Design and implementation of a sign-to-Speech/text system for deaf and dumb people

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Abstract

This paper shows an approach for outlining and executing a savvy glove for hard of hearing and unable to speak individuals. There have been a few looks into done keeping in mind the end goal to locate a less demanding route for non-vocal individuals to speak with vocal individuals and convey what needs be to the hearing scene. Advancements have been made in gesture based communication yet basically in American Sign Language. This exploration plans to build up a communication via gestures interpreter in view of savvy glove interfaced remotely with microcontroller and content/voice showing gadgets. An approach has been created and modified to hear the gesture based communication. The entire framework has been executed, customized, cased and tried with great outcomes.

Keywords: sign language, glove, gesture recognition.

1. Introduction

The major issue for the not too sharp group is clearly the trouble in speaking with vocal individuals. These individuals impart by means of communication via gestures; notwithstanding, the principle issue is that the greater part of individuals are not acquainted with gesture based communication and they are not willing to take in this dialect. This produced a thought to propose this venture in which it will definitely encourage and enhance a specialized technique between the non-vocal and vocal individuals. Many investigates have been directed over the most recent ten years to create sign to discourse/content interpreters. The greater part of these depend on PC video quality, which is altogether affected by the encompassing light and circumstance of the actualized camera (determination, centering, arrangement and mechanical-vibration). Such impacts may bring about uproarious pictures that diminish the framework ability to distinguish the sign and perceive the relating meaning. For the most part, the materialness of these frameworks is constrained in dull zones and the client versatility (the client ought to be appropriately arrangement with the camera). Another framework portrayed in [5] presents hand-gloves based sign to discourse/content framework. These frameworks are PC based, which appropriately expands the cost, size and control, and decreases the portability of these frameworks. Additionally, these frameworks are intended for English dialect In this paper, a content/discourse framework for the communication through signing made by us is created. As indicated by the best information of the
creators, there is no business item for our own communication via gestures and this paper is one of the activity investigations around there. The principle favorable circumstances of the created framework, as for others, are its straight forwardness, ease, low power and its full versatility. Likewise, it is a hand-glove based and accordingly it can be utilized even in dull condition, and there is no confinement on the clients development. Moreover, just a single hand is utilized to speak to all signs, which makes it simpler and more agreeable. In this framework, the sign acknowledgment is performed by flex sensors based glove interfaced to Arduino nano. The Arduino nano executes an in-house created program to perceive the sign and actualize relating letters in order vocally and literarily. This is simpler than sign to word interpreter, which vision methods for sign acknowledgment [1]-[4]. The productivity of these procedures relies on upon the needs convoluted framework with a great deal of hand, facial and body signals to pass on the importance [7]. Subsequently, leeway for the proposed framework stresses on its capacity to make an interpretation of sign to letter, which has minimal effort and it can be utilized to speak to more extensive scope of words. Promote, the framework is less difficult and necessities less sensors, and this includes additional diminishment for the cost.

2. Sign Language

A sign language is movements or actions used by people to communicate with others, without using the vocal codes. It combines facial expressions, hand gestures or movement of arms to give the audience an indication of what the person is trying to convey or say. It is well known that, the alphabets contain 26 letters in which each of these letters has its own form. For instance we have utilized the sound of "I need tea or espresso" for "A", "Good day" for "H", "How are you" for "G", "Water" for "C", "Hi" for "B". The parts are interfaced to the microcontroller.

3. Existing System

![Existing diagram of system design](image)

The current framework demonstrates the whole outline of the framework, which incorporates the transmitter side and collector side. In the transmitter side, there are five flex sensors joined to the glove to recognize
the twisting of each finger. The controller utilized as a part of the transmitter side is Arduino NANO interfaced with RF transmitter. The transmitter is utilized to transmit the signs to the recipient.

The flex sensors and RF transmitter are interfaced with the microcontroller. In the collector side, there is a RF module to get the signs. The microcontroller utilized as a part of the beneficiary side is Arduino Mega2560. TFT LCD is actualized to show Arabic letters, and the Emic-2 module attempts to deliver the sound through 8 Ohms speaker. EMIC 2 TEXT-TO- SPEECH MODULE is utilized to create the Arabic sound where in EMIC 2 is characterized for English and Spanish letters sounds as per the detail sheets. So the framework did not deliver authentic.

