



GESTURE BASED TALKING ASSISTANCE FOR DUMB PEOPLE AND ALTERING THROUGH PHONE CALL

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Abstract:

Communication is the process of exchanging ideas, thoughts, feelings and information in form of verbal or non-verbal message. But for a person who cannot hear is visual, but not auditory. This person lacks the amenities which a normal person owns. The big reason behind this is lack of communication, as deaf people are unable to listen and dumb people are unable to speak [2]. The sign language is an important and only method of communication for deaf-dumb persons. As sign language is a formal language employing a system of hand gesture for communication.

Keywords: Sign language, smart gloves, accelerometer sensor, microcontroller.

1.INTRODUCTION

Each typical person sees, tunes in and after that responds to the circumstances by talking himself out. Individuals, fundamentally the hard of hearing and the imbecilic [4], depend on some kind of gesture based communication for imparting their emotions to others. For the most part idiotic individuals utilize gesture based communication for correspondence, yet they discover trouble in speaking with other people who don't comprehend communication via gestures. Thus, there is a boundary in correspondence between these two groups. This venture intends to lower this obstruction in correspondence. It turns

into the issue for two people who knows two diverse dialects, so it turns into an issue to chat with each other thus they require an interpreter physically which may not be constantly helpful to orchestrate and this same sort of issue happens in the middle of the Normal Person and the Deaf individual or the Normal Person and the Dumb individual [1][2]. The fundamental point of the venture is to build up a financially savvy framework which can offer voice to voiceless. With the proposed work is signalled are changed over into discourse. It implies that correspondence boundary between two unique groups can be made productive.

The use of sign language is not only limited to individuals with impaired hearing or speech to communicate with each other or non-sign-language speakers and it is often considered as a prominent medium of communication. Instead of acoustically conveyed sound patterns, sign language uses manual communication to convey meaning. It combines hand gestures, facial expressions along with movements of other body parts such as eyes, legs, etc. This paper proposes a design for recognizing signs used in ASL and interpreting them. Some of the challenges experienced by speech and hard

of hearing people while communicating with normal people were social interaction, communication disparity, education, behavioural problems, mental health, and safety concerns [3]. The ways in which one can interact with computer are either by using devices like keyboard, mouse or via audio signals, while the former always needs a physical contact and the latter is prone to noise and disturbances [3]. Physical action carried by the hand, eye, or any part of the body can be considered as gesture. Hand gestures are the most suitable and easily interpretable for humans. Here, single handed gesture recognition system is proposed, it uses right handed gestures, and are classified and recognised for the specific character. Static gesture recognition system proposed here does not require any colour code. The sign recognition system proposed, recognizes the signs with great accuracy and with less overheads in features and time.

2. LITERATURE REVIEW

A. Hand Gesture to Speech Conversion using MATLAB

It presents a system that will not only automatically recognize the hand gestures but also convert it into corresponding speech output so that speaking impaired person can easily communicate with normal people. The gesture to speech system, G2S, has been developed using the skin color segmentation. The system consists of camera attached to computer that will take images of hand gestures. Image segmentation & feature extraction algorithm is used to recognize the hand gestures of the signer. According to recognized hand gestures, corresponding pre-recorded sound track will be played [1].

B. Sign Language to Speech Conversion

This work is to develop a system for recognizing the sign language, which provides communication between people with speech impairment and normal people, thereby reducing the communication gap between them. Compared

to other gestures (arm, face, head and body), hand gesture plays an important role, as it expresses the user's views in less time. In the current work flex sensor-based gesture recognition module is developed to recognize English alphabets and few words and a Text-to-Speech synthesizer based on HMM is built to convert the corresponding text [2].

c. Sign Language Recognition System to Aid Deaf-dumb People Using PCA

This paper presents design and implementation of real time Sign Language Recognition system to recognize 26 gestures from the Indian Sign Language using MATLAB. The signs are captured by using web cam. This signs are pre-processed for feature extraction using HSV colour model. The obtained features are compared by using Principle Component Analysis (PCA) algorithm. After comparing features of captured sign with testing database minimum Euclidean distance is calculated for sign recognition. Finally, recognized gesture is converted into text and voice format. This system provides an opportunity for a deaf-dumb people to communicate with non-signing people without the need of an interpreter [3].

