A NOVEL APPROACH AS AN AID FOR BLIND, DEAF AND DUMB PEOPLE

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***Abstract*— Communication is the only medium by which we can share our thoughts or convey the message but for a person with disability (deaf and dumb) faces difficulty in communication with normal person. Generally, there will likely be at least some level of social isolation for those with disabilities With deafness/muteness, employing the same methods of communication as the other person (e.g. sign language or text-to-speech) is definitely going to be a main factor under consideration. It is fundamental to disabled people's lives that disability is recognized as an equality issue. In this project, we are going to propose a new system-prototype in an effort to make the process of interaction between the Blind, Deaf and Dumb people much easier. This will make use of the Portable Technology and Arduino Circuit Boards to provide a means of communication to differently-abled people having one or all of the above mention disabilities.**

***Keywords*— Communication between the Blind, Deaf and Dumb people, Arduino Circuit Boards, Flex Sensors, Wearable Technology.**

I. INTRODUCTION

The subject of visual impairrment and education has included evolving approaches on how a blind student must be treated. Louis Braille quoted as, ―Access to communication in the widest sense is access to knowledge, and that is vitally important for us, if we are not to go on being despised or patronized by sighted people. We do not need pity, nor do we need to be reminded that we are vulnerable. We must be treated as equal and conversation is the way this can be brought about‖ [18]. There are about 12.3 million people in India with moderate to complete hearing loss. There are 478 schools receiving government funding and approximately 372 private schools for the deaf scattered throughout India. Science and Technology have made Human life addictive to comfort but still there exists an underprivileged group of people who are fighting for finding an innovative way that can make the process of communication easier for them.

Conversations between person who lacks the ability to talk and hear with a normal person have always been a challenging task. There is a device which aims to solve the problem of person with earing and speech impairment called a deaf-mute communication interpreter system. The glove is equipped with five flex sensors, tactile sensors and accelerometer attached internally. For each specific gesture, the flex sensor creates a proportional variation in resistance and accelerometer measures the orientation of hand. The processing of these hand gestures is executed in Arduino. The glove includes two modes of operation – training mode and an operational mode. The chain of letters to form words is also done in Arduino. In addition, the device also includes a text to speech conversion (TTS) block which translates the matched gestures i.e. text to voice output [1]. There are devices called braillers that allow to compose a message for a blind person to read. Sometimes these can be very expensive. Companies are even developing Braille technology for smart phones[19]. However these devices are not able to eliminate the complete disability of a person as this may help the normal person to understand them but if the normal person wishes to communicate back he must know any of the above language. Hence these devices will provide only one way communication. The existing devices will not be helpful in the case if the receiver is blind, deaf and dumb.

II. OBJECTIVES

This project is intended to have an operational model and bridge the gap in communication to help people suffering from Blindness or Deafness or Dumbness or any combination of these three.

This will make use of the Wearable Technology to provide a means of communication to differently-abled people.

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III. EXISTING SYSTEM

DIGITAL DATA ENTRY GLOVE, BY GARY GRIMES 1983:

The first device for measuring hand positions was developed by Dr. Gary Grimes at Bell Labs. Patented in 1983, Grimes' Digital Data Entry Glove had finger flex sensors, tactile sensors at the fingertips, orientation sensing and wrist-positioning sensors. The position of the sensors are changeable due to the gestures. It was intended for creating "alpha-numeric" characters by examining hand positions. It was primarily designed as an alternative to keyboards, but it also proved to be effective as a tool for allowing users with speech impairment to "finger-spell" words. Data gloves are one of several types of electromechanical devices used in haptics applications.

IV. PROPOSED SYSTEM

This will make the communication easy between the disabled people based on the extent of their abilities.
This device takes the input message from the differently abled sender whether it be text, hand gesture, Braille input as per his/her disabilities and facility and that message will be transferred to long or short distances as per the requirements.
Once the message is transmitted to the receiver then it is again converted into text, voice, Braille output as per the facility and abilities of the receiver.