4. Proposed block diagram

![Block diagram of system design](image)

This part presents the system implementation including the hardware and software. The hardware of this system represents the interconnected devices, circuits, modules and micro-systems. The software denotes the developed algorithm and the implemented programming language.

5. Hardware

In the framework configuration, flex sensors are appended to a hand glove, along each finger length, to act as a motion acknowledgment. The yield of the flex sensors will differ with the bowing level of each finger, and the simple yield voltages, which are acquired from these flex sensors, are bolstered into the Arduino nano. A draw up resistor is utilized which delivers the voltage. The ADC highlight in Arduino nano forms these simple flags and changes over them into computerized signals.

In addition, the program put away in the microcontroller will likewise change over the perceived signal into its proportional content data which is coded as letter sets. Then this coded data is exchanged to the Xbee transmitter. Xbee beneficiary gets the coded data and transmits to Raspberry pi. In the Raspberry pi content to discourse change
happens. At that point it is exchanged to the speaker where it makes the flag louder. At long last, the changed over discourse will play out the sound through the speaker.

6. Software

Arduino Software (IDE) was utilized to program the framework. There are two codes, one for the transmitter side and the other one is for the collector side. The stream graphs of the codes are represented in Figures 4 and 5. Figure 4 demonstrates the stream diagram of the product outline in the transmitting side, while the beneficiary side stream graph of the product is appeared in Figure 5. Figure 4 indicates how the code in the transmitter side aids in transmitting the sign which client translates. Once the client demonstrates the signal, the code in the transmitter side checks whether the qualities are in range for the specific letter and on the off chance that it is in range the transmitter transmits, else the code will sit tight for new values and the procedure continues rehashing.

![Flow chart for the software of transmitter](image1)

**Figure 3:** A flow chart for the software of transmitter.

![Flow chart for the software of receiver](image2)

**Figure 4:** A flow chart for the software of receiver

Figure 4 indicates how the code in the beneficiary side works. Once the collector gets an esteem, the code in the recipient side peruses the esteem got and checks whether the letter got meets the prerequisites to be shown like it is the best possible letters in order and after that it will be shown on to the LCD screen and it can likewise read from the LCD after squeezing the push catch for sound. In the event that esteem got is not an appropriate letter
it will dispose of and sit tight for new arrangement of qualities from the transmitter. This procedure will be rehashed the length of there are qualities.

7. Flex Sensors

In this gadget the hand motions are perceived utilizing flex sensor. These sensors are connected to the gloves. Flex sensors are like potentiometer, i.e. variable resistor. The resistance of the sensor changes as per the measure of its bowing, which assistant relies on upon the development of finger. To unequivocally quantify the bowing flex sensor are utilized. The flex sensors have a normal level resistance around 10k ohms. At the point when the sensor are twisted the resistance offered by them increments.

8. Raspberry Pi

The Raspberry Pi is a Visa measured PC that attachments into your TV and a console. It is a proficient little PC which can be utilized as a part of gadgets ventures, and for a large portion of the things that your desktop PC likes, spreadsheets, word preparing, perusing the web, and playing amusements.

![Figure 5: System design of Raspberry pi](image)

the base size SD card we suggest utilizing is 8GB. This will give you the free space you have to introduce extra bundles or make projects of your own. The gadget is fueled by 5V small scale USB. Precisely how much present (mA) the Raspberry Pi requires is subject to what you attach to it. We have found that obtaining a 1.2A (1200mA)
control supply from a respectable retailer will give you sufficient energy to run your Raspberry Pi for most applications, however you might need to get a 2.5A (2500mA) control supply on the off chance that you need to utilize each of the four USB ports on the Models B+/2B/3B without utilizing an outer fueled USB center point. In this venture RASPBERRY PI coded with python dialect and it changes over the content frame into discourse shape.

