

Hetero Motive Glove For Hearing And Speaking Impaired Using Hand Gesture Recognition

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Abstract: Gestures help us decipher meaning in communication. A gesture is a form of non-verbal communication, in which visible body actions communicate particular messages, either in place of or in conjunction with speech. Gestures include movement of the hands, face or other parts of the body. People move their hands while they talk, resulting in gestures. Gesture is even found in individuals who are blind from birth. Thinking of this hand gestures in communication, gives the idea of helping mute people to communicate in the normal way with others. Generally mute people use sign language for communication but they find it difficult to communicate with others who don't understand sign language. This system consists of a glove attached with flex sensors and an accelerometer sensor. With the help of these sensors, the movements of the fingers are captured and the captured information's are processed and the information is fed into the speaker. And to make it as a two way communication, we are capturing the speech of normal person and displaying it on an LCD screen, so that a normal person and a mute person can communicate at ease. We will be using Bluetooth for the signal transmission, incorporating the same with the help of Arduino. This can be easily handled and will be a gift to the mute people.

Index Terms— Arduino, Bluetooth, Glove, Two way Communication

I. INTRODUCTION

Hand gestures are elementary movements of a person's hands and are the atomic communication components representing the thoughts of a person. Evolutionary anthropologists tell us that hand gestures have been used since the beginning of human history and are much older than speech. Moreover, hand gestures are a natural, ubiquitous, and meaningful part of spoken language, and researchers have claimed that gesture and sound form a tightly integrated system during human cognition. The aim of this project is to make the communication process of the hearing and speaking impaired person much easier. They are using sign language for communication. The sign language can be understood only by the people who are exposed to it. The normal people who don't know the sign language find it difficult to communicate with them. This language problem has made them as an isolated group in the society. This project will help to overcome this inequality of our society.

The glove that we are providing will capture the signs which those people are gesturing using flex sensors and an accelerometer sensor and convert this into an audio signal which in turn comes out as a voice message through the speaker. In order to make this communication more efficient

like the communication between normal people, the speech of normal person will be displayed in the LCD Screen. By this way, a mute person and a normal person can communicate in the most efficient way.

II. INDIAN SIGN LANGUAGE

Sign Language is a well-structured code gesture. Every gesture has a meaning assigned to it. Sign Language is the only means of communication for mute people. With the advancement of science and technology many techniques have been developed not only to minimize the problem of mute people but also to implement it in different fields. People, who are not mute, never try to learn the sign language for interacting with the mute people. This becomes a cause of isolation of the mute people. But if we can develop a device to make their isolation disappear, the difference between the normal people and the mute community can be minimized. We have proposed a system which is able to recognize the various alphabets of Indian Sign Language for normal and mute interaction giving more accurate results at least possible time. It will not only benefit the mute people of India but also could be used in various applications in the technology field. Fig 1 describes the gestures made in Indian Sign Language to represent the English alphabets.



Fig. 1: Gesture for Alphabets

III. HETERO MOTIVE GLOVE

Gesture To Speech

The gesture to speech module starts with the glove, which is the heart of the project. It consists of five flex sensors, an LDR and a three dimensional x-y-z axis accelerometer. All these sensors are commercially available and are normally used in our laboratory. The flex sensors are the most critical sensors as most of the letters can be distinguished based on the finger's flexes. This provides two degrees of flexes of the fingers. They are variable resistors. As the flex sensors are bent, the resistance changes in an approximately linear fashion. They are originally six inches long. The accelerometer is used for movement and orientation detection. Specific hand movements are the only way to detect the letters J and Z. The only way to distinguish the letters G and Q is sensing the orientation of the thumb and index finger. The accelerometer comes in handy to the rescue. The purpose of LDR is to distinguish between a set of letters in which the flex sensors are ambiguous. Letters such as R, U and V have only one difference which is the distance between the index and the middle fingers as shown in Fig 2. LDR will help to clearly establish the difference between R, U and V.



Fig. 2

There is a small solder board on the glove which receives all the outputs from the flex sensors. For all the flex sensor outputs, there are two set of headers from the Detection unit that are plugged into two sets of pins on the Glove circuit. The headers and pins provide a clean interface between the glove and Detection unit. In order to disconnect them, only the two sets of headers need to be unplugged.

The idea is to make the glove works in real time. All the twenty six letters can be successfully recognized by detecting the fingers position. Hierarchical detection is fast and stable for most of the letters, but confusion exists among certain group of letters like U and E, V and W, G, Q and L. The ambiguity exists mainly because of two reasons. The flex sensors are too sensitive, so they are sometimes activated when other parts of the hand are moving. Also, because flex sensors cannot be sewed on the glove in their ideal position, and thus cannot be activated for certain letters. By signing carefully and lengthening the de bounce time, the program is able to recognize these ambiguous letters with at most 1 or 2 misinterpretations. The fastest rate we can achieve is about one to two letters per second. Anybody with the ability to see can pick up the glove and learn its usage. After learning, the results will be fairly accurate.

