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Gesture Vocalizer for Dumb People

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Abstract: ***In ancient times, the Sign language system was developed to eradicate the problem in dumb and deaf people and make them gain knowledge for proper interaction with the world. Learning sign language involved creating sign language using fingers movement and movement in hand. It is been observed that dumb and deaf people feel themselves inferior to the society and do not interact much with other people. There are many projects tried to Develop to make things beneficial for them but still we are unable to create a better support for DnD people. There where a lot of projects developed but the costing of the project was very high which cannot be affordable at any scale. Projects developed by MIT students cost more than 2 lakh rupees and there where many other efforts made to help but all went in vain as the biggest problem raised was project being cost efficient and for a developing country like India creating a product that cause 2 lakh for a person is not at all possible. From the literature it is known that, in India it is true that computers have not reached even normal schools in the rural and remote areas. Therefore, providing computers for Dumb and deaf children to learn and use them seems certainly farfetched. Therefore, we got an idea to design and develop user-friendly, cost- effective learning aid for Dumb and deaf children. The project aims to design a learning aid for the Dumb and deaf people in English language which infuses a sense of playing while learning. The proposed idea is implemented on an Arduino Microcontroller interfaced with LCD, Gyroscope and mobile device as output devices. The proposed model develops a glove that can Convert sign language to human voice and which can be understandable by us and this will definitely build the bridge between us and make Dumb and Deaf people a part of our society and which can make better for mankind. The biggest challenge is to reduce the cost as much as possible and keep things more available for the society***

I. INTRODUCTION

In an information-oriented society, all members of the Society have the right to obtain and use the information. Therefore, it is necessary to develop various devices, which can provide information to anyone easily. Globally more than 20 million people are Dumb and deaf and with other Physically challenged people like visually impaired or deafblind people are facing lots of problems while communicating or interacting with other people. To provide a helping hand towards the dumb and deaf society, recent technological growth has been developing different skilled methods to enhance their communication procedures. Illiteracy among this group is very high, much of which is attributed due to the lack of reading material in accessible format. For reading and writing dumb and deaf people always use Sign language representation of different alphabets, symbols (as shown in Fig. 1) and digits (as shown in Fig. 2) etc. Sign language is the language used by the Dumb and deaf to read and write. It is vital for communication and educational purposes.

In this project we will be trying to implement sign to voice conversion where in we will be converting the sign language into voice form by using aurdino, Bluetooth module HC05, ADXL345, Combinational circuit , 16*2 LCD, using Application and a android device . The input data from combinational circuit that consist of pair of metal contact points at joint of the figure and according to the movement in the fingures. Which will be further transferred using aurdino to LCD and using Application to the mobile Device and then heard as sound on the mobile speakers Sign languages (also known as signed languages) are languages that use the visual-manual modality to convey meaning. Sign languages are expressed through manual articulations in combination with non-manual elements. Sign languages are full-fledged natural languages with their own grammar and lexicon. Sign languages are not universal and they are not mutually intelligible with each other, although there are also striking similarities among s ign languages

II. LITERATURE SURVEY

Lemelson-MIT sign language converter Two University of Washington undergraduates have won a $10,000 Lemelson-MIT Student Prize for gloves that can translate sign language into text or speech. The LemelsonMIT Student Prize is a nationwide search for the most inventive undergraduate and graduate students. This year, UW sophomores Navid Azodi and Thomas Pryor — who are studying business administration and aeronautics and astronautics engineering, respectively — won the “Use It” undergraduate category that recognizes technology-based inventions to improve consumer devices. Their invention, “SignAloud,” is a pair of gloves that can recognize hand gestures that correspond to words and phrases in American Sign Language.

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Each glove contains sensors that record hand position and movement and send data wirelessly via Bluetooth to a central computer. The computer looks at the gesture data through various sequential statistical regressions, similar to a neural network. If the data match a gesture, then the associated word or phrase is spoken through a speaker

Many of the sign language translation devices already out there are not practical for everyday use. Some use video input, while others have sensors that cover the user's entire arm or body," said Pryor, an undergraduate researcher in the Composite Structures Laboratory in the Department of Aeronautics & Astronautics and software lead for the Husky Robotics Team. "Our gloves are lightweight, compact and worn on the hands, but ergonomic enough to use as an everyday accessory, similar to hearing aids or contact lenses," said Pryor.