D. Full duplex communication system for deaf & dumb people

Sign language is a useful tool to ease the communication between the deaf person and normal person. The system aims to lower the communication gap between deaf people and normal world, since it facilitates two way communications. The projected methodology interprets language into speech. The system overcomes the necessary time difficulties of dumb people and improves their manner. This system converts the language in associate passing voice that's well explicable by deaf people. With this project the deaf-mute people can use the gloves to perform sign language and it will be converted into speech; and the speech of normal person is converted into text and corresponding hand gesture, so the communication between them can take place easily [

3. Design of an Assistive Communication Glove

Hand gesture recognition is a process of translating hand posture and movement into some predefined set of meanings. Automatic hand gesture recognition has been applied in various application domains, for example, surgical skill assessment [1], virtual reality [2], sign translation [3-13] and human-computer interface [14]. The gesture recognition techniques can be classified into three main categories based on the input modality, i.e. vision-based, sensor-based, and a hybrid of the first two techniques. For vision-based techniques, cameras are used as the input devices. The techniques have been successfully deployed several research

studies [11, 12] and a low-cost and widely-used product such as Sony PlayStation Eye [15]. Although images and videos are rich sources of information, the data processing usually requires a complex computation. Challenges in image and video processing include variant lighting conditions, complex background, field of view constraints and occlusion. The sensor-based techniques, especially wireless sensors [1, 7, 16], can provide users with enhanced mobility. The devices are usually more expensive and can be cumbersome in some cases.

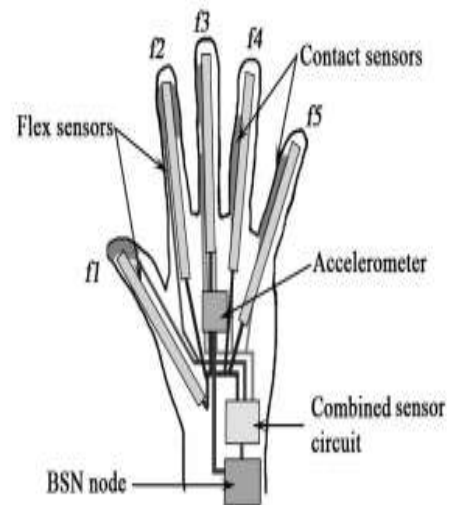


Fig 1. The sensor glove design

In the model, five flex features were first used to separate the ASL finger spelling gestures into 6 clusters of confused gestures. Gestures in each of the confused clusters were then further separated using different sets of selected features. Most of misclassifications in the study occurred in the clusters of {M, N, O, X, S} and {U, V} due to a constraint resulting from the insufficient information in the sensory signals. This paper proposes a new design of

the sensor glove for ASL finger spelling recognition. To enhance the recognition accuracy, contact sensors are added to the glove design. To address issues such as limited number of input/output channels and installation area, the concept of combined sensory channel has been proposed. The new sensor glove has been validated on ASL finger spelling gestures collected from six speech-impaired subjects from the Thungmahamek School for the Deaf and a normal subject. A comparative study of the previous and current versions of sensor gloves is presented based on classifiers trained with different sets of features.

4. BLOCK DIAGRAM:

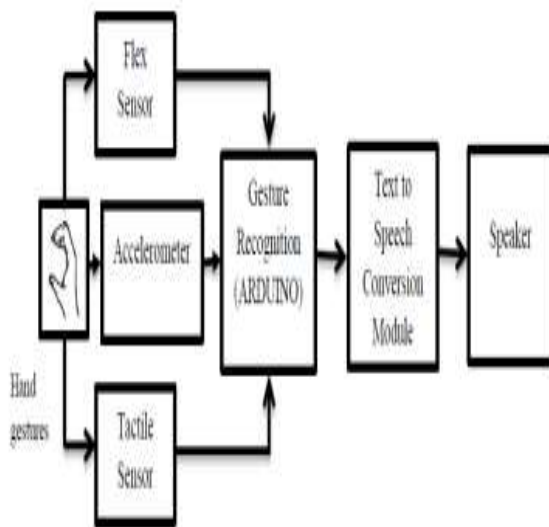


Fig 2 block diagram

The Figure shows the entire block of Deaf-Mute communication interpreter device. The controller used in the device is an Arduino. Five flex sensors are used to measure the degree of bending of the fingers. The flex sensors are interfaced with the controller using the voltage divider circuit. Accelerometer is directly interfaced to the

digital ports as it includes the signal conditioning circuit. Three tactile sensors are used to improve accuracy of letters M, N and T. The device contains two more tactile sensors for training mode and word formations. This is interfaced with the digital ports of controller to feed in the digital data. Arduino processes the data for each particular gesture made. The controller has two modes of operation – training mode and operational mode. In training mode the gesture are made by user and the voltage levels are stored in EEPROM. In operational mode the data is being compared with predefined values and the matched gestures are sent to text to speech conversion module. The module consists of TTS block and SpeakJet. The output is processed and heard via a speaker.

