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# Sign Language Recognition using Smart Glove

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***Abstract:*** ***Gesture-based communication Recognition through innovation has been ignored idea even though an enormous local area can profit from it. There are more than 3% total population of the world who even can't speak or hear properly. Using hand Gesture-based communication, Every especially impaired people to communicate with each other or rest of world population. It is a way of correspondence for the rest of the world population who are neither speaking and hearing incompetency. Normal people even don't become intimate or close with sign language based communications. It's a reason become a gap between the especially impaired people & ordinary person. The previous systems of the project used to involve the concepts of image generation and emoji symbols. But the previous frameworks of a project are not affordable and not portable for the impaired person.The Main propaganda of a project has always been to interpret Indian Sign Language Standards and American Sign Language Standards and Convert gestures into voice and text, also assist the impaired person can interact with the other person from the remote location. This hand smart glove has been made with the set up with Gyroscope, Flex Sensor, ESP32 Microcontrollers/Micro bit, Accelerometer,25 LED Matrix Actuators/Output &, flex sensor, vibrator etc.***

***Keywords: Sign Language Recognition, Flex sensor, Indian Sign Language, American Sign Language, ESP32 bit Microcontroller Embedded System, Networking, Cloud Computing, and Machine Learning/Artificial Intelligence***

## I. INTRODUCTION

Communication is a medium of transferring information and conveying data to each other. Over the centuries, Communication is a way of exchanging data, information, thought and feelings with each other. Indian Sign Language is a standardized and commonly used sign language over worldwide. The people can communicate by using their hand by performing some action with the help of fingers of both the hands, in that no grammar is considered and it can take only common words. In this communication omitted the Articles such as 'a', 'an', 'the' and tense also. For ex, in the English language the sentence is –"I am not a good person", or in sign, language grammar is removed and it's said "Not a good person". advances in a field of Machine Learning, Cloud Computing and other domains make it easy to identify and clarify the pattern of a hand gesture. Smart gloves classify and identify the action of a hand and motions of fingers on a person to person basis. The data of sensors are in form of digital signals, which are combined with a particular value for the identify the word or alphabets, These alphabets use to form a phrase. in that, flex sensors are used to identify the position of the fingers and hands. In a conclusion, by using smart glove speech or hearing person can convey the other world peoples easily. the main purpose of the glove is, to make the impaired people life kind of speech or hearing-impaired folks straightforward

## II. LITERATURE SURVEY

[1] Cao Dong, Ming C. Leu, Zhao Zheng Yin 2015 according to the analysis done that, one out of every five people is having speech or hearing incompetency on this planet is an Indian. In India about more than 1.5 million with hearing-impaired utilize Sign Language as a method of correspondence.[2] Nguyen Dang Binh, Toshiaki Ejima 2006"A new Approach Dedicated to Hand Gesture Recognition "Normal parents of special incompetency or vice versa use a gesture-based conversation with others. However, due to this type of complication an automatic Sign-to-Speech/text language interpretation framework could assist to make more details accessible to the hearing impaired. [3] Kirsten Ellis and Jan Carlo Barca 2012 Neural networks were used to implement an adaptive interface, called Glove Talk II, which contains hand gestures to control the parameters of a parallel formant speech synthesizer to allow a user to speak with his hands. It is used to implement an artificial vocal tract [4] Nicholas Born. 2010, "Senior Project Sign Language Glove Talk II"is a system that translates hand gestures to speech through an adaptive interface. Hand gestures are mapped continuously to 10 control parameters of a parallel format speech synthesizer. The mapping allows the hand to act as an artificial vocal tract that produces speech in real-time. This gives an unlimited vocabulary, multiple languages in addition to direct control of fundamental frequency and volume.

Currently, the best version of Glove Talk II uses several input devices (including a Cyber glove, a contact glove, a Polhemus sensor, and a foot pedal), a parallel formant speech synthesizer, and three neural networks. The gesture to speech task is divided into vowel and a consonant neural network. The gating network and the consonant network are trained with examples from the user. [5] SIGN LANGUAGE RECOGNITION USING MACHINE LEARNING S.Saravana Kumar1 , Vedant L. Iyangar2 1 Professor, Department of Computer Science and Engineering Karpagam College of Engineering, Coimbatore. 2Student, Department of Computer Science and Engineering, Karpagam College of Engineering, Coimbatore.2018A modern learning and translation tool for sign language implemented in Machine Learning can significantly affect the ease of Sign Language Communication. This tool will aim to : Obtain a video feed from the camera Classify and display the equivalent English Alphabet for the American Sign Language Alphabet. [6] "Conversation of Sign Language to Speech with Human Gestures", ISBCC'2015 by Rajaganapathy. S, Aravind. B, Keerthana. B, Sivagami.MNeural networks were used to implement an adaptive interface, called Glove Talk II, which contains hand gestures to control the parameters of a parallel formant speech synthesizer to allow a user to speak with his hands. It is used to implement an artificial vocal tract Glove Talk II is a system that translates hand gestures to speech through an adaptive interface. Hand gestures are mapped continuously to 10 control parameters of a parallel format speech synthesizer. [7] Translating Indian Sign Language to text and voice messages using flex sensors", International Journal of Advanced Research in Computer and Communication Engineering 2015 Vol. 4, Issue 5,by Sachin Bhat, Amruthesh's M, Ashik, Chidanand Das, Sujith. The glove is internally equipped with multiple flex sensors that are made up of "bend-sensitive resistance elements", For each specific gesture, internal flex sensors produce a proportional change in resistance of various elements. The processing of this information sends a unique set of signals to the PIC microcontroller and speak jet IC which is pre-programmed to speak desired sentences. [8] Paul D. Rosero-Montalvo1,2, Pamela GodoyTrujillo1, Edison Flores-Bosmediano1, Jorge Carrascal-Garc´ıa3, Santiago Otero-Potosi3, Henry Benitez-Pereira3 and Diego H. PeluffoOrd´ 2018 o˜nez4"Sign Language Recognition Based on Intelligent Glove Using Machine Learning Techniques" published on 978- 1-5386-59/18/$31.00 ©2018 IEEE. Here in the hardware section of their proposed design has its constituent electronics components as a bend sensor, hall-effect sensor, accelerometer, and machine learning algorithms used for gesture recognition. The bend sensor output is fed to the analog multiplexer (HEF4051 by NXP semiconductors. [9] Abhinandan Das, Lavish Yadav, Mayank Singhal, Raman Sachan, Hemang Goyal, Keshav Taparia RaghavGulati, Ankit Singh, Gaurav Trivedi 2016 "Smart Glove for Sign Language Communications" Indian Institute of Technology Guwahati, Assam 781039, India. Published on 978-1-5090-4291-3/16/$31.00 ©2016IEEE. The mapping allows the hand to act as an artificial vocal tract that produces speech in real-time. This gives an unlimited vocabulary, multiple languages in addition to direct control of fundamental frequency and volume. Currently, the best version of Glove Talk II uses several input devices (including a Cyber glove, a contact glove, a Polhemus sensor, and a foot pedal), a parallel formant speech synthesizer, and three neural networks.