V. DESIGN SPECIFICATION

The structure of this design consists of the following components:

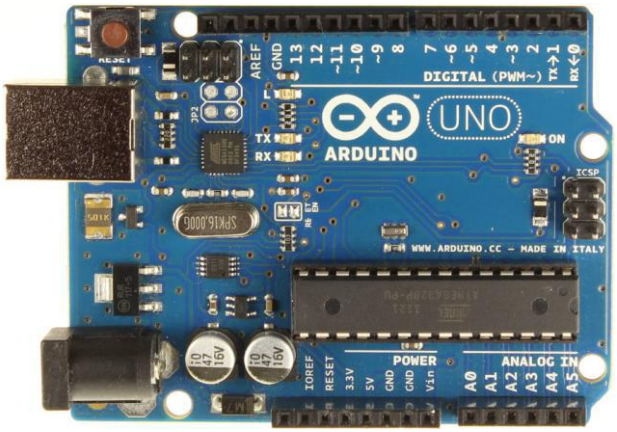
A. Sensor Glove:

The Sensor Glove is used to convert the American Sign Language (ASL) into audio using voice board which can further be converted into text to be displayed on the LCD screen as per the requirements.

The Sensor Glove consists of 2 major components namely Arduino Circuit board and Flex Sensors.
The Gestures made by the hand is fed as an input to the Flex Sensors and their output is given to the Arduino Circuit Board for gesture recognition. Once the gesture is recognized, it is converted into speech which is taken as an audio output with the help of voice board and speaker.

B. Arduino Uno:

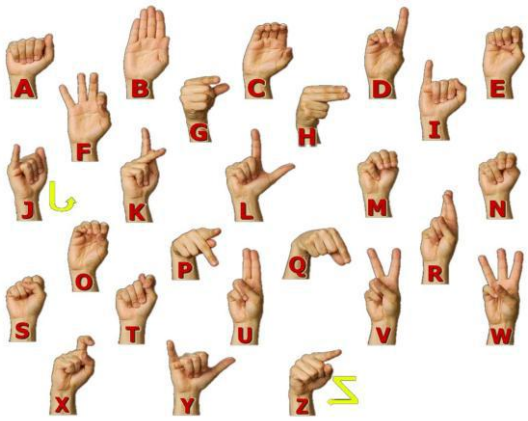
The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. In this project we are using 2 Arduino boards one as master device and the other one as slave. The inputs are connected to master device and the signals are received by the slave device.



C. Flex Sensor:

A flex sensor or bend sensor is a sensor that detects the amount of deflection by the change in resistance. Since the resistance is directly proportional to amount of bend it is often called flexible potentiometer. Here we use 5 flex sensors each for each finger. Upon bending the effective input resistance is given to the master device and based on the gesture the resistance the output is displayed on the LCD connected to the slave device. Usually they follow American Sign Language (ASL) for gesture recognition. Finger spelling is a method of spelling words using hand movements.

The following are the gesture patterns in American Sign Language (ASL) for the deaf and dumb person which is given as flex input to the arduino board.



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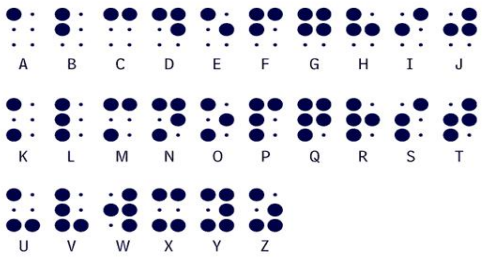
D. Voice Playback and Recorder Kit:

Voice playback and recorder kit gives high quality recording and playback with 11 Minutes audio at 8 KHz sampling rate with 16 bit resolution. The aPR33A series C2.x is specially designed for simple key trigger, user can record and playback the message averagely for 1, 2, 4 or 8 voice message(s) by switch, it is suitable in simple interface or need to limit the length of single message [20].

E. Braille Output:

Here we use motors for creating a sense of vibration which can be felt by blind people. These motors are arranged in such a way that it resembles the Braille pattern and when the input is given the motors run according to the input. The input can be either flex or keypad. This is to reduce the cost complexity of the device.



