Gesture of Speech Recognition for Mute Community

Mrs. S. P Shally M. E [1], M. Karbhagam[2], K. Pavithra[3], J. Priyanka[4]

[1] Assistant Professor, Department of ECE, DMI College of Engineering, Tamilnadu 600123

[2,3,4] UG Students, Department of ECE, DMI College of Engineering, Tamilnadu 600123

Abstract - **A dumb person cannot speak like a normal person. To have communication between dumb people and normal people, gesture communication is challenging one. Image processing-based techniques are requiring the camera to be in front of gesture, which may not be possible all the time. To diminish communication gap in between dumb people and normal people, hand gloves are designed which can be easily worn and operated by the dumb person. The resistance sensor and ADXL335 accelerometer sensor are fitted in hand gloves, which can easily measure the bend and movement of hand gesture of the user. These sign signals are converted into a digital signal using ADC. The microcontroller is used to recognition hand gesture. After recognition of gesture, these signals are sent to ZigBee module. The received text signal is converted into speech signal using Text to Speech. The converted text to speech output is presented with the help of speaker system so that it will be helpful to normal people to understand sign performed by the dumb person. The LCD module is also used to display recognized gesture at microcontroller.**

Index Terms - **Sign language, ADXL337 accelerometer, Glove, Arduino microcontroller, Gestures**

INTRODUCTION

Correspondence between hard of hearing, quiet and a visually impaired individual have dependably been a difficult assignment. Science and innovation have made human life addictive to comfort yet at the same time there exists an underprivileged gathering of individuals who are battling for finding a creative way that can make the procedure of correspondence simpler for them. The visually impaired individuals can talk openly by methods for ordinary language while the hard of hearing stupid have their very own manual visual language. The main methods for correspondence accessible to the vocally subject is the utilization of "Gesture based communication". Gesture based communication is the fundamental system for hard of hearing, idiotic correspondence.

Correspondence with hard of hearing individuals turns out to be increasingly harder if the separation between them is more. For instance, envision a situation in which a typical individual needs to speak with an individual having a consultation inability arranged at a far separation from him, at that point he will not almost certainly trade his/her considerations. On the off chance that two hard of hearing/moronic people are close to one another, they can utilize gesture-based communication to convey, yet at the same time this strategy is wasteful as both ought to have profound comprehension of gesture-based communication. Communication through signing cannot be perceived by a large portion of the ordinary individuals and visually impaired individuals. On the off chance that an individual has every one of the three incapacities, for instance on the off chance that a visually impaired individual is hard of hearing quiet, at that point there is no methods in which he/she can convey. Dazzle individuals may know about the Braille content and the almost totally senseless individuals will be unable to comprehend Braille content. They face troubles in their method for correspondence. This issue persuaded us to actualize visually impaired, hard of hearing and unable to speak communicator.

The long-haul objective is to empower correspondence between outwardly weakened (i.e., dazzle), hearing and discourse disabled (i.e., tragically challenged) individuals from one perspective and the outwardly hindered, hearing and discourse impeded individuals on the other. As of now, there is no methods for correspondence between such individuals who are tragically in altogether extensive numbers in a nation, for example, India. Our model proposes the arrangement of wasteful correspondence among typical and impaired individual by actualizing a continuous framework. Each run of the mill individual sees, tunes in and after that reacts to the conditions by working himself out. People, on a very basic level the nearly deaf and the numbskull [4], rely upon some sort

of signal-based correspondence for bestowing their feelings to other people. Generally, blockhead people use motion-based correspondence for correspondence, yet they find inconvenience in talking with other individuals who don't fathom correspondence through motions. In this way, there is a limit in correspondence between these two gatherings. This endeavor expects to bring down this block in correspondence.

It transforms into the issue or two individuals who knows two assorted vernaculars, so it transforms into an issue to talk with one another along these lines they require a translator physically which may not be continually useful to organize, and this equivalent kind of issue occurs amidst the Normal Person and the Deaf individual or the Normal Person and the Dumb individual [1][2]. The central purpose of the endeavor is to develop a monetarily sagacious system which can offer voice to voiceless. With the proposed work is flagged are changed over into talk. It suggests that correspondence limit between two extraordinary gatherings can be made gainful. Amid the most recent couple of decades, they have run over different advancements that have made the life so simpler and agreeable that even don't need to move our body to complete an undertaking. In any case, continually running in the race to be in front of everybody they have overlooked that despite everything to have an area of populace called the physically crippled individuals who are denied of the progressions of Science and Technology since it has not given them that comfort that is required by them to feel that they also are the piece of the general public and they also can walk connected at the hip with others. Correspondence being an essential part of human life is especially troublesome for the general population who are Blind, Deaf or Dumb.