Speech To Text

Voice Recognition, also known as the Speaker Recognition, has two categories: speaker identification and speaker verification. Speaker identification is used to determine which one of the people speaks, i.e. "one out of more election; and speaker verification is used to determine whether a person specified speaks, i.e. "One-on-one recognition". According to the voice of different materials, voice recognition can be divided into the text-dependent and text-independent technology. The text-dependent voice

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recognition system requires speaker pronounce in accordance with the contents of the text. Each person's individual sound profile model is established accurately. People must also be identified by the contents of the text during recognition to achieve better effect. Text-independent recognition system does not require fixed contents of words, which is relatively difficult to model, but is convenient for user and can be applied to a wide range. Voiceprint recognition is an application based on physiological and behavioral characteristics of the speaker's voice and linguistic patterns. Different from speech recognition, voiceprint recognition is regardless of contents of speech. Rather, the unique features of voice are analyzed to identify the speaker. With voice samples, the unique features will be extracted and converted to digital symbols, and then these symbols are stored as that person's character template shown in Fig. 3. This template is stored in a computer database, a smart card or bar-coded cards. User authentication is processed inside the recognition system to identify matching or not.

Speech recognition technology is one from the fast growing engineering technologies. Nearly 20% people of the world are suffering from various disabilities; many of them are blind or unable to use their hands effectively. they can share information with people by operating computer through voice input. The performance of speech recognition systems is usually evaluated in terms of accuracy and speed. Accuracy is usually rated with word error rate (WER), whereas speed is measured with the real time factor. Other measures of accuracy include Single Word Error Rate (SWER) and Command Success Rate (CSR).

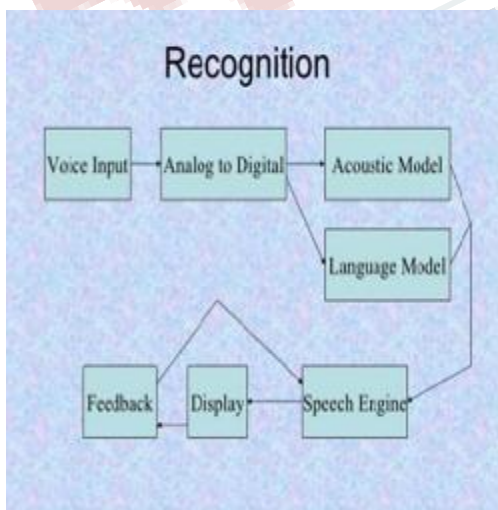


Fig. 3: Speech to Text Conversion

IV. SCOPE

The main target of this project is to help Hearing and Speaking Impaired People. Learning in the same environment as theirs, we have grown to know about their inconvenience while communicating. This had shattered their confidence. It is also making them feel like disabled people. So, this project helps in their communication with normal people. Usage of wireless transmission with the help of Bluetooth module makes the project more advanced one. Two way communication that we are introducing in our project will make the project much easier one to use. As it is easy to handle, there will be a huge welcome for this one. The Hardware Implementaion of this project is shown in Fig.4.

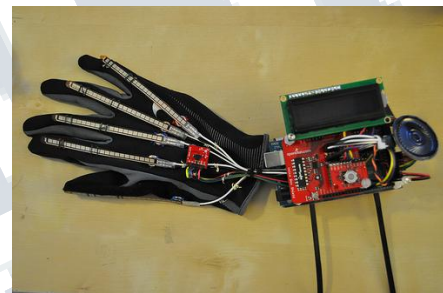


Fig. 4: Hardware Implementation

It is unfortunate that with the ever increasing smart environment still not many applications are available which can be controlled using hand gesture. This idea can provoke many more applications using this hand gesture such as operation of keyboard and mouse in computers, play stations without joysticks and who knows every click and tick can be done with just gestures bringing Human – Computer Interaction to the next level.

V. FUTURE WORK

The present application seems to be feasible and more user friendly in comparison to the traditional input modes but is somewhat less robust in recognition phase. Now the project provides the provision for the usage of mere alphabets. As the process of communication is much more than the alphabets, the future work will hold the usage of frequently used common words. The words in turn will pave

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the way for sentences. Converting each and every sentences used by the mute people in the process of communication will be a greater help to the mankind. Here, the speech of normal people is being displayed as text in English. In future, we can develop it in all vernacular languages. Then, the project will have a much wider audience.

Patel College of Engineering and Technology, Gujarat
Technological University Gujarat, India in 2011.

VI. CONCLUSION

Over the last decade numerous methods for hand gesture taxonomies and representations have been evaluated for the core technologies proposed in the hand gesture recognition systems. However the evaluations are not dependent on the standard methods in some organized format but have been done on the basis of more usage in the hand gesture recognition systems. The potential related to the application of hand gesture recognition systems in day to day life always keeps inspiring the advances required to realize the reliable efficient accurate and robust gesture recognition systems. We have used different sensors for hand gesture recognition in this project in the real time manner. This technique works well in the clear identification of hand gestures of alphabets with some practice. The performance of the proposed method highly depends on the readings obtained from the flex sensors.

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