A Wearable Hand Gloves Gesture Detection based on Flex Sensors for disabled People

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Abstract: A gesture is used to classify and recognize a signal that enables communication among the disabled person. It is a technique that can be use to make people feel convenient similar to the behavior of normal people. In this article, the communication toolkit abide of a gesture recognition kit that further subsist of an audio device and hand Gloves with sensors. The sensor captures the gesture passes it to the display panel where the audio device recognizes and speaks up the gesture making proper two way communication between persons. In this paper, we talk about the use of selective panel that depicts what a concern person want to communicate through various set of images stored in it and then speak out using the device. The need of action is depleted due an in built mechanism that would be much more efficient.

Keywords : Sign Language; Display Panel; Human-Computer Interface (HCI); Flex Sensors; American Sign Language (ASL); Hand Gesture

I. INTRODUCTION

Human Beings communicate and know each other through thoughts, ideas. The best way to present the idea is through speech. Some people don't have the power of speech; the only way to communicate with others is through sign language. The problem with sign language is that it is confined to the people who are also deprived of the power of speech. These people are often termed as deaf and dumb. It is limited to the same set of persons that cannot speak. Deaf and hard of hearing people have the right to choose what they wish to be called, either as a group or on an individual basis. Overwhelmingly, deaf and hard of hearing people prefer to be called "deaf" or "hard of hearing". Nearly all organizations of the deaf use the term "deaf and hard of hearing", and the National Association of the Deaf (NAD) is no exception. The World Federation of the Deaf (WFD) voted in 1991 to use "deaf and hard of hearing" as an official designation. Yet there are many people who persist in using terms other than "deaf" and "hard of hearing".

There are various terms used for deaf and dumb people.

Hearing-Impaired: A term much preferred by hearing people, largely because they view it as politically correct. "Hearing-impaired" is a well- meaning word that is much resented by deaf and hard of hearing people. Deaf and hard of hearing people feel that the words "deaf" and "hard of hearing" are not negative in any way at all.

Deaf and Dumb: A relic from the medieval English era, this is the granddaddy of all negative labels pinned on deaf and hard of hearing people. The Greek philosopher, Aristotle, pronounced us "deaf and dumb," because he felt that deaf people were incapable of being taught, of learning, and of reasoned thinking. To his way of thinking, if a person could not use his/her voice in the same way as a hearing person, then there was no way that this person could develop cognitive abilities.

A. Sign Language

Sign language is a language which is used for communication between the normal people and disabled people. Sign language relies on sign patterns, i.e., body language, orientation and movements of the arm to facilitate understanding between people. In all around the world about 9.1 billion peoples are deaf and dumb. In their day to day life they faced lot more problems on their communication. Sign language is used by dumb people for the means of communication. Sign languages are used to convey different symbols, different objects etc. They also convey combination of words and symbols.

Wherever communities of deaf people exist, sign languages have developed, and are at the cores of local deaf cultures. Although signing is used primarily by the deaf, it is also used by others, such as people who can hear but cannot physically speak, or have trouble with spoken language due to some other disability (augmentative and alternative communication).Sign language varies from country to country with its own vocabulary and grammar. Even within one country, sign language can vary from region to region like spoken languages.

1) *American Sign Language (ASL):* American Sign Language (ASL) is a complete, complex language that employs signs made

by moving the hands combined with facial expressions and postures of the body. It is the primary language of many North Americans who are deaf and is one of several communication options used by people who are deaf or hard-of-hearing. American Sign Language (ASL) is a natural language that serves as the predominant sign language of Deaf communities in the United States and most of anglo phone Canada. Besides North America, dialects of ASL and ASL-based creoles are used in many countries around the world, including much of West Africa and parts of Southeast Asia. ASL is also widely learned as a second language, serving as a lingua franca. ASL is most closely related to French Sign Language (LSF). It has been proposed that ASL is a Creole language of LSF, although ASL shows features atypical of Creole languages, such as agglutinative morphology.