related work

Throughout the decades as the innovation is picking up lead toward each pathway of life has turned into a simplicity. Same is especially valid for the denied individuals of the general public. Joining distinctive fields of designing has come about for the imbecilic to talk and hard of hearing to hear. In April 2014, utilizing equipment as a guide to convey it was expected to encourage individuals by methods for a glove based hard of hearing quiet correspondence translator framework. The glove is inside furnished with five flex sensors, material sensors and accelerometer. For every particular signal, the flex sensor delivers a corresponding change in obstruction and accelerometer estimates the introduction of hand. The yield from the sensor is simple qualities it is changed over to advanced [4]. As of late in July 2014, it was proposed a face and hand signal acknowledgment framework which can control PC media player. It utilized the face acknowledgment conspire for watcher confirmation and the hand motion acknowledgment in system of computer media player, for example, volume down/up, next music and so on [2]. Henceforth signals assume a critical job in correspondence and can be utilized for the hard of hearing and unable to speak to impart among the general public. In 2013, an equipment named Microsoft Kinect Sensor was presented that built up the motion spotting calculation for Indian Sign Language. In the first stage, hand following is completed utilizing casings of Kinect. In second stage, the highlights of Cartesian framework (speed, point, area) and hand as for body are extricated. Kmeans is utilized for separating the code expressions of highlights for HCRF. In the third stage, Hidden Conditional Random Field is used for arrangement [3]. Furthermore, since decades engineers are endeavoring to utilize innovation for the hard of hearing and unable to speak to impart. Considering the way that if equipment is included the instrumentation factor climbs the cost factor. Something which is powerfully valuable and cost effective would be useful for the individuals who are monetarily feeble. It shows a framework that will not just naturally perceive the hand signals yet in addition convert it into relating discourse yield so talking hindered individual can undoubtedly speak with ordinary individuals. The motion to discourse framework, G2S, has been created utilizing the skin shading division. The framework comprises of camera connected to PC that will take pictures of hand motions. Picture division and highlight extraction calculation is utilized to perceive the hand signals of the underwriter. As indicated by perceived hand motions, relating pre-recorded soundtrack will be played [5]. This work is to build up a framework for perceiving the gesture-based communication, which gives correspondence between individuals discourse debilitation and ordinary individuals, in this way diminishing the correspondence hole between them. Contrasted with different motions (arm, face, head and body), hand signal assumes a vital job, as it communicates the

client's perspectives in less time. In the present work flex sensor-based motion acknowledgment module is created to perceive English letters in order and few words and a Text-to-Speech synthesizer dependent on HMM is worked to change over the relating content [6]. This paper presents structure and usage of constant Sign Language Recognition framework to perceive 26 signals from the Indian Sign Language utilizing MATLAB. The signs are caught by utilizing web cam. These signs are pre-handled for highlight extraction utilizing HSV shading model. The acquired highlights are thought about by utilizing Principal Component Analysis (PCA) calculation. In the wake of contrasting highlights of caught sign and testing database least Euclidean separation is determined for sign acknowledgment. At long last, perceived motion is changed over into content and voice group. This framework gives a chance to a hard of hearing stupid individuals to speak with non-marking individuals without the need of a mediator [7]. Gesture based communication is a valuable apparatus to facilitate the correspondence between the hard of hearing individual and typical individual.

The framework means to bring down the correspondence hole between hard of hearing individuals and ordinary world, since it encourages two-way interchanges. The anticipated procedure translates language into discourse. The framework conquers the vital time challenges of imbecilic individuals and improves their way. This framework changes over the language in partner passing voice that is well logical by hard of hearing individuals. With this task the hard of hearing quiet individuals can utilize the gloves to perform gesture-based communication and it will be changed over into discourse; and the discourse of ordinary individual is changed over into content and comparing hand signal, so the correspondence between them can occur effectively [8]. Communication via gestures cannot be perceived by the majority of the typical individuals and visually impaired individuals. Dazzle individuals might know about the Braille contents and the almost totally senseless individuals will most likely be unable to comprehend Braille contents. On the off chance that an individual has every one of the three inabilities, for instance on the off chance that a visually impaired individual is hard of hearing quiet, at that point there is no methods in which he/she can convey. They face challenges in their method for correspondence.

