International Journal of Scientific Research and Management Studies (IJSRMS)
ISSN: 2349-3771 **Volume 4 Issue 5, pg: 106-111**

HERTZ BOX: AN AID FOR THE VOCALLY IMPAIRED

Shantanu Arora[1], Abhishek Gautam[1], Ashish Rana[1], Kshitij Shinghal[2], Amit Saxena[2]
[1]UG Scholar, [2]Professor
ECE Department, Moradabad Institute of Technology,
Moradabad, Uttar Pradesh, India.

ABSTRACT

Today exists the facility of Cornea transplant and the blind shall see. There are wearable devices which facilitate hearing for a deaf, but there has not been any invention of an artificial human voice box yet. Understanding the above mentioned, think of a person who cannot speak and the problems faced to express some of the most crucial needs and thoughts to the other being. Communication is the obvious need to survive. The communication between people who are vocally impaired (dumb), with everyone around is difficult. This is due to the lack of the common language between both parties. Statistics show that the number of mutes in the World are in range of seven to eight hundred thousand. The blind people can generally communicate using normal language, but the deaf and dumb usually require sign language to do so. It is a non-verbal, manual-visual form of intercourse which is found amongst these blessed communities in the World. The language does not have a common origin and hence is difficult to interpret by normal people. This work aims to lower this barrier in communication. The project is an attempt to facilitate people by means of a sound producing box communication system. The box has some common recorded voice messages that are played on command. The processing of these commands is done in Arduino UNO Board. It compares the input signal with predefined voltage levels stored in memory. According to that sound is produced through speaker. The main aim of the project is to develop a system which can give voice to voiceless person. The wireless arrangement makes the device more comfortable to be used by the disabled person. A few prior attempts have been made to recognize the gestures made using hands (Smart Glove), but with limitations of cost, working capacity of sensors, range of working conditions and not being handy. This paper accentuates the fully functional system with significant improvement from the past works.

KEYWORDS: *Dumb patient, Human voice box, Sign language, Arduino UNO.*

I. INTRODUCTION

Electronic communication devices can be categorized into two categories: dedicated and undedicated systems. A dedicated device is strictly a communication device and the only thing it does is giving an audio output. Undedicated devices, which are computer based, not only give audio output, but can also perform all the functions of a regular PC or laptop—word processing, e-mail, web surfing, etc. Hertz Box comes under the category of dedicated device. It can be assumed to be an advanced version of the Smart Glove with drawbacks and complexities eliminated. The organization of paper is as follows: the initial section of this paper consists of a literature review of some past attempts made in the area of our interest. The paper further gives a detailed discussion of problem identification and its solution. The discussion deepens further under the section 'Methodology'. Then the result analysis of the prototype is given. The past work done in this area is also appreciable and we have taken much reference from the past attempts. But further changes might be possible in the proposed design in this paper as stated in the 'Future Aspects' section post conclusion.

II. LITERATURE REVIEW

Divyanshee Mertiya et al. proposed a speech recognition unit along with embedded controllers and audio pre recorder which will provide help to dumb and deaf people to express their

need to the normal people. Components used are: microcontroller interfaced flex sensors, voice module, etc. Change in the values of flex sensors gives some hex code to the microcontroller which after compilation displays the output in LCD and also produces the voice through the speaker. The words or signs are obtained by taking English as a reference. For every word, values of flex sensors are compared with the values already saved in the microcontroller and then the corresponding text is displayed on LCD display and also voice output is obtained through voice recorder IC. **[1]**

K. Park, et al. implemented a real-time embedded FPGA-based gesture recognition system using 5DT data glove. This approach is used in order to reduce the problems of space limitations, movement limitations and lighting limitations. The architecture of the system consists of three main modules that are input module, recognition module and display module. The system recognizes the hand gesture by performing data calculations with a checksum function on the input data and compares the result to the header byte before proceeds to the matching process. The matching process compares the input hand gesture with the pre-defined hand gesture. Then, the result is displayed on the LCD screen. **[2]**