A. ARDUINO WITH BUILT IN ATMEGA 328

Arduino is an open source platform based on simple microcontroller board. The controller used in the device is Arduino duemilanove with inbuilt atmega328 in it. Atmega328 has 32KB on-chip flash memory for storing codes of which 2KB used for boot loader. It also includes a 2KB of SRAM and 1KB of EEPROM. The program that is developed is to be stored on the flash memory of the controller. The Arduino software also includes a serial monitor which allows data to be sent to or from the Arduino board.

B. FLEX SENSOR

Flex sensors are resistive carbon elements. When bent, the sensor produces a resistance output correlated to the bend radius [9]. The variation in resistance is approximately 10 to 30 KOhm's. An unflexed sensor has 10Kohm resistance and when bent the

resistance increases to 30Kohm at 90o [3]. The sensor is about ¼ inch wide, 4-1/2 inches long.

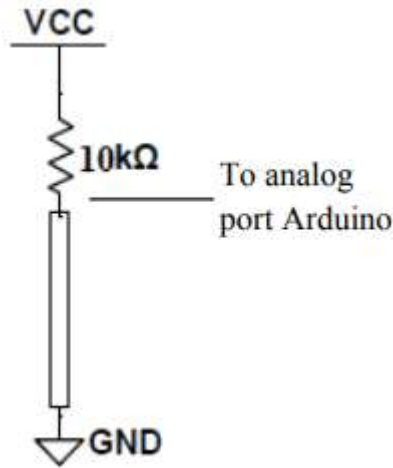


Figure 3. Voltage divider circuit

The sensor is incorporated in device using a voltage divider network. Voltage divider is used to determine the output voltage across two resistances connected in series i.e. basically resistance to voltage converter. The resistor and flex forms a voltage divider which divides the input voltage by a ratio determined by the variable and fixed resistors.

C. TACTILE SENSORS

A tactile switch also known as momentary button or push-to-make switch is commonly used for inputs and controller resets. These types of switches create a temporary electrical connection when pressed. One pin is supplied with +5 volts and the other pin is grounded. This is connected to the digital pin of Arduino. Output is grounded as switch is pressed and high otherwise.

D. ACCELEROMETER

Accelerometers are used for tilt sensing. They measure both static and dynamic acceleration. The sensor has a g-select input which switches the accelerometer between ± 1.5g and ±6g measurement ranges. It has a signal conditioning unit with a 1-pole low pass filter, temperature compensation, self-test, and 0g-detect which detects linear free fall.

E. TEXT TO SPEECH CONVERSION

The translator consists of text to speech module that allows the device to translate the gesture once recorded. The encoder (TTS256)-synthesis (SpeakJet) pair includes text to speech modality without loading microcontroller. The output text of Atmega 328 is converted to sound by TTS. The TTS256 is a 28 pin DIP, 8 bit microprocessor programmed with 600 letters to sound rules. The built-in algorithm allows real time translation of English ASCII characters to allophone addresses. This is used along with SpeakJet to facilitate text to speech conversion.

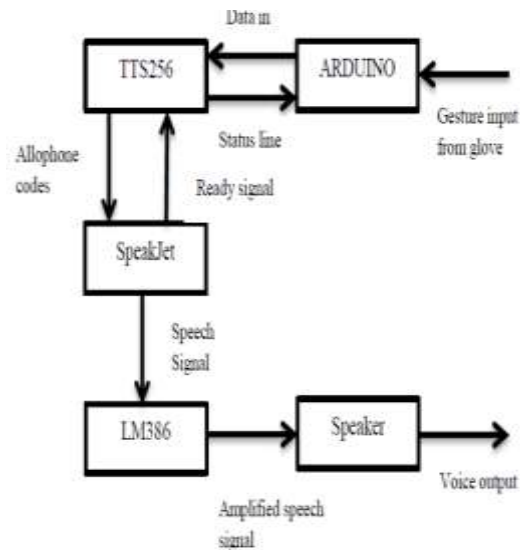


Figure 4. Block diagram of speech synthesizer

The technique behind TTS256 is that it accepts serial data ASCII characters and translates to syllabic sounds. SpeakJet generates an audio signal using five sine-synthesis generators for the allophones. A ready signal is sent from SpeakJet to TTS to indicate its ready state. The output from SpeakJet is amplified using LM386 audio amplifier. The voice output is through a speaker.