2) *Comparison of ASL with Spoken Language:* In spoken language, words are produced by using the mouth and voice to make sounds. But for people who are deaf (particularly those who are profoundly deaf), the sounds of speech are often not heard, and only a fraction of speech sounds can be seen on the lips. Sign languages are based on the idea that vision is the most useful tool a deaf person has to communicate and receive information. ASL is a language completely separate and distinct from English. It contains all the fundamental features of language—it has its own rules for pronunciation, word order, and complex grammar. While every language has ways of signaling different functions, such as asking a question rather than making a statement, languages differ in how this is done. For example, English speakers ask a question by raising the pitch of their voice; ASL users ask a question by raising their eyebrows, widening their eyes, and tilting their bodies forward. Just as with other languages, specific ways of expressing ideas in ASL vary as much as ASL users do. In addition to individual differences in expression, ASL has regional accents and dialects. Just as certain English words are spoken differently in different parts of the country, ASL has regional variations in the rhythm of signing, form, and pronunciation. Ethnicity and age are a few more factors that affect ASL usage and contribute to its variety. Following figure shows the letter of alphabets in ASL.
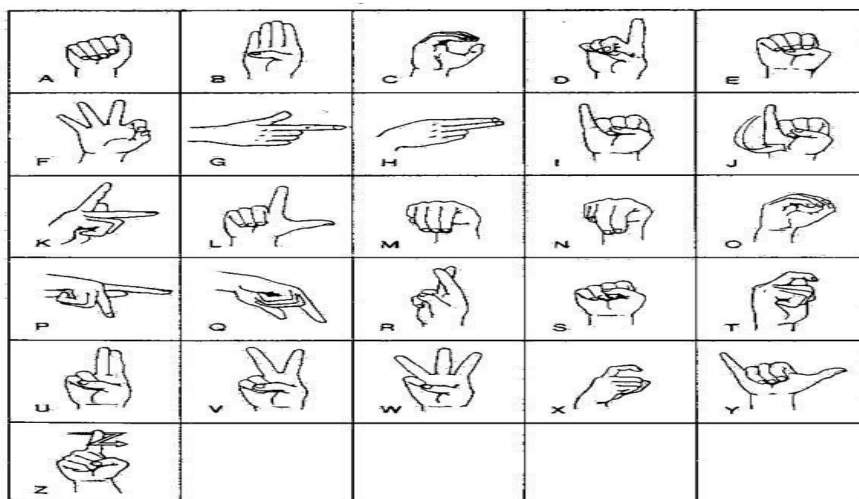

Fig.1.1: The letters of the alphabet in American Sign Language.

B. Hand Gesture Recognition

Gesture is defined as an expressive movement of body parts. Gestures are different postures made by the finger curls and bends. Gestures are the medium for communication. In this system the gestures are the basic necessity which are required as the input.Hand gestures may be static or dynamic.

1) *Static Hand Gestures:* Static hand gestures are fixed with respect to time, these gestures do not depend on motion

2) *Dynamic Hand Gesture:* In dynamic hand gestures movement of some portion of the hand is involved with respect to time. These gestures require motion and are based on the trajectory that is formed during the motion in question.

C. Sign Language Detection Techniques

Technology has reduced the gap between normal people and hearing impaired people through the systems that converts sign language into speech.

These systems can be broadly classified in two types based on the mechanism used to convert sign language into speech.

These are glove based system and vision based system.

1) Glove Based Systems: In Glove based systems, a person sign's while communicating are transferred to the computer using gloves worn on hands. The real time sign is compared with the database that contains all the signs added initially to the system. After matching with the correct sign, the data is transferred to text to sound converter system where the data is converted to sound.

2) Vision Based Systems: In vision based systems a camera is used to track the persons hand and then based on feature extraction, template matching a decision is taken. It is more complex then glove based mechanism.