III. SIGN LANGUAGE TO SPEECH CONVERSION USING ARDUINO

Sign language is a natural way of communication between normal and dumb people. Sign language is mostly dependent on hand gesture recognition. It is sometimes not easy for normal people to recognize the signs properly and understand what they want to say. So the intension of the gloves is to make the life style of the dumb and deaf people easy. The gloves translates the hand gestures to text and further speech so that the normal people can read the recognized gesture and hear to the voice and understand what that person wants to tell, which will make thecommunication more efficient. The system consists of both physical and non-physical communication. Sign language differ from country to country it is not universally same. America developed American Sign Language (ASL); British developed British Sign Language and so on. Most of the countries follow the American Sign Language and our system is also based on the same. The gloves convert the specific gestures to text then to speech using Arduino as heart of the system. The flex sensors are used in the system which is attached onto the gloves which convert the gesture into resistance which is further converted to the text through Arduino nano. The flex sensors come from flexible sensors family, which are flexible enough. Along with flex sensors accelerometer and contact sensors are also used for accurate output. The accelerometer is used to monitor the motion of the hand and to monitor the contact between the fingers the contact sensors are used. The selection of the sensors is based on the singes the language is consisting. Some singes are dependent on the movement of palm so to monitor that accelerometer is used while some signs are dependent on the contact of the fingers so to get the specific output if that signs contact sensors are used. The output of the sensors is processed on Arduino nano to get text as an output displayed on LCD. Further that text is sent via Bluetooth module to mobile phones/computers. Further that data is converted to speech via text to speech conversion software. There is no such commercial system available in the market to convert sign language into speech. However research is being made to convert sign to speech and make it portable, efficient and highly accurate.

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The flex sensors are used in the system which is attached onto the gloves which convert the gesture into resistance which is further converted to the text through Arduino nano. The flex sensors come from flexible sensors family, which are flexible enough. Along with flex sensors accelerometer and contact sensors are also used for accurate output. The accelerometer is used to monitor the motion of the hand and to monitor the contact between the fingers the contact sensors are used. The selection of the sensors is based on the singes the language is consisting. Some singes are dependent on the movement of palm so to monitor that accelerometer is used while some signs are dependent on the contact of the fingers so to get the specific output if that signs contact sensors are used. The output of the sensors is processed on Arduino nano to get text as an output displayed on LCD. Further that text is sent via Bluetooth module to mobile phones/computers. Further that data is converted to speech via text to speech conversion software. There is no such commercial system available in the market to convert sign language into speech. However research is being made to convert sign to speech and make it portable, efficient and highly accurate.

V. LIMITATIONS AND PROBLEMS

Project in under testing and yet to be called fully functioning sign to voice converter and the biggest problem is the cost at which it is made. It is around 1 Lakh rupees which cannot be affordable for anyone. This project can eliminate the problem of dumb and deaf but to a certain extent with a high cost which cannot be affordable to all.The biggest problem of the project are the components that are used are if high cost which cannot be acceptable. And the availability of the components at a large number is difficult and won't be easy to implement. As the main aim of the project is to help society and these projects cost a lot and wont be beneficial for society

Scope : We went through all the projects and found the main problem of cost as all the project consisted of similar flex sensor which are at a high cost and are not at all applicable if we want to create help for society we have to eliminate the use of flex sensor which we did by introducing our own combinational circuit which is combination of resistors and metal contact plates which will be connected and deconnected according to the movement of the fingures and will send signal to aurdino for futher processing.

VI. PROPOSED SYSTEM

Gesture vocalizer is a project that can convert sign language to human voice .The main idea of creating this project is to convert sign language of dum and deaf people to understandable human voice available for everyone. Our society is so diversified and we have a community of dum and deaf people who want to communicate with us, want to convey their thoughts towards us but are unable to do so. Hence we came up with an idea of creating a sign to voice converter without using flex sensor.

