

ASL Recognition Using Smart Glove

Pravin Patil¹, Gaurav Avkirkar², Dnyaneshwar Bhabad³

Department of Computer Engineering, Mumbai University, INDIA

Abstract—The world consists dumb people communities which having the difficulties with communication. These communities have to learn sign language to communicate. The average public does not have the knowledge of Sign Language. So the dumb communities face difficulties for communicating with average public. Here we are trying to solve this problem using the smart gloves which can help with communicating average person. Smart glove is an electronic device that translates sign language into text or speech in order to make the communication feasible between the dumb communities with the normal public. It is a wireless data glove which is normal cloth driving glove fitted with flex sensors along the length of fingers. This also helps normal person to understand what dumb people is trying to say and reply accordingly. The main aim is to develop a cost effective system which can give voice to dumb communities with the help of Smart Gloves which is easy wearable for the dumb community.

Keywords— *Electronic, Flex Sensor, Sign Language, Smart Glove, Wireless.*

I. INTRODUCTION

The world consists much community with the serval disability which differ them from the normal people. In that community the dumb people are also included. The mute people make up to the 72 million of the world's population. Dump person lacks the benefits that a normal person owns. A person with disability is not able to stand in the race of normal person. The reason is lack of communication between dump people and normal people. Many attempts are also made to remove the gap between this communities. This attempts are made using various ideas. One of the idea is using sign language .This dumb community uses special sign language for communication. This sign language consists the moment of hand and fingers. The hand gesture have special moments which are assign for the communication. Unfortunately, most of them normal people not understand their gestures and are unable to identify what is being said by them. Although some data gloves are available in the markets but they are used for gaming and other virtual reality applications. There is no such complete system available in the market for the translation of sign language into speech. Various techniques have been employed in the recent past years. These include visual recognition techniques using image processing which, however, come with their own limitations. Skin colour detection, though a popular strategy used in computer vision based algorithms, which is sensitive to lighting conditions. Moreover, a flexible and progressively adapting model for skin colour recognition is a challenging task. Beside, motion cues limit the gesture to a stationary background.

II. LITERATURE REVIEW

2.1 A Review Paper on Smart Glove - Converts Gestures into Speech and Text [1].

In this paper, smart glove consist of the sensors which are used to detect the hands. The very few attempts are also made in past so gesture can be recognize by using hand, which include camera , leaf switches, copper plate gloves ,and flex sensor gloves. Dumb people with hearing problem use sign language which is based on hand moment and gesture to represent the language, so they can communicate with the communities.

Smart glove is an electronic device that translates sign language into text or speech in order to make communication feasible between two different communities. The mute peoples make up to the 72 million of the world's population according to a report published by a World Federation of the Deaf.

2.2 Sign Detection for Dumb People [2].

In this paper, a gesture based device is proposed for dumb person to communicate with normal person. Dumb peoples uses sign language for communication .But they find difficulty in communicating with others who can't understand sign language. This acts as barrier for communication. So communication becomes difficult for them.

Using smart gloves fitted with flex sensors helps them to convert sign language in text and also given to speakers so audio can be produced. With the help of Smart gloves the gap or bridge between two different communities can be filled up.

2.3 Smart Gloves As A Communication Tool For The Speech Impaired And Hearing [3].

In this paper, in order to shares the thoughts and to communicate with person with disability the communication is the only medium so that they can convey the message to others. But there are lots of issues in communication with the person with disability.

2.4 Hand Gesture Interpretation Using Sensing Glove Integrated with Machine Learning Algorithms [4].

System presented in this paper, is a low cost design for a smart glove that can perform sign language recognition. Hand gesture recognition is an emerging and field having a wide variety of applications, such as human computer interaction, automation control, and computer games.

The glove was built using off the shelf sensors and other hardware. Four different machine learning algorithms were implemented to recognize the signals received from the 11 sensors installed at various locations on the glove. Moreover, more powerful machine learning algorithms are being applied to improve the accuracy of the smart glove.