II. SYSTEM ARCHITECTURE

The figure shows the overall system architecture flow chart. The system will work in two part.
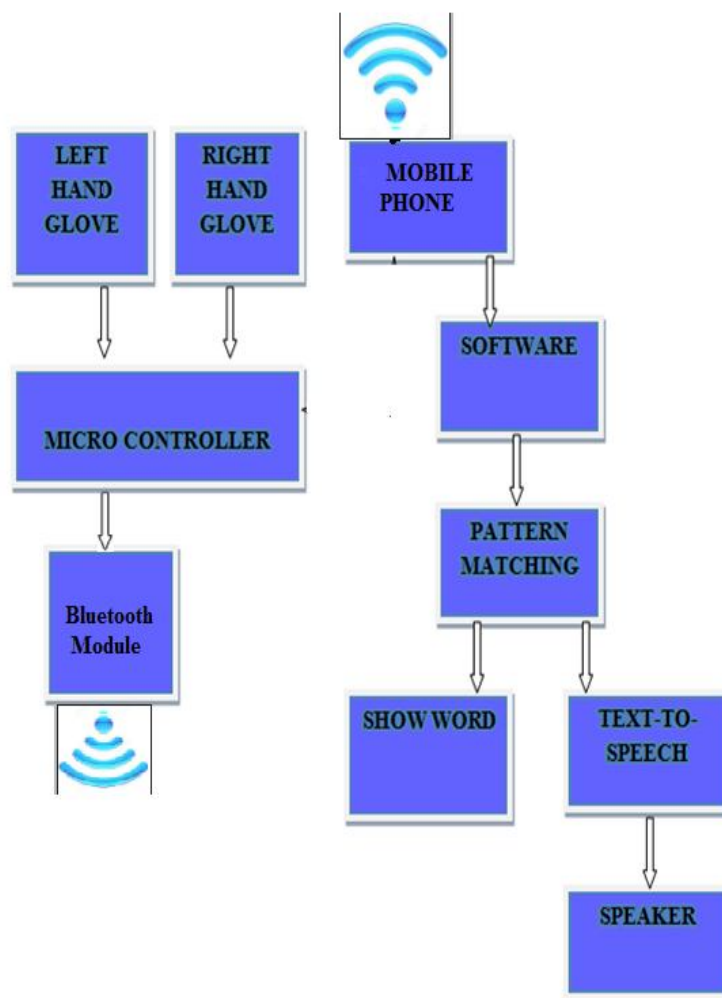

A. Gloves with Microcontroller

The gloves from right hand and left hand by pressing the flex sensors will make one gesture which is detected by microcontroller. The microntroller send one number via Bluetooth module.