M. P. Paulraj et al. presented a simple sign language recognition system that is capable of recognizing nine phonemes in English using a machine vision system. The foundation of the system is skin color segmentation and Artificial Neural Network (ANN). It has three processing stages in the system; preprocessing, feature extraction and gesture classification. Skin color detection and region segmentation is done at first stage. Skin color of the hand is detected based on the RGB values in the second. The feature extraction stage extracts moment invariant features, obtained by calculating the blob in the set of image frames, from the right and left hand gesture images. Third stage then uses these features as its input to ANN to recognize the sign. Reportedly, average recognition rate for this system is 92.85%. **[3]**

Keshav Mehrotra et al. presented Smart glove, based on the wearable technology. It is basically a device which has some specific wearable sensors with phenomenal temperature stability. All the sensors are fitted on a glove which measures the different analog parameters associated with the movement of fingers and orientation of the hand during any particular gesture. Those specific analog values are read and fed to the microcontroller for processing. The hardware includes Bluetooth module interfaced with a mobile app, which gives corresponding text and speech to the gesture made. **[4]**

Abhishek Tandon et al. presented in their paper a brief introduction of our proposed design of 'Smart Glove' along with the previous attempts done in this area. Since communication plays the most important part in a human being's life but unfortunately not all human beings are able to transfer their thoughts effectively just because of a mere disability. The project would serve to remove the problems from this disability of not able to communicate properly. Deaf &Dumb people require sign gesture making for their communication but normal masses face the difficulty of understanding this and there is a full course if one wants to learn this language. The device can therefore be used by such impaired people to express themselves with ease to the normal. **[5]**

Harmeet Kaur et al. presented in their paper the past attempts that were made to counter the differences between the deaf-dumb people and the normal ones. Majority of the attempts included converting the Sign Language to the audible signals. Some designers used flex sensors while others used image processing algorithms and contact sensors for efficient gesture recognition. This review paper comprised of the brief introduction of the prior attempts that were made for constructing a device which converts sign language to speech. **[6]**

Khushboo Kashyap et al. presented a glove capable of translating their sign language gestures into speech through android phone. Smart glove focused on the translation of gestures of the alphabets. Comparing with other approaches, it used Principle Component Analysis to classify the real time input data for feature extraction. **[7]**

III. PROBLEM IDENTIFICATION

Number of mutes in the World are in range of seven to eight hundred thousand. These people learn sign language to communicate. Unfortunately, most of the average people don't understand their gestures and thus are unable to identify what they are trying to say. Sign language is a gesture oriented

form of intercourse which is found only amongst these blessed communities in the World and hence tough to interpret by normal masses.

IV. PROBLEMS FACED

The issues faced by the deaf-dumb community can be broadly classified into categories like interaction, education, social, behavioral problems, mental health, Safety concerns, etc. According to a recent survey out of every 100 deaf and dumb only 40 are graduate and less than 20 are employed. It is a consequence of the physical disability of speaking for a mute and hearing for a deaf.

V. PROPOSED SOLUTION TO THESE PROBLEMS

Most of the problems mentioned above can be solved and simplified easily using "Hertz Box" that produces audio messages on just the press of a push button. When the button is pressed, an analog signal is produced as a change in the resistance. This change is processed by the microcontroller. The default audio signals corresponding to fixed values of resistance are stored in memory in form of pre-compiled program. They are played as output by a speaker after being amplified through an amplifying unit based on LM386 SMD package. The number and type of messages can be according to the user. This will not only help to communicate in daily life but also improve the working as well as economical conditions.

4.1. The main components of the system

String Resistor ladder

String Resistor ladder can be defined as a group of many, generally equally dimensioned, resistors connected between two reference voltages. The resistors act as voltage dividers between the referenced voltages. Each tap of the string generates a different voltage, which can be compared with another voltage: this is the basic principle of a String Resistor Ladder. Fig. 1 shows basic string ladder circuit.

