represents ‘ 0’ logic level and high value voltage represents ‘ 1’ logic level. In this project we are going to use 10 flex sensors thereby obtaining 1024 different combinations of sign conventions can be implemented through this project which will cover all daily communication normally used by the deaf and dumb people.

Fig 2:- Flex Sensors

Accelerometer (Tilt Sensor):-

The ADXL335 is a small, thin and low power device capable of measuring complete 3-axis acceleration. The ADXL335 can measure acceleration with a minimum full scale range of ±3g. It requires less power and gives output signals in terms of analog voltages that are proportional to acceleration. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock or vibration. The three axes' sense directions are highly orthogonal and have little cross-axis sensitivity since it uses a single polysiliconsurfacemicro-machined sensor structure for sensing X, Y and Z axes. The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package.

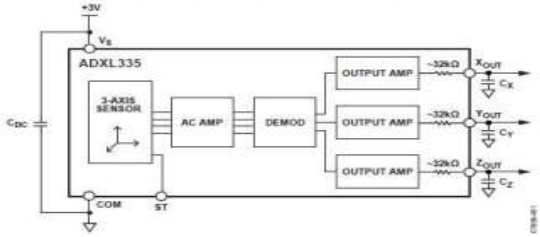

Fig 3:- Functional Block Diagram of Accelerometer

Voice Module(Isd1820):-

The voice module (ISD1820) is a multiple-message record and playback device. It is a single chip voice recording, non-volatile storage and playback capability for 8 to 20 seconds.It can be directly controlled by the push button on PIC Microcontroller. It can record, playback as well as repeat.It comprises of multiple voice channels and high quality sound recording.

Fig 4:-Voice Module

Working:-
Flow Diagram:-

Firstly, because of the hand movements there is a potential drop across the variable resistor which is the flex sensor which is connected inside the glove. We get an analog value of voltage. This analog voltage is fed to the ADC input pins of the PIC Microcontroller. ADC converts the analog value into corresponding digital values and stores in microcontroller's memory. If the voltage value crosses the threshold value, it is recognized as input. After recognizing the input the alphabet/word is displayed on LCD screen as well as it is heard through the speaker also.Here,there is use of accelerometer sensor for the tilt of the wrist because the flex sensors are there for detecting the movements made by the fingers but there are sign conventions wherein the wrist movement are an integral part. Thus,to cover all kinds of gestures made by the hands we are using accelerometer sensor along with flex sensors.

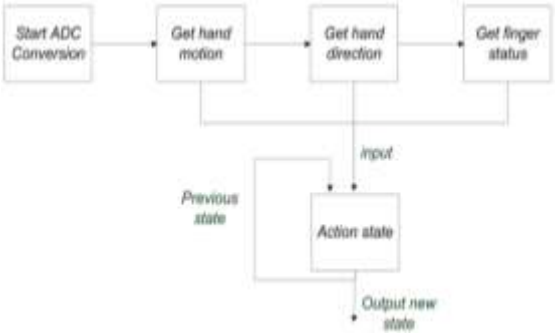

Fig 5:- Microcontroller Operation

The several sign conventions are stored in the microcontroller's memory using AVR programming and its corresponding voice data are prerecorded using ISD1820 voice module. The voice module is connected to UART of the PIC microcontroller. When a gesture is made by the disabled person the microcontroller starts analog to digital conversion of the input data which it receives from flex sensors and accelerometer sensors. If the gesture matches with the stored value of gesture which is previously stored in the microcontroller's main memory then the corresponding output is produced in the text format for the deaf person and voice output for dumb person. The purpose of using the PIC microcontroller is that it has ADC pins, digital I/O pins as well as an analog pin at PORT A. Also its response time is high and it works on relatively low voltage of about 5volts. The microcontroller checks the output of the first flex sensor and then calculates its pulse width and saves it and similar process is performed for other flex sensors. This device is portable since the data is already stored in the memory of PIC microcontroller. The use of the accelerometer sensor makes the system less sensitive since it avoids the huge change in the digital output even when there is a small tilt of the hand. Thus, the system proposed becomes less susceptible to large output shifts.