B. Android phone with Bluetooth based Text to Speech App

The android application is developed to detect the number. The number is detected and match. According to the number a pre defined sentence is displayed on Screen. The same sentence is speak by using text to speech library.
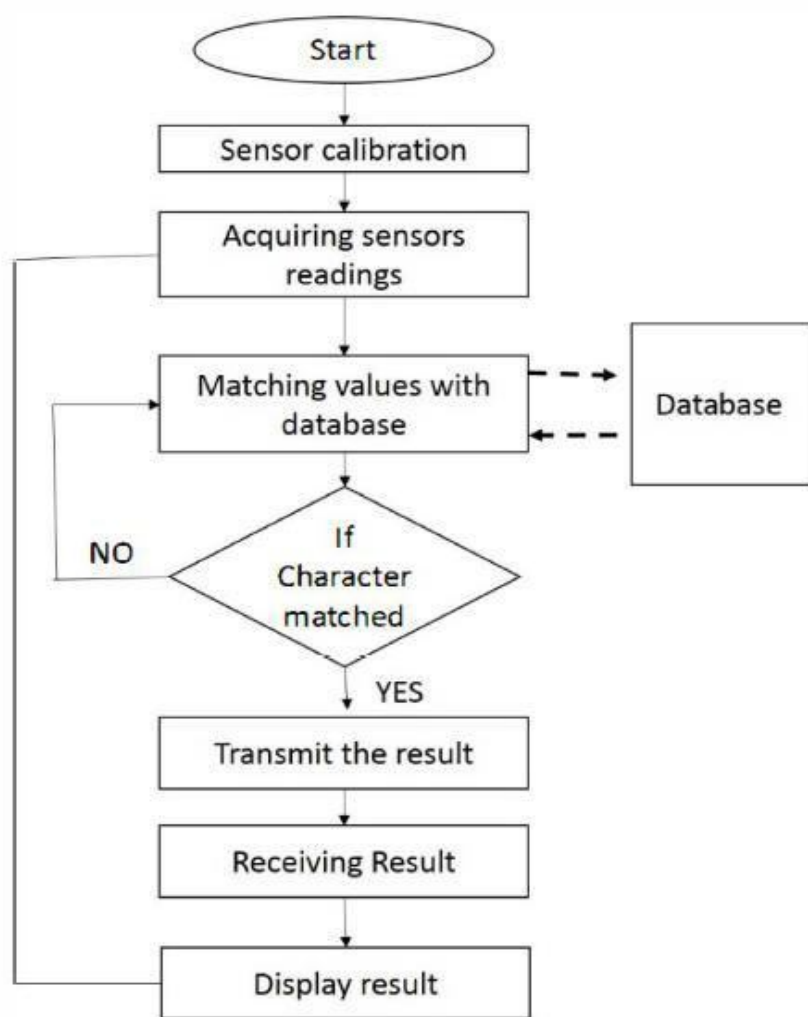
The Flowchart to recognize the alphabets of sign language is shown in Figure. It works on the simple principle that when the device is powered on, the sensors are calibrated. Then the microcontroller acquires the readings from the sensors. The values are matched with a database stored. If the values matches the given letter that is found the character is forwarded to the display unit and the result is displayed and the program stops the process for once else if the character is not matched then the process still goes on and is in the loop till a character is matched from the database.

III. PROBLEM DEFINITION

It was always a serious problem for deaf and dumb people to communicate with each other but somehow they come up with sign language as a solution. Deaf and dumb people face problem in communication to normal person. As for communicating to each other, both need to have knowledge about sign language and this is bit difficult scenario. Normal person can communicate with deaf and dumb people but as they are not aware of all the signs and terminologies it is difficult for them to communicate. Normal speed of any deaf and dumb person of talking is more than normal person after normal person learn sign language. There must be an intermediate system.

IV. PROPOSED SYSTEM

In this system two hand gloves is implemented to capture the hand gestures of a user. The data glove is fitted with flex sensors along the length of each finger . The flex sensors output a stream of data that varies with degree of bend. The analog outputs from the sensors are then fed to microcontroller. It processes the signals and perform analog to digital signal conversion. The gesture is recognized and the corresponding text information is identified. The user need to know the signs of particular

alphabets and he need to stay with the sign for two seconds. There are no limitations for signs it is hard to build a standard library of signs. The new sign introduced should be supported by the software used in the system. These sensors are attached along the fingers . The degree of bending of fingers and thumb produces the output voltage variation which in turn on converting to analog form produces required voice. A pair of gloves along with sensors enables mute people or old people to interact with the public in the required sentence which is very much helpful for them.

How it works
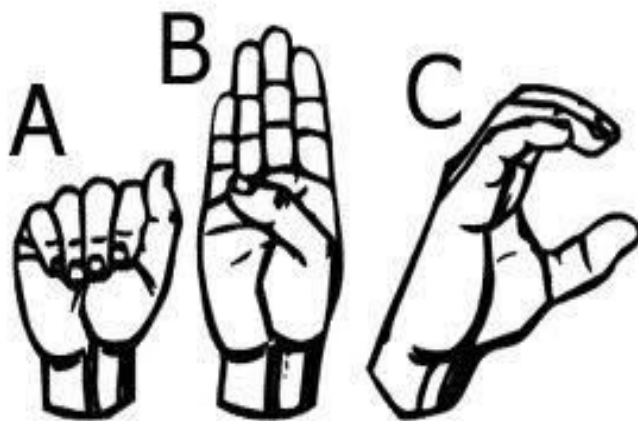
Fig.5.1: American sign language symbols

As per shown in image every word / character has predefined pattern of finger and palm combination. Proposed system is to identify this type of pattern or combinations electronically.