In [9] they have proposed another framework model called the SHAROJAN BRIDGE with an end goal to conquer any hindrance during the time spent correspondence between the Blind, Deaf and Dumb individuals. In [10] the methodology centers around: an) installing insight into sensors and actuators utilizing Arduino stage; b) organizing keen things utilizing Zigbee innovation; c) encouraging cooperation with brilliant things utilizing Cloud administrations; d) improving information trade effectiveness utilizing JSON information design. This [2] ponder presents the underlying advance of a programmed interpretation framework ready to decipher visual discourse utilized by hard of hearing people to content, or sound related discourse. Such a framework would empower hard of hearing clients to speak with one another and with ordinary hearing individuals through phone systems or through Internet by just utilizing phone gadgets outfitted with basic cameras. This [7] paper portrays the improvement of an Advanced Speech Communication System for Deaf People and its field assessment in a genuine application space. specifically, for motivations behind high accessibility and fiasco recuperation, replication of information on distributed storage should be actualized proficiently. Keeping that in mind, in [11] paper, they have explored the consolidated issue of transferring IoT information from a lot of sensor entryways and productive replication of information on dispersed distributed storage.

BLOCK DIAGRAM

Sign language interpreter consisting of accelerometer sensor which helps to measure the movement of the three-axis direction (x, y and z). The accelerometer sensors are placed on the glove. The data from these sensors are sent to the microcontroller for further processing purpose. Once data is recognized at the microcontroller that is sent to the android phone via Bluetooth module. At android phone side, app is developed which is text to speech converter that helps to convert text signal to voice signal. LCD module is also used to display recognized data from the microcontroller.
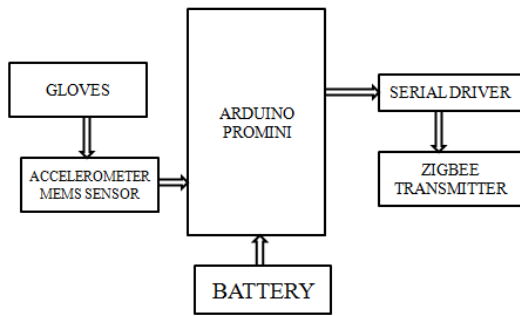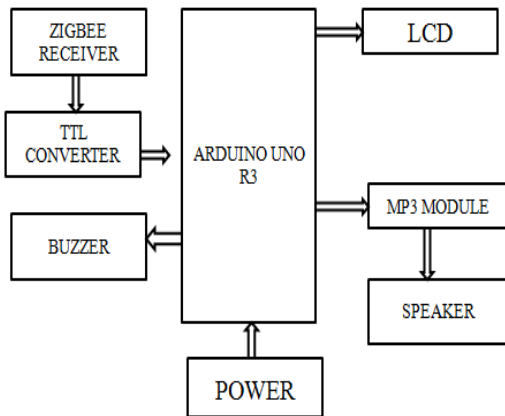
Fig 1: Glove Unit

Fig 2: Receiver Unit

Hardware Requirements
- Arduino Uno R3
- Rfm75 Zigbee Tx &Rx
- Adxl335 Mems Sensor
- Buzzer
- Relay
- Mp3 Module
- Speaker
- Battery
- Power Supply Unit
- 16*2 Lcd

Software Requirement
- ARDUINO IDE
- Embedded C

HARDWARE IMPLEMENTATION
Arduino UNO
The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by arduino. The board is equipped with sets of digital and analog input/output

(I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under Common Creative Attribution Share-Alike 2.5 license and is available on the arduino website. Layout and production files for some versions of the hardware are also available. "UNO" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The UNO board and version 1.0 of arduino Software (IDE) were the reference versions of arduino, now evolved to newer releases. The UNO board is the first in a series of USB arduino boards, and the reference model for the arduino platform. The ATmega328P on the arduino UNO comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The UNO also differs from all preceding boards in that it does not use the FTDI USB-to serial driver chip. Instead, it uses the Atmega16U (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Fig -2: Arduino Board

LCD
Liquid Crystal Display (LCD) is used to display the output to the user in the form of GUI (Graphic User Interface) and a mono chromatic display. LCD used in this project is JHD162A series. There are 16 pins in all. They are numbered from left to right 1 to 16 (if you are reading from the backside). Generating custom charcters on LCD is not very hard. It requires the knowledge about custom generated random-access memory (CG-RAM) of LCD and the LCD chip

controller. Most LCDs contain Hitachi HD4478 controller. CG-RAM is the main component in making custom characters. It stores the custom characters once declared in the code. CG-RAM size is 64 byte providing the option of creating eight characters at a time. Each character is eight byte in size.
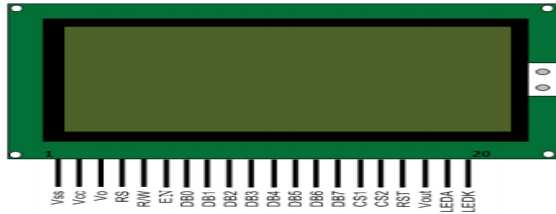
Fig 3: LCD