F. Software

Arduino programming sketch as seen by the Arduino IDE programmer has two functions namely:
Void setup():When a sketch starts and the function is called, this function is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.
Void loop():After the execution of te setup block loop function is called,. Here te main code which is to be executed repeatedly for example, LED blinking.

VI. METHODOLOGY AND WORKING

This is proposed by taking care of all the possibilities and combinations of the three disabilities namely Blindness, Deafness and Dumbness from which a person suffer. The working of the device for transmission of a message from one disabled person to another is described in the following steps:
The system we are using is a type of wearable technology. First of all, the output and input of the system is set to the desired form of the user.
For a blind user, the input can be text using the Sensor Glove or Braille script keypad as per his/her wishes and requirements and the output can be audio and Braille pattern. Thus, the device is set so that it can take input and give output as per the requirements of the user.
The message to be sent by the user is taken as an input to the gadget. The input can be text, gesture or Braille Language. The gadget has a Sensor Glove for text input and a Braille Language Converter for taking the Braille Language input and converting it into text.

If the message to be delivered by the sender is in the form that is acceptable and understandable by the receiver and the communication is a direct type of Communication, then the message is transferred directly to the receiver.

Let us take the example in which a Deaf and Dumb person wants to communicate to a Blind Deaf and Dumb. Following are the steps that must be followed to make the communication possible.
The Deaf and Dumb person will send a text message to the board through the Sensor Glove by the use of hand gestures as described in the American Sign Language.
The Sensor Glove will convert the Gestures into an audio message. The gestures can also be converted into text message by the use of Analog to Digital Converters. The output from the Arduino master board will be converted from text to Braille Language in the Arduino slave board so that the Blind can easily understand it. The motor vibrates when the receiver receives the message which is nothing but our Braille output.

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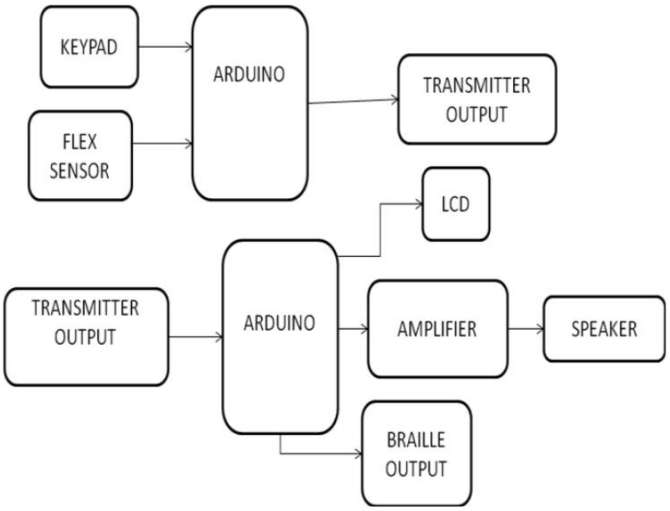
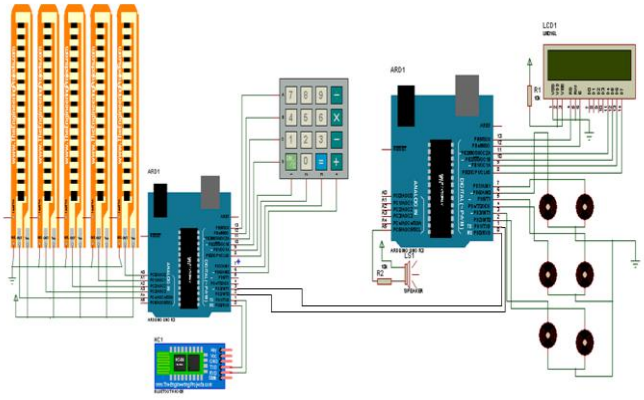
VII. BLOCK DIAGRAM FOR CONVERSATION AMONG THE BLIND, DEAF AND DUMB PEOPLE

The block diagram of the system is shown in the below figure.