A. Hand Gloves

Flex sensor and microcontroller are mounted w i t h the gloves. These flex sensors are attached with micro controller via jumping cables and data send to android phone via a Bluetooth module.
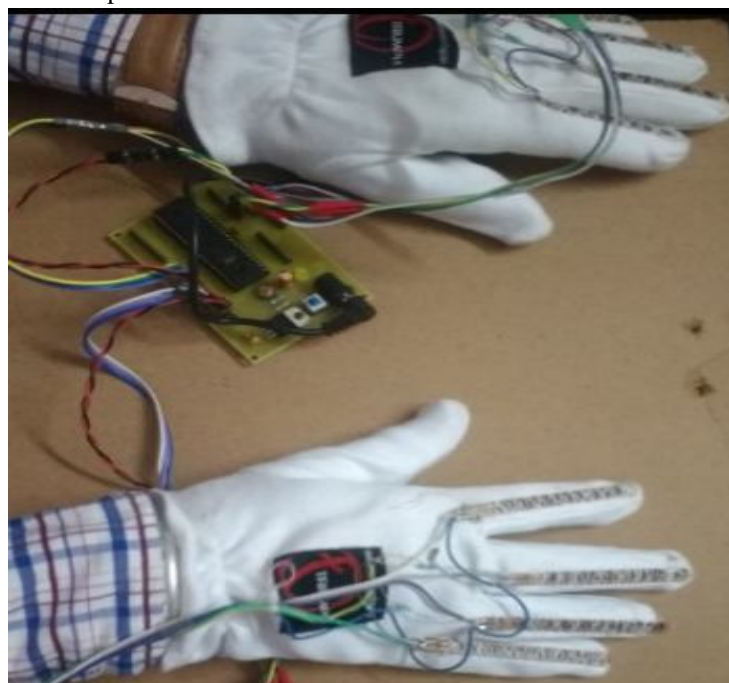

Fig.4.1: Hand gloves

B. Glove Side
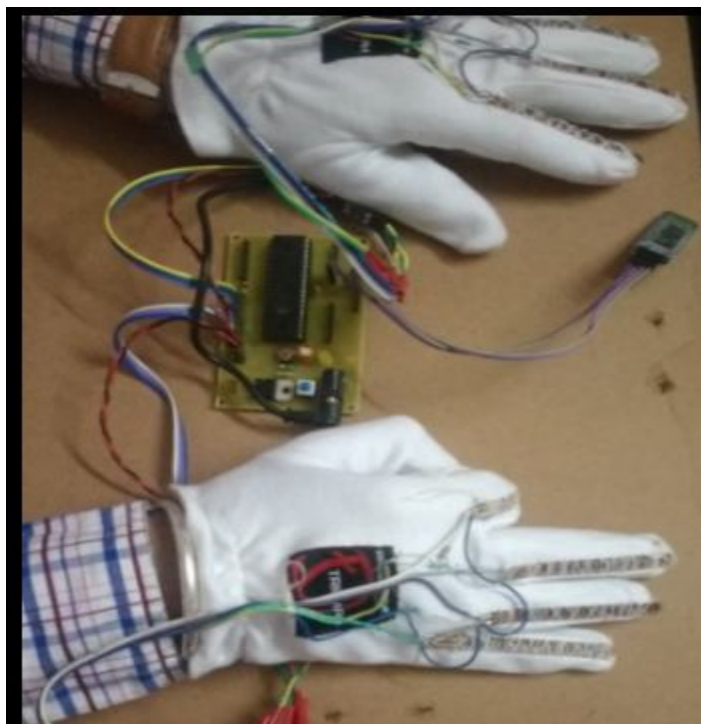
Fig 5.1:Typical picture of the glove
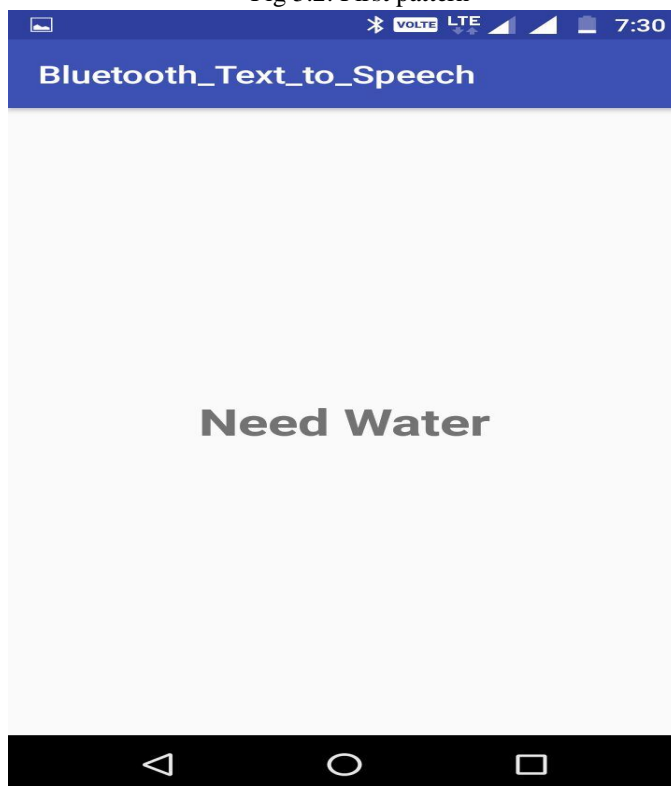