Accelerometer Sensors

Accelerometer within the Gesture Vocalized system is employed as a tilt sensing element, which checks the tilting of the hand. ADXL103 measuring system as shown in Figure three. The tip product of the measuring system is provided to 3rd module, which incorporates pipeline structure of 2 ADC. There is a technical issue at this stage of the project, that the analog output of the measuring system.

Speech Syntheses

On the idea of this comparison the microcontroller involves acknowledge that that gesture will the hand build. Quickly the microcontroller is aware of that that knowledge is distributed by the bend detection module, and what that means of this knowledge is. That means implies that the microcontroller is aware of if the hand is creating some outlined gesture and what ought to the system specification. The last step of the system is to convey voice to every outlined gesture. For this purpose, a speech synthesizer is employed. Every word is consisted of some explicit phonemes and just in case of Speech synthesizer every allophone has some explicit addresses as shown in Figure 4. This address is to be sent to the Speech synthesizer at its address lines, to form the speaker, speak that individual word. Currently these addresses area unit already hold on within the microcontroller. So far, the microcontroller is aware of what the gesture created by the hand, and what ought to be expressed against it. The microcontroller sends the eight-bit address to Speech synthesizer. This eight-bit address is representing the allophones of the word to be spoken. Speech synthesizer offers a sign output. This

signal is amplified by victimization the amplifying electronic equipment. The output of the electronic equipment is given to the speech synthesizers.

RESULTS AND DISCUSSION

When power is ON, the position and orientation of hand is obtained from the data glove that consists of five Flex sensors on fingers (Thumb, index, middle, ring, and pinky) and one accelerometer of PIC microcontroller LM386 Speaker Speakjet TTS256 Three outputs (X, Y, and Z positions). Tilting of the palm can be captured by the accelerometer where Flex sensors can measure the bend of the five fingers when making a sign. When the user performs a gesture/letter and press a button, signals coming from the sensors are amplified via a dedicated amplification circuit to each signal, and then captured by the microcontroller which convert the analog signals to digital values through its 8-channel ADC These values are formatted into a simple state matrix: five values for the Flex sensors, one for each axis of the accelerometer. As a result, each letter in the ASL will have a specific digital level for the five fingers and the three axis of the accelerometer. Each level is represented by a value between 0 and 255; an interval of $\pm$ 3 levels should been taken into consideration in case the user could not keep his hand steady.
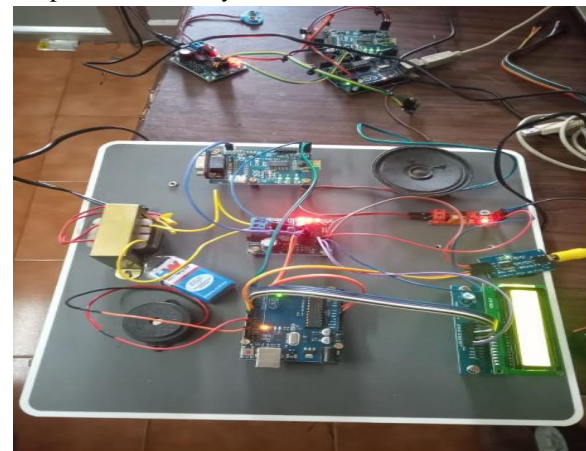
Fig 4. Experimental Setup

CONCLUSION

Sign language may be a helpful gizmo to ease the communication between the deaf or mute community and additionally the standard. people. This project aims to lower the communication gap between the

mute community and additionally the standard world. The projected methodology interprets language into speech. The system overcomes the necessary time difficulties of dumb people and improves their manner. Compared with existing system the projected arrangement is compact and is possible to carry to any places. This system converts the language in associate passing voice that is well explicable by blind and ancient people. The language interprets into some text kind displayed on the digital display screen, to facilitate the deaf people likewise. In world applications, this system is helpful for deaf and dumb of us those cannot communicate with ancient person. The foremost characteristic of this project is that the gesture recognizer may be a standalone system, that is applied in commonplace of living. It is in addition useful for speech impaired and paralysed patient means those do not speak properly and in addition used for Intelligent Home Applications and industrial applications.

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