5. EXPERIMENTAL RESULTS

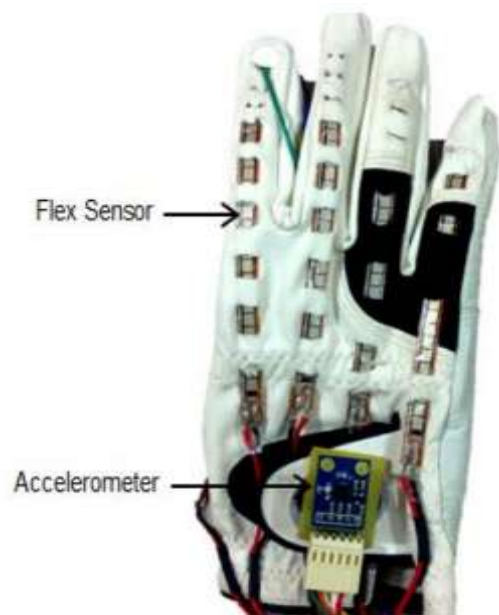


Fig. 6. Sensors Mounted Glove

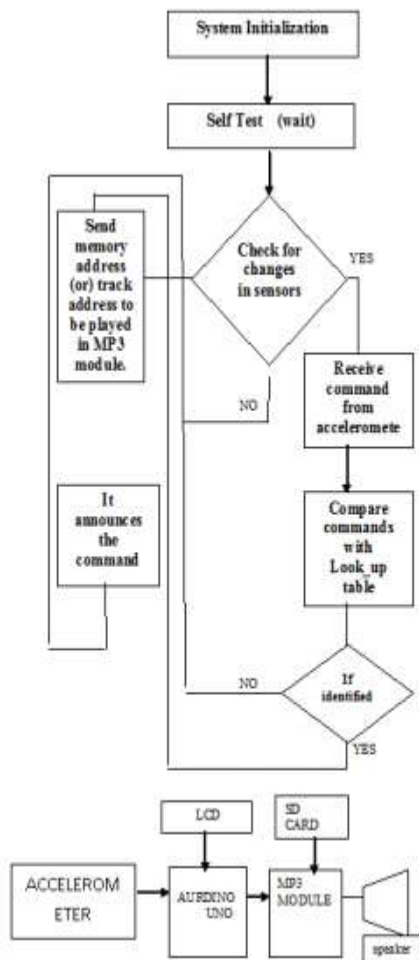


Fig 5. Flow chart

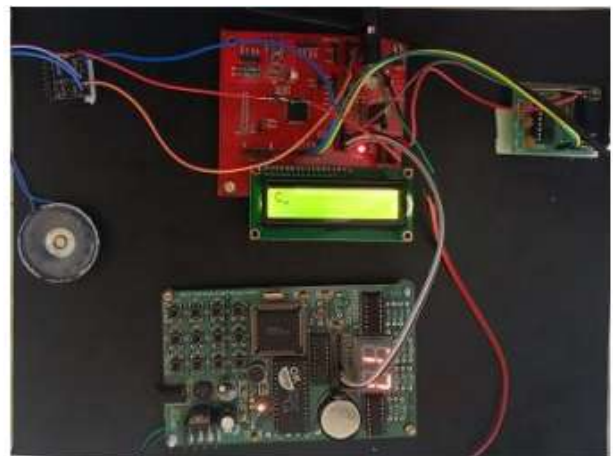


Fig. 7. Experimental setup

The voice recognition module which is speakerdependent module will send the id to the microcontroller which in turn helps in displaying the output that will be a full duplex communication.



Fig. 8 Training Mode —Gesture A



Fig. 9 The Training Mode —Gesture C

CONCLUSION

The project proposes a translational device for deaf-mute people using glove technology. The proposed technique has enabled the placement of five flex sensor, 5 tactile sensors and an accelerometer on to a glove. The results demonstrate that sensor glove design with tactile sensor helps to reduce the ambiguity among gestures and shows improved accuracy. Further the device will be an apt tool for deaf-mute community to learn gesture and words easily. The project can be enhanced to include two or more accelerometer's to capture the orientation of hand movements once the gesture is made. This will expand the capability to translate larger gestures.

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