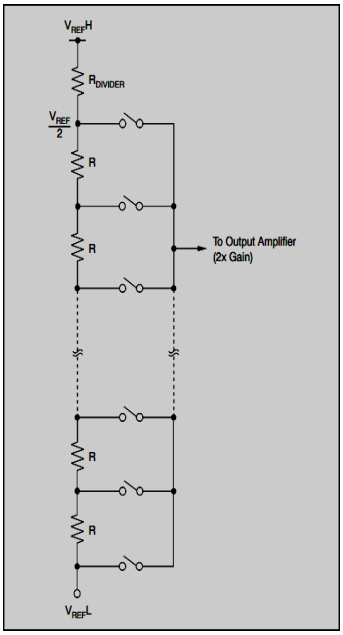

Fig.1 Basic String Resistor ladder circuit

VI. METHODOLOGY

Figure 2 shows the process flow, which shows the working of the device. There are 7 buttons present on the prototype, which are pressed to send an analog signal to the Microcontroller (Arduino UNO).

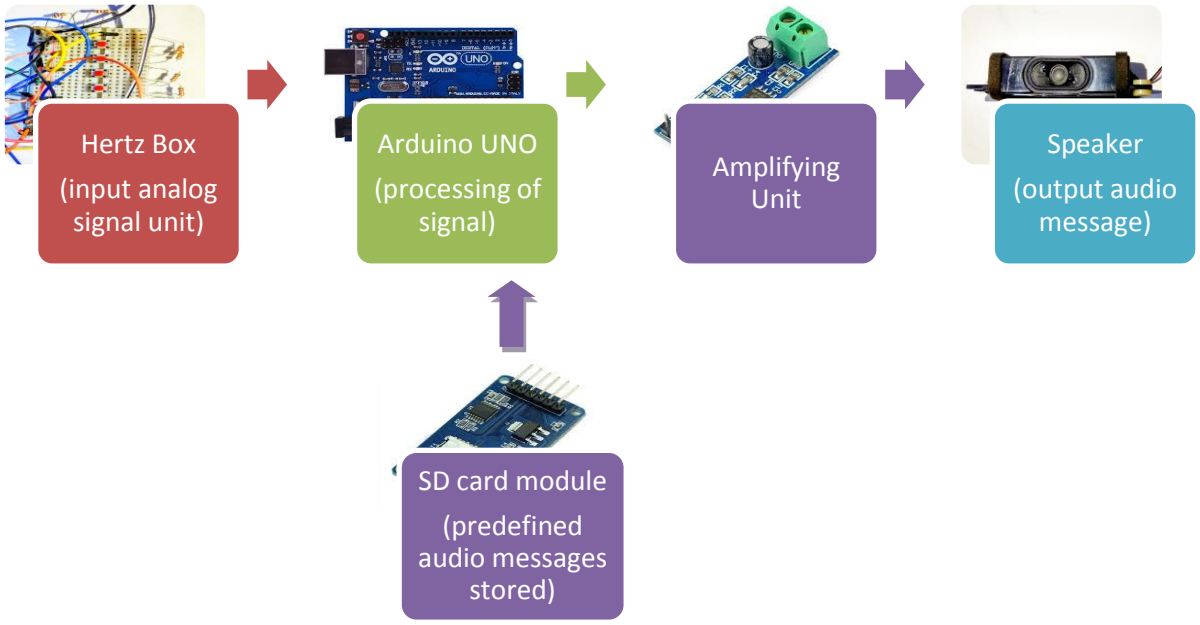

Fig. 2 Block Diagram of Hertz Box (prototype)

There is a memory storage device connected to it. The process is done and the output is in the form of an audio message from the speaker.
The major building blocks of this figure 2 are:

1. Input Analog Unit (Resistor Ladder)
2. Arduino UNO
3. Micro SD Card Module
4. Amplifying Unit
5. Speaker

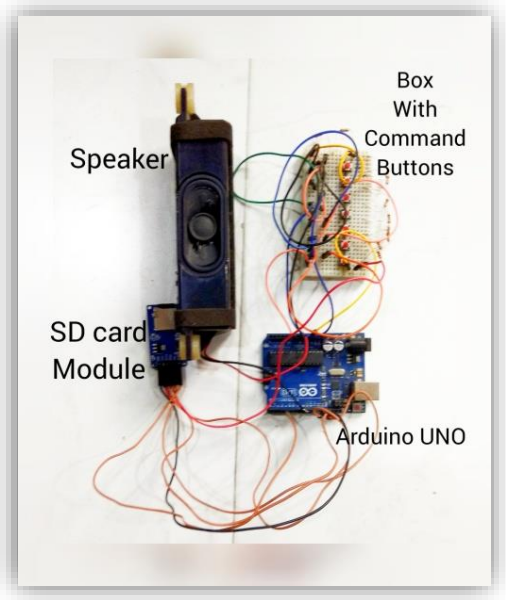

Fig. 3 Hertz Box

Figure 3 shows the hardware of prototype. There are 7 basic audio messages that can be heard aloud on just the press of a button on the box.