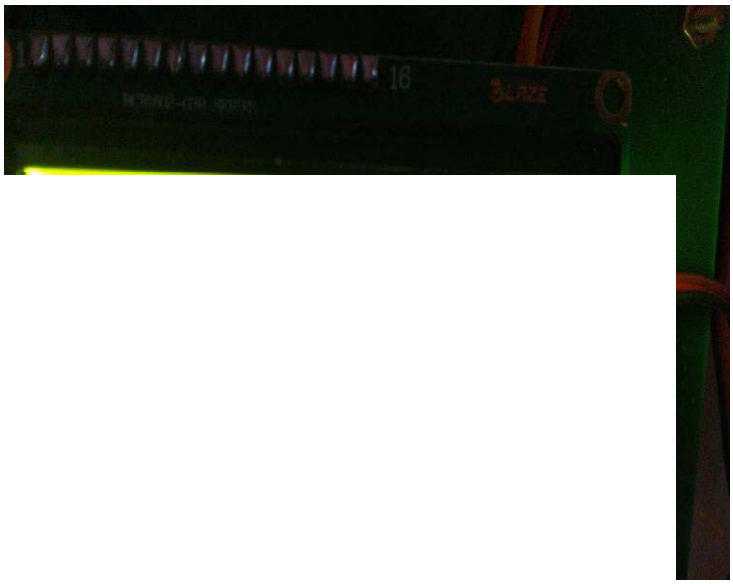


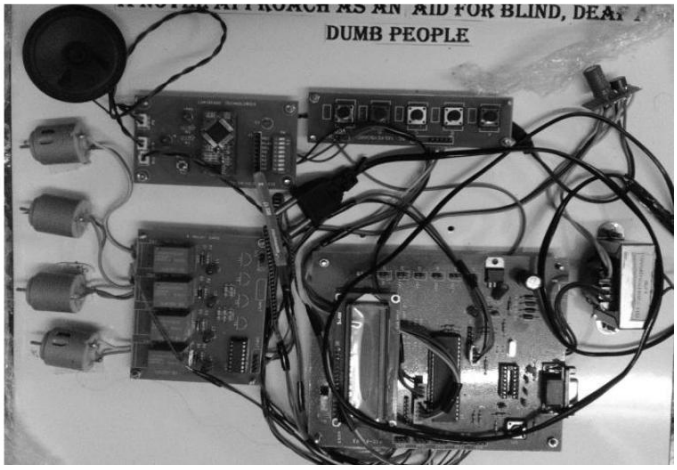
Here the keypad input and the flex input is connected to the Arduino master board i.e. the input side. The keypad can be normal text input or Braille input. Then the master and slave boards are connected according to their circuit configuration. In the slave Arduino board i.e. output side the LCD display, Braille output i.e. motors and voice playback and recorder kit with speakers are connected.

VIII. RESULTS AND DISCUSSIONS



This is the basic circuit diagram of our project. We designed this circuit in proteus software and obtained simulation output.





X. CONCLUSION

In this project we have proposed the basic approach of the system which can be a very useful tool in forgoing the barrier of disabilities in communication of the people suffering from any of the possible combination of Blindness, Deafness and Dumbness among themselves as well as with normal people. The person can communicate and transfer the message as per his ability and desire. The deaf and dumb/dumb can use the American Sign Language to transmit the message while those who are unable to understand the Sign Language can make use of the device to get the output in the audio or Braille Language or normal text displayed in LCD. This makes them interactive with the outside world.

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X. FUTURE WORKS

There can be number of future advancements that can be associated with this project work and some of which are described as follows:

We are using the Arduino master-slave to make connectivity which cannot be used for long distance communication. In future some new way can be developed that can use the Internet connectivity feature to make the connectivity of the device better and for longer distances.

Arduino Technology also provides Ethernet, WI-FI and Bluetooth support. Thus incorporate these features to our device to make it capable of connecting to any other device with WI-FI and Bluetooth support.

There can be more perfection in sensing the movements and gestures so that the message transmission can be made smoother.

Since this is a type of wearable technology, we can think of micro level advancements that can be implanted so that the device can be made more compact, faster and reliable.

XI. LIMITATIONS

In this project we are using the wearable technology along with several Arduino Boards and circuitry which makes the device a little bulky and massive. The disabled person must be aware of the American Sign Language and the Braille Language in order to send and receive the message.

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