2.5 Smart Glove with Gesture Recognition Ability for the Hearing and Speech Impaired [5].

This paper uses a smart system which would be able to help hearing and speech impaired person with communication.. The primary goal of this paper is to design a low cost wired smart glove. This system uses the bend sensors which consist of three components as a flexible tube, an infrared sensitive and infrared diode.

Once the system were trained, the glove was tested for each gesture. For the purpose of general purpose gesture recognition we need two gloves with some added circuitry. This circuitry system will help to take data from the moment. The machine learning algorithm used helps the user to define his own symbols according to his convenience and achieve high accuracy.

2.6 Smart Glove for Sign Language Communications [6].

In this paper, advance gesture recognition or sign language detection system is proposed to bridge this communication gap; each flex sensor is treated as a variable resistor, with the resistance increasing as the flex sensor is bent. The data collected from the flex sensors and gyroscope is a simple range of analog values. Thus, smart glove technology has and can possibly have many applications in near future.eg home automation.

This is quite a challenge as knowledge of sign language is known to people in very limited circles, usually family members of the deaf and mute community. Not every person can understand and comprehend sign language based communication. As a solution to this problem, a sign language recognition system is implemented.

2.7 Missing sense a smart glove for sign to speech/text conversion [7].

In this paper, the main focus is to make the communication easy for those people who do not speak. Any kind work that requires more than one person can only be successfully done with communication, but for a person with hearing and speaking disabilities, this becomes the difficult task. Sign language is a medium which facilitates communication between people with speaking and hearing disabilities. It makes use of a variety of hand gestures and signs based on the movements of the palms and the fingers, which correspond to the different letters of the alphabet, helping deaf and dumb people to communicate.

The aim of project was to develop a wearable electronic device which recognizes the hand gestures using Flex sensors and translate into an audio output. The objective of the proposed project was to develop a cost efficient system which will enable the deaf and dumb people giving them voice with the help of smart gloves.

2.8 Flex Sensor Based Hand Glove for Deaf and Mute People [8].

In this paper, a sign language recognition system was implemented, which could assist communication by translating their gestures into the meaningful English letters.. It is necessary to have an gesture recognition or sign language detection system like smart glove to bridge this communication gap of two different communities.

Each flex sensor is a variable resistor. As the flex sensor is bend the resistance is increased. The data collected from the flex sensors and gyroscope is a simple range of analog values. Thus, smart glove technology has and can possibly have many applications in near future.eg home automation.

2.9 Implementation Paper on Sign Language Using Flex Sensor [9].

In this paper, the proposed system consisting of flex sensors to take input from different gestures through gloves, microcontroller to convert input analogue data to digital data and for further processing, power supply to provide voltages to specific units, and finally Bluetooth module to send the data from controller to android mobile. helps to classify the sentiment of the text.

The polarity detection algorithm is applied to determine the overall sentiment of the sentence. Pre-processing in Machine Learning includes removing or avoiding misspellings or slang words.

2.10 Smart Speaking Glove-Virtual Tongue for Deaf and Dumb [10].

In this paper, smart speaking glove is proposed for mute community. Generally, speechless person communicate through sign language which is not understood by normal people.

This paper is useful for speech impaired people who will fill the communication gap between deaf or dumb people and normal people. In future it can be used in application like remote handling, smooth traffic control.

2.11 Design and Implementation of a Sign-to Speech/Text System for Deaf and Dumb People [11].

In this paper, an approach for designing and implementing a smart glove for deaf and dumb people is proposed. There have been some researches has done to find an compatible way for mute people to communicate with normal people Developments have been made in sign language but mainly used in vast amount in America.

According to the best knowledge of the authors, there is no commercial product for Arabic language and this paper is one of the initiative researches in this area. The main advantages of the developed system, with respect to others, are It simplicity, low cost, low power and its full mobility.

2.12 "Two Way Wireless Data Communication And American Sign Language Translator Glove for Images Text and Speech Display on Mobile Phone [12].

In this paper, Sign language uses combination of physical movements, facial expressions gestures and postures to communicate. Unlike verbal or written form of communication sign language is a manual form of communication, when two or more people do not know any common language then they communicate with help of sign language, which is the most primitive and elementary form of communication.