9. Arduino Nano

![Figure 6: System design of Arduino Nano](image)

Arduino board plans utilize an assortment of microchips and controllers. The sheets are furnished with sets of advanced and simple info (I/O) sticks that might be interfaced to different development sheets and different circuits. The sheets highlight serial interchanges interfaces, including Universal Serial Bus on a few models, which are likewise utilized for stacking programs from PCs. The microcontrollers are regularly modified utilizing a lingo of elements from the programming dialects C and C++. Not withstanding utilizing conventional compiler apparatus chains, the Arduino extend gives an incorporated improvement condition in view of the Processing dialect extend. Arduino is equipment Layout and creation documents for a few adaptations of the equipment are likewise accessible. The source code for the IDE is discharged under the GNU General Public License. By and by, an official Bill of Materials of Arduino sheets has never been discharged by Arduino staff. An Arduino board comprises of an Atmel 8-, 16-or 32-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560), however other producers’ microcontrollers have been utilized since 2015. In this venture Arduino nano is executed both as equipment and programming. In equipment stage it changes over simple flag into advanced flag. In Arduino Software (IDE) was utilized to program the framework.

We will code the letters in order as per the acknowledgment of sign from the flex sensor yield. It will transmit flag to the xbee transmitter. The sheets utilize single-line sticks that encourage associations for programming and consolidation into different circuits. Most sheets incorporate a 5 V direct controller and a 16 MHz gem oscillator or artistic resonator. Arduino microcontrollers are pre-customized with a boot loader that disentangles transferring of projects to the on-chip streak memory. Some serial Arduino sheets contain a level shifter circuit to
change over between RS-232 rationale levels and transistor–transistor rationale level signs. Current Arduino sheets are customized by means of Universal Serial Bus (USB). A few sheets, for example, later-display Uno sheets, substitute the FTDI chip with a different AVR chip containing USB-to-serial firmware, which is reprogrammable through its own particular ICSP header. Different variations, for example, the Arduino Mini and the informal Boardarduino, utilize a separable USB-to-serial connector board or link, Bluetooth or different strategies, when utilized with customary microcontroller instruments rather than the Arduino IDE, standard AVR in-framework programming writing computer programs is utilized.

10. System realization and Testing

For the framework usage the picked glove is from the north face organization which is called glove. This glove is made out of fabric and it is extremely agreeable to wear, likewise, it has a truly unfiathomable preferred standpoint which is that it is touch screen availability, subsequently it can be utilized while utilizing touch screen telephone in our every day lives. The instance of the framework for the beneficiary side is comprised of plastic which gives it light weight to convey along.

The five flex sensors are associated with five 10 kω resistors, which are interfaced with the Arduino NANO in the transmitter side. As can be found in Figure 11, each flex sensor is associated between +5 V Battery and the 10 kω resistor. To make the framework remote we have added xbee transmitter beneficiary module to the transmitter and recipient side which is interfaced straightforwardly to the Arduino. Alongside the xbee module in the beneficiary side, the Arduino Mega 328 to show the transmitting content (see Figure 12). The battery is controlled by a switch. At last, RASPBERRY PI is associated with Arduino Mega 328 to show the sound through 0.5-watt speaker of 8 Ω. Every one of these segments are interconnected and mounted inside a dark walled in area to settle the plan.

Figure 7: Connection of flex sensors.
The last acknowledged framework has been tried and the outcomes were great. Once the individual wearing the savvy glove measurement a letter motion, the speaker yields the voice when the sound catch is clicked.

Figure 8: Final realized system.

11. Conclusion

This paper presents glove-based sign-to-content/voice interpreting framework for hard of hearing and unable to speak individuals. The glove speaks to the gesture based communication letters as a yields a sound through the speaker, which helps in restricting the correspondence boundary amongst tragically challenged with vocal individuals. The critical of the exploration is identified with its intend to help these class of non-vocal individuals to speak with others and enhance their commitments to development and fabricate their countries. The framework has been outlined, customized, executed and tried with a decent outcomes. The framework could be reached out to cover more extensive scope of sign by utilizing a mix of two gloves rather than one.

References