FUTURE SCOPE:-

- Designing of a gesture system using facial expressions(face recognition).
- Perfection in monitoring and sensing of the dynamic movements involved in "Hand gesture recognition system".
- Designing of a whole jacket, which would be capable of vocalizing the gestures and movements of animals.
- This device can be developed into a device that includes various sign languages in different countries.
- The robot control system to regulate machine activity at remote sensitive sites.
- Vision based recoginition system.
- Real time hand gesture recognition system using digital camera.

CONCLUSION:-

The final system designed is portable since the whole operation is performed on the microcontroller and it consist of gloves which is used for gesture recognition. The flex sensors and accelerometer sensors are connected inside the glove .In this way, the circuit developed is quite easy and its connection is relatively simple. So the disabled person only has to carry the hand glove and the microcontroller board which is light in weight and consumes low power upto 5volts. A volume control enables the disabled person to adjust the volume of the speaker. Here, the data is pre-stored of different sign conventions in the memory of microcontroller. Here, special care of the connections is considered because any distortion in the connection will cause the system failure. So one way to avoid such scenario is to seal the microcontroller properly. By virtue of this device the communication of the deaf and dumb person with normal person is made possible. This device also eliminates the need of the interpreter and also avoids miscommunication. Thus, the final system will not be much expensive making it accessible to every needful person. .With proper planning this system can be used in different organizations. Different types of sign conventions (ISL OR ASL) can be stored in the device.

REFERENCES:-

1. Laura Dipietro, Angelo M. Sabatini, Paolo Dario," A Survey of Glove-Based Systems and Their Applications" IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C: APPLICATIONS AND REVIEWS, VOL. 38, NO. 4, JULY 2008.
2. Yeongyu Park, Jeongsoo Lee, and Joonbum Bae," Development of a Wearable Sensing Glove for Measuring the Motion of Fingers Using Linear Potentiometers and Flexible Wires" IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS, VOL. 11, NO. 1, FEBRUARY 2015.
3. Archana S. Ghotkar and Dr. Gajanan K. Kharate," STUDY OF VISION BASED HAND GESTURE RECOGNITION USING INDIAN SIGN LANGUAGE "INTERNATIONAL JOURNAL ON SMART SENSING AND INTELLIGENT SYSTEMS VOL. 7, NO. 1, MARCH 2014 .
4. Anbarasi Rajamohan, Hemavathy R., Dhanalakshmi M,"Deaf-Mute Communication Interpreter", International Journal of Scientific Engineering and Technology (ISSN : 2277-1581) Volume 2 Issue 5, pp : 336-341 1 May 2013.
5. Péter MÁTÉTELKI, Máté PATAKI, Sándor TURBUCZ, László KOVÁC," An assistive interpreter tool using glove-based hand gesture recognition" 2014 IEEE Canada International Humanitarian Technology Conference - (IHTC)
6. Celestine Preetham, Girish Ramakrishnan, Sujan Kumar, Anish Tamse Dr. Nagendra Krishnapura, "Hand Talk-Implementation of a Gesture Recognizing Glove" 2013 Texas Instruments India Educators' Conference.
7. Nikhita Praveen, Naveen Karanthand Megha M S, "Sign Language Interpreter Using A Smart Glove", 2014 International conference on Advances in Electronics, Computers and communications (ICAECC). 978-1-4799-5496-1/14/$31.00 ©2014 IEEE.
8. M.K. Bhuyan Chaitanya and Darsha Sharath Chandra, "Hand Gesture Animation by Key Frame Extraction", 2011 International Conference on Image Information Processing (ICIIP 2011), 978-1-61284-861-7/11/$26.00©2011-IEEE.
9. Otiniano, R., and Amara, C. "Finger spelling recognition from rgb-d information using kernel descriptor", IEEE Transactions on neural systems and rehabilitation engineering, Vol.28, No. 8, pp. 124-184, 2006.