Some models are based on capturing gestures with help of a camera and they have been successfully deployed in gaming purpose for creating virtual 3D environment like Sony play station eye. But using cameras as an input channel will produce different kind of background noises that will be difficult to process.

III. ANALYSIS

The below table is the summary of the studied research papers and the different techniques used on Sentiment analysis of code-mixed text.

**TABLE-1
ANALYSIS TABLE**

Sr. No.	Title	Techniques/modules	Advantages	Limitation
1	A Review Paper on Smart Glove -Converts Gestures into Speech and Text [1]	Using CMOS camera, switches based glove, Copper plate based glove ,Flex sensor based glove.	It removes the gap between two communities.	Inconvenient for both communities.
2	Sign detection for dumb people [2]	Flex Sensor, LCD, Microcontroller and TTS module	The glove based system is cheap than other.	The implantation is not done with ASL.
3	Smart gloves as communication tool for the speech impaired and hearing impaired [3]	Arduino nano, Flex Sensor, Flex Sensor, Arduino Software, Android Studio	Overview of the work is shown. Work with android	The more modules required in this system..
4	Hand Gesture Interpretation Using Sensing Glove Integrated with Machine Learning Algorithms [4]	Different modules and the classification of algorithms is used for storing data.	The results show that the accuracy of the system is up to 99.3% for well-trained users.	The database collection System analyzing is more difficult.
5	Smart Glove With Gesture Recognition Ability For The Hearing And Speech Impaired [5]	Bend Sensors, Hall Effect Sensor , Accelerometer	It is very cheap than other system	Working of the sensor used in this system is not effective than other sensors like flex sensors.
6	Smart Glove for Sign Language Communications [6]	Sensor Module, Networking Module, Processing Module	Modules used in this system is useful for getting accurate result	It is much more costly to use this type of module
7	Missing sense a smart glove for sign to speech/text Conversion [7]	Arduino Uno, Flex Sensors, and other Modules.	The working of UNO is explained in this paper.	This system has been implemented on Windows platform.
8	Flex Sensor Based Hand Glove for Deaf and Mute People [8]	Finger Bending Analysis, and other sensors.	Working can be done with provided system	This system need specialized software for output
9	Implementation Paper on Sign Language Using Flex Sensor [9]	Arduino Uno, flex Sensor	This system shows correct result from the fitted data.	The word not been presented.
10	Smart Speaking Glove-Virtual tongue for Deaf and dumb [10]	Flex sensor, ATmega328, Speech module , 16x2 LCD.	Magnevation Phrase Translator for speak jet is used.	Magnevation Phrase Translator make it complicated.
11	Design and Implementation of A Sign-to-Speech/Text System for Deaf and Dumb People [11]	Flex sensors, Arduino Nano, R F module, Arduino mega	It represented Arabic language on display.	This system did not cover wide range.

12	Two Way Wireless Data Communication and American Sign Language Translator Glove for Images Text and Speech Display on Mobile Phone [12]	Flex sensor (6), AVR-2560 Microcontroller.	Use of sixth flex sensor on the wrist eliminates the use of accelerometers.	Word are not implementd.
----	---	--	---	--------------------------

IV. PROPOSED SYSTEM

Proposed system is on glove based system devices for hand which recognize the gesture and the moments of the hand and fingers. The extra sensors make it easy for the gathering the data as the various values and reframing it. Our design, described in this report, combines flex sensors, accelerometers and modules to capture all aspects of the hand movements during gesture formation. The information from the sensors is fused together and send to the microcontroller. Another attractive feature of our glove is that it is user friendly and easy to wear.