As the flex sensor cost 1000rs for 1 piece and using 5 can cost a lot and the whole project will definitely go very high and our main aim is to reduce the cost so that we can make things available for the society and encourage our dum and deaf community with us

A. Steps Involve

Combinational circuit and ADXL 345 is used as input to aurdino and output is produced on 16*2 LCD and via HC05 it is is given as output on mobile device using mobile application According to movement in fingers the output of combinational is produced and with calibration of ADXL 345 gyro sensor a combined output is produced and this output is fed as input to aurdino for further processing and producing output on LCD and mobile device. The processing of input is done and according to the curled finger and position of gyro the output is produced which will be further explained this output is then further produced as output on lcd and mobile device in form of sound. The output produced on lcd is used for a person with hearing disability he can perceive the data transferred as sign language and mobile device is used to get data as voice format. The data that is transferred from aurdino is via HC05 and with help of application that is connected via Bluetooth module which is interfaced aurdino. This data is then read as text to speech and then heard as sound. There are many ways to create a application we went through Android studio, and found application to be difficult to handle as we dint had much prior knowledge of installation and operation of software. We went through many tutorial videos our guide to helped us a lot but things where not easy as we felt. Then we moved to flutter. Working with flutter was pretty less complicated as android studio, we went through creating the application but had problem with connecting HC05 with application it had some undetectable problem as is was not compatible. So we had to shift to MIT app inventor Working with MIT was easy as it has many facility working as pick and place and removed many problems we faced before in many other applications. It is never that Android studio or flutter were bad. It was we who where unable to operate. Currently we are working with MIT and soon will be able to complete the work with ease.

Hence the project can be declared as a complete Working project with all hardware, software and application .

VII. IMAGE CAPTURE PERFORMANCE

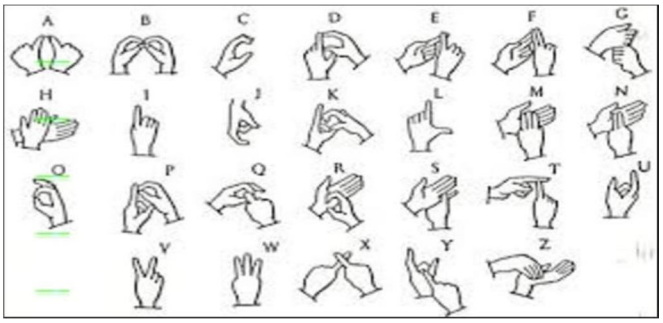


Fig.1 Alphabets

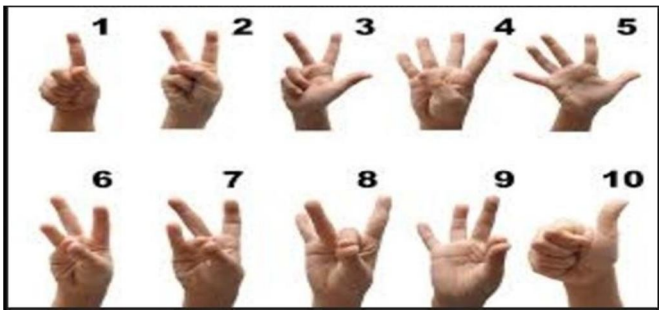


Fig.2 Numbers

VIII. RESULTS

1) *Accuracy of Gesture Recognition:* The system successfully recognized 90% of the intended gestures, with some errors occurring in complex or rapid movements.
2) *Response Time:* The average response time from gesture input to vocal output was 0.5 seconds, indicating real-time performance.
3) *User Feedback:* Participants reported ease of use, especially with simple gestures. However, some found it challenging to perform gestures accurately in noisy environments.

IX. DISCUSSION

1) *Effectiveness:* The high accuracy rate suggests that the combination of sensors (e.g., accelerometers) and machine learning models effectively identifies gestures. This demonstrates potential for real-time communication support.
2) *Challenges:* Gesture Variability: Users may perform the same gesture differently, affecting recognition accuracy. Environmental Factors: Lighting conditions (if using cameras) and background noise can impact performance.
3) *Improvements Needed:* Incorporating adaptive learning algorithms to adjust to individual user gestures.Enhancing hardware for better sensitivity and faster processing.