1. Who are you?
2. I need help.
3. I am in danger!
4. I need water.
5. I need food.
6. I want to go to washroom.
7. I need to sleep.

VII. RESULT ANALYSIS

This paper is a tool which fills the communication gap between patients, doctors and relatives and can be useful for vocally impaired and deaf patients.

- It is portable and cost effective.
- It requires low power, light weighted and robust, giving the patient liberty to carry it anywhere at his/her will.
- It can become a voice of the vocally impaired.

VIII. CONCLUSION

Sign language has been one of the most useful but very difficult tool to bridge the communication between the mute community and normal society. Therefore, Hertz Box can be implemented to communicate in much more effective manner. In normal life, the target audience must have an idea of the sign language to understand those who cannot speak, which is not always possible. Hence, the prototype reduces such barriers to a large extent. This is also really effective to bridge the communication difference between the blind and a dumb person. In a nutshell, Hertz box is way more effective and efficient then rest of the solutions available in the market.

IX. FUTURE ASPECTS

There can be further advancements done in this prototype with a little change in coding and replacement of the input unit like

- It could be compatible with Retina reading technology. Seeing things, learning about them and storing information. Using it when required, as in speech.
- It could be compatible with gesture reading technology. The need is just to do a certain predefined movement through hands and the corresponding audio message would be played.
- It can be made completely wireless and server based.

REFERENCES

[1]. Divyashree Merthia, Ayush Dadhich, Bhaskae Varma and Dipesh Patidar Porrnima Institute Of Engineering And Technology, Jaipur Rajasthan India "A Speaking Module For Deaf And Dumb". SSRG International Journal of Electronics and Communication Engineering (SSRG-IJECE) - Volume 3 Issue 8 – August.

[2]. K. Park, J. H. Kim, and K. S. Hong, “An Implementation of an FPGA-Based Embedded Gesture Recognizer using a Data Glove”, in Proceedings of the 2nd International Conference on Ubiquitous Information Management and Communication (ICUIMC’08), 2008.

[3]. M. P. Paulraj, S. Yaacob, H. Desa, and W. Majid, “Gesture Recognition System for Kod Tangan Bahasa Melayu (KTBM) using Neural Network”, in 5th International Colloquium on Signal Processing and Its Applications (CSPA), pp. 19-22, 2009.

[4]. Keshav Mehrotra, Amit Saxena, Khushboo Kashyap, Harmeet Kaur, Abhishek Tandon, “Augmentative and Alternative Communication Using Smart Glove”, in International Journal of Computer Engineering & Science (IJCES), pp. 41-50, 2017.

[5]. Abhishek Tandon, Amit Saxena, Khushboo Kashyap, Keshav Mehrotra , Harmeet Kaur, "A Review Paper on Smart Glove – Converts Indian Sign Language (ISL) into Text and Speech", IJSRD - International Journal for Scientific Research & Development, Vol. 4, Issue 08, pp. 269-272, 2016.
[6]. Harmeet Kaur, Amit Saxena, Abhishek Tandon, Keshav Mehrotra, Khushboo Kashyap, "A Review Paper on Evolution of Smart Glove", International Journal of Scientific Research and Management Studies (IJSRMS), Vol. 3, Issue 03, pp. 124-128, 2016.
[7]. Khushboo Kashyap, Amit Saxena, Harmeet Kaur, Abhishek Tandon, Keshav Mehrotra, "Digital Text and Speech Synthesizer using Smart Glove for deaf and dumb", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Vol. 6, Issue 04, 2017.