Fig 5.2: First pattern

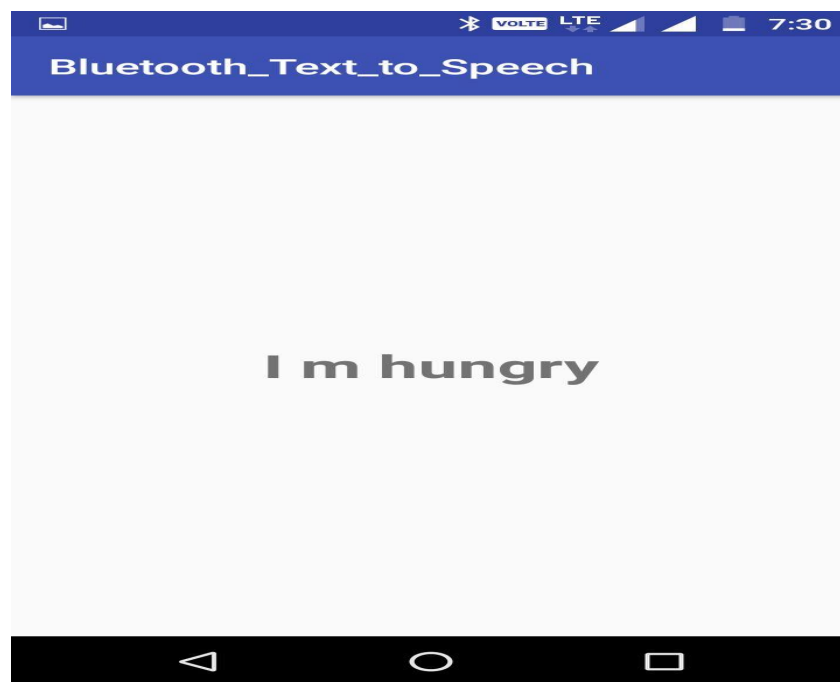Fig 5.3: Second pattern
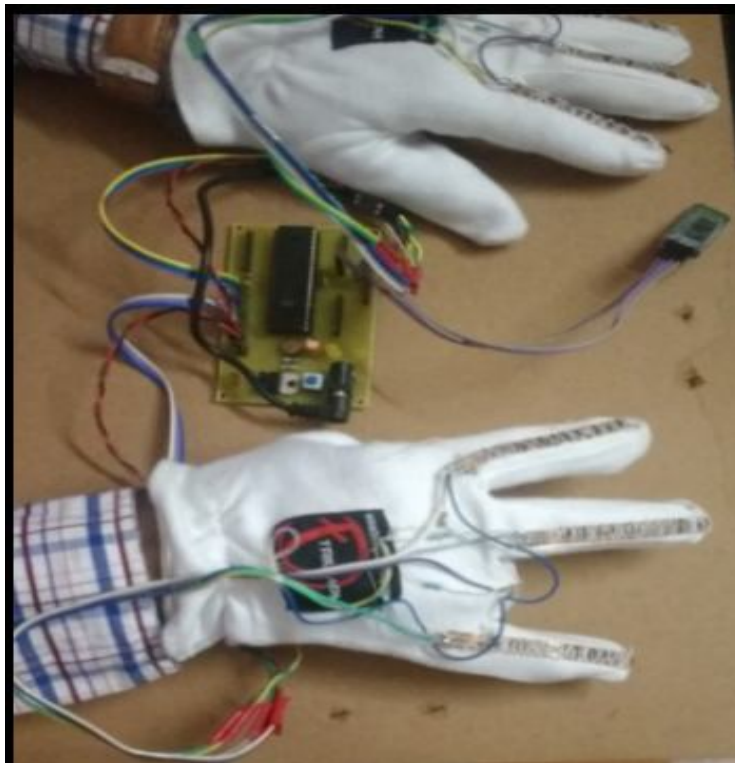