X. ARDUINO PROGRAMMING

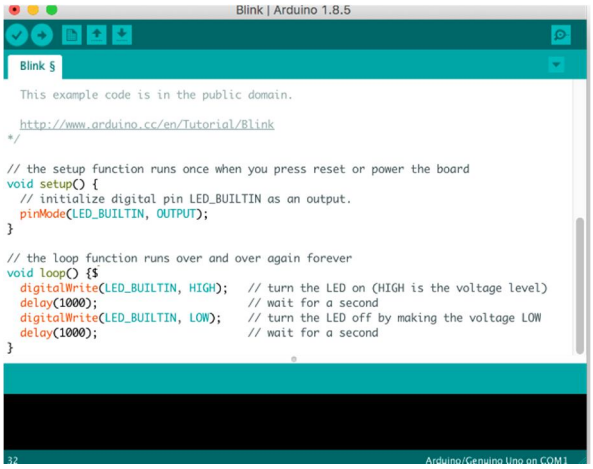


Fig.3 Programming on Arduino Interface

The programming of an Arduino Mega 2560 can be done with the help of an IDE (Arduino Software), and it supports Cprogramming language. Here the sketch is the code in the software which is burned within the software and then moved to the Arduino board using a USB cable. An Arduino mega board includes a boot loader which eliminates an external burner utilization to burn the program code into the Arduino board. Here, the communication of the boot loader can be done using an STK500 protocol.When we compile as well as burn the Arduino program, then we can detach the USB cable to remove the power supply from the Arduino board. Whenever you propose to use the Arduino board for your project, the power supply can be provided by a power jack otherwise Vin pin of the board

A. Download & install the Arduino environment (IDE)

If you just got your Arduino Uno board, you'll first have to install the Arduino IDE (Integrated Development Environment) on another computer. The code is typed into the IDE and sent to the Arduino via a USB cable.

Visit arduino.cc to download the most recent Arduino IDE version for your computer. There are different versions for Mac, Windows, and Linux OS.

At the download page, click on the "Installer" option for the easiest installation then Save the .exe file to your disk drive. Open the .exe file.

Click the button to agree to the licensing agreement

Decide which components to put in, then click "Next" Select which folder to put in the program to, then click "Install"

Wait for the program to complete installing, then click "Close"

B. Launch the Arduino IDE

After your Arduino IDE software is downloaded, unzip the folder. To do so, double-click on the Arduino shortcut on your Desktopt.

The IDE will open up and you'll see the code editor.

1) If needed, install the drivers: If you used the Installer, it'll install drivers automatically as soon as you connect your board.

2) Connect the board to your computer via the USB cable: To power up your board, connect your Arduino board with the pc via USB cable. The green color power LED should glow on the board.

3) Select your board: Next, make sure the software is ready up for your particular Arduino board. Go to the "Tools" computer menu from the menu bar. Select the "Board" option and another menu will appear, where you'll select your Arduino model from the list.

XI. HARDWARE CONSTRUCTION AND WORKING

At the input end we have used combinational circuit along with ADXL 345 Gyro sensor which will be operating to generate signal language to signals which will be understandable for aurdino. The output of aurdino is fed as input to 16*2 LCD and via HC05 it is transferred to mobile device using our created Application. It will convert the incoming text to the application into voice format which will be further processed.

XII. WORKING

Case1:- If there is a condition when first four fingers are curled and thumb is raised straight then aurdino gets the input signal as (00001) along with the deflection in the Gyro sensor if any movement is observed and according to both signal input is fed to aurdino. The input signal to aurdino is calibrated with the series of data streams that are fed during programming we can feed as many as signals, every signal will be corresponding to movement of fingers position and gyro position, introduction of gyro has increased the amount of data that can be processed and can be detected on the LCD and similar data is available on application that we have created and converted as voice form.