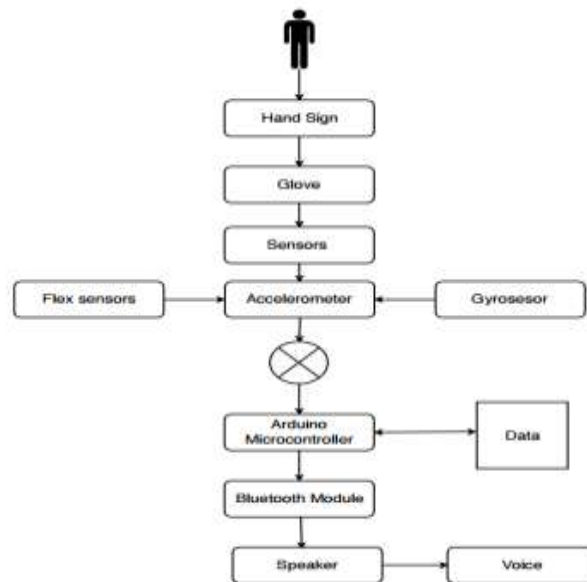


FIGURE 1. System Flow Diagram For ASL Recognition Using Smart Glove.

V. CONCLUSION

Making a communication bridge a accurate and cost effective with the help of smart glove designed for deaf and dumb people. The previous attempts done are mostly done with the help of the camera module. The glove is capable of translating their sign language gestures into speech. Smart glove uses the Principle Component Analysis to classify the real time input data for feature extraction. The utilization of the benefits of both analog and digital sensors helps in easy debugging of the system. The gloves uses basic electronic devices and readily available sensors which helped in reducing the cost of making the system. It will provide the more reliable, efficient, easy to use and light weight solution to user as compare to other system. This will responsible to create meaning to lives of mute people.

REFERENCES

[1] K. Rastogi, P. Bhardwaj, "A Review Paper on Smart Glove - Converts Gestures into Speech and Text", International Journal on Recent and Innovation Trends in Computing and Communication ISSN: \2321-8169, May 2016.

[2] P. Arunagir , B. Hariharan, R. Ilam mathiazhagan, K.J. Pynadath, S. Narendhiran, "Sign Detection For Dumb People", International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE), APRIL 2016.

- [3] A. Manware, R. Raj, A. Kumar, T. Pawar, "Smart Gloves As A Communication Tool For The Speech Impaired And Hearing", JETIR (ISSN-2349-5162), June 2017.
- [4] A. Ali, A. Mushtaq, A. Memon, "Hand Gesture Interpretation Using Sensing Glove Integrated with Machine Learning Algorithms", International Scholarly and Scientific Research & Innovation 10(11) 2016.
- [5] U. Chouhan, A. Panse, A. Kumar Voona and S. M. Sameer , "Smart Glove With Gesture Recognition Ability For The Hearing And Speech Impaired ",IEEE Global Humanitarian Technology Conference - South Asia Satellite (GHTC-SAS), 2014.
- [6] A. Das, L. Yadav, M. Singhal, R. Sachan, H. Goyal, K.T. Gulati, A. Singh, G. Trivedi, "Smart Glove for Sign Language Communications" IEEE, 2016.
- [7] A. Soni, A.Kardak, "Missing sense a smart glove for sign to speech/text conversion", International Journal of Multidisciplinary Research and Development, July 2016
- [8] A. Mamuni, M.D. Sarwar Jahan, K. Polash and F. M. Alamgir, "Flex Sensor Based Hand Glove for Deaf and Mute People", International Journal of Computer Networks and Communications Security, February 2017.
- [9] N. Kawale , P. Kaspate , H. Vanjari , P. Sarode , "Implementation Paper on Sign Language Using Flex Sensor " International Journal of Innovative Research in Computer and Communication Engineering, IJIRCCCE.2018.
- [10] M.S. Kasar , A. Deshmukh , A. Gavande, P. Ghadage, "Smart Speaking Glove-Virtual Tongue for Deaf and Dumb", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 2016.
- [11] D. Abdulla, S. Abdulla and R. Manaf, "Design and Implementation of a Sign-to Speech/Text System for Deaf and Dumb People", IEEE, 2016.
- [12] D. Bajpai, U. Porov, G. Srivastav, N. Sachan, "Two Way Wireless Data Communication And American Sign Language Translator Glove for Images Text and Speech Display on Mobile Phone", Fifth International Conference on Communication Systems and Network Technologies, 2015.