Fig 5.4: Second pattern result
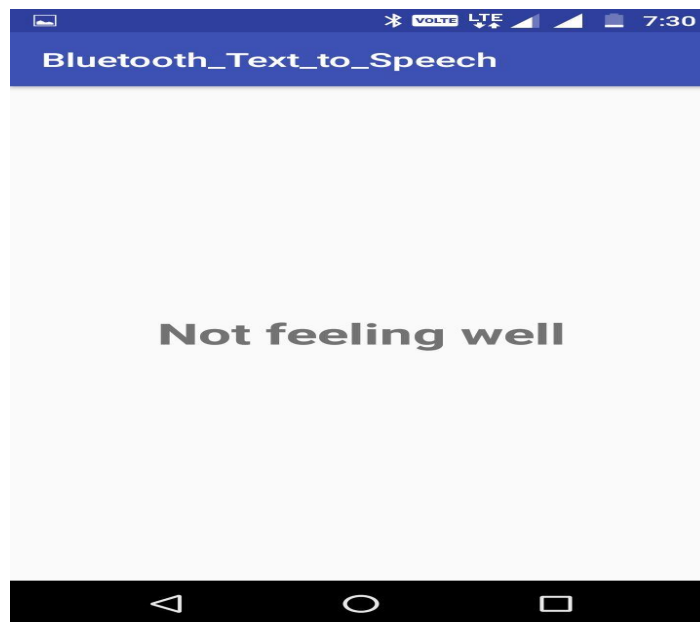
Fig 5.5: Third pattern

Fig 5.6: Third pattern result

V. CONCLUSION

As a sign language is a method to convey the thoughts of Deaf and Dumb people, this system provides the medium which is more reliable and helpful. Here sign gesture gets converted into text and speech so that communication is not limited between

them only, utilizing data gloves communication barrier between two different communities is eliminated. Here, the system converts the sign gesture into text as well as speech, using the Gloves. It also facilitates to add more Gestures into the database. And as , the microcontroller is used which is portable and light weighted which makes deaf and dumb people to carry this glove easily.

VI. FUTURE SCOPE

In this system, more sensors can be embedded to recognize full sign language with more perfection and accuracy. The system can also be designed such that it can translate words from one language to another. To make this system portable user can also run this system through mobile application. Due to this mobile application the system become more flexible for deaf and dumb people because the bulkiness of the system is very less than the previous version.

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