Case 2:-If there is a condition when first four fingers are curled and thumb is raised straight then aurdino gets the input signal as (00001) along with no deflection in the Gyro sensor if any movement is observed and according to both signal input is fed to aurdino, this data will be different from previous signal as there is no deflection in gyro. Accordingly we can create tons of signals as one signal can be linked with ample of gyro signals and which will be further transferred and can solve the problem of sign to voice conversion

This is just working of hardware we will understand working of Software and application in later part

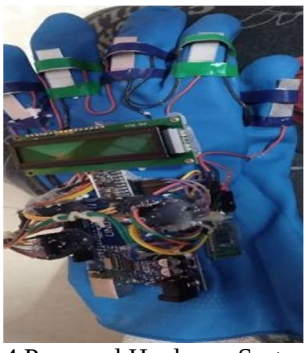
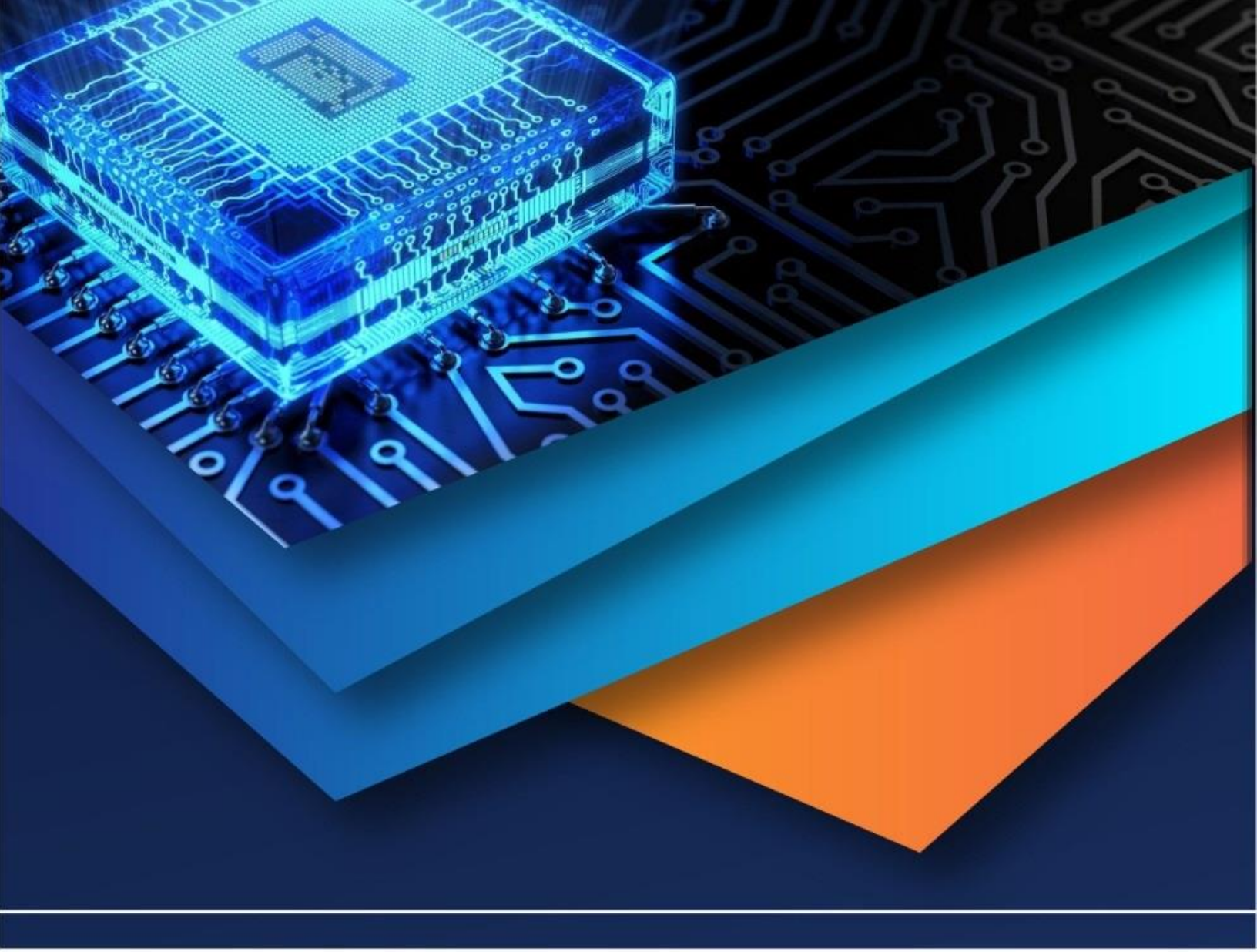


Fig.4 Proposed Hardware System

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