[10] Solanki Kumar 2016, "Indian Sign Language using Flex sensor Glove" International Journal of Engineering Trends and Technology (IJETT)vol.4, n0.6 June 2013. In their paper, they have thoroughly scrutinized the previous attempts over the technologies and also suggested various possible ways to implement the design of a simple smart glove. They tried to develop an electronic speaking glove, designed to facilitate easy communication through synthesized speech for the benefit of speechless patients. Gestures of fingers of a user of this glove will be converted to synthesized speech to convey an audible message to others, for example in critical communication with doctors.

## III. PROPOSED ARCHITECTURE

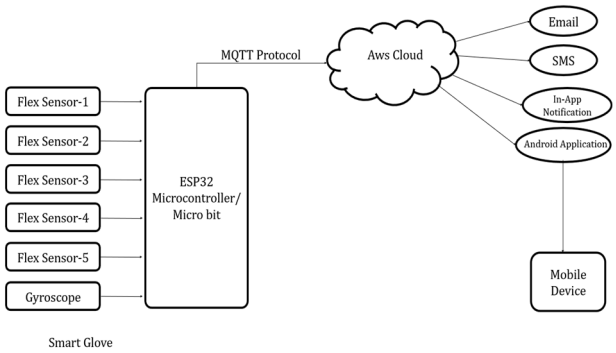
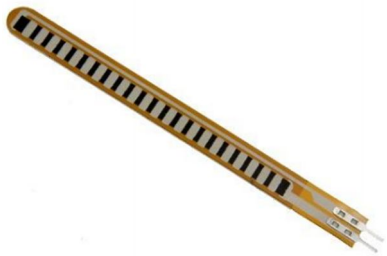



Figure 1 System Architecture

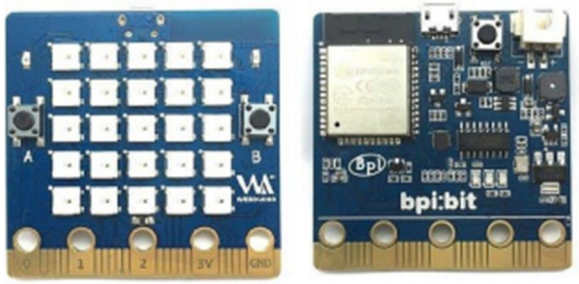
The undertaking work begins from the offers of hand gloves where there are appended flex sensors and at whatever point the sensor encounters bowing the worth of sensors get changed. The changing value of the sensor is depending upon the resistance and applied angle of the bending when we bend the sensor at some angle. we can see the value of the resistance is increased and accordingly the output gets reduced. We are also using a gyroscope to get the exact position of the hand & also implementing a fuzzy logic-based algorithm to predict the word from sensor value. Arduino Nano is applied to capture signals from the connected flex sensors and accelerometer which are placed on the glove. Then that computed output is sent across to display the text message output linked together along with Bluetooth connection to a Computer containing text message to speech combination and output of speech is accomplished. After looking at the changing value of the output, the value gets recorded by the ESP32 controller/Micro-bit and Send on AWS cloud. AWS sends these data to the application in real-time using AWS IoT Core Service with the help of MQTT Protocol.

The Smart Glove is integrated with the following Components:

1) *Flex Sensors:* Flex Sensors measures the total curving and flexing done by the user to communicate with the use of sign language.. Every flex sensor is connected with 10k resistors.



2) *ESP32-Micro-Controller/Micro-bit:* ESP32 microcontroller series is an inexpensive, low-power system that is integrated with the Wi-Fi network and BLE dual mode Bluetooth on a chip microcontroller. And micro bit microcontroller which can be computerized to perform several distinct tasks,. The device features have 25 built-in LED lights and programmable two buttons.




3) *Gyroscope:* A gyroscope is a sensor that can be used to detect or measure the angular velocity which maintains the orientation of an object .
4) *Bluetooth Module:* Bluetooth modules can transmit and receive data wirelessly by using two devices This data is sent in a Bluetooth Module in alphabetical order,numerical values,etc.
5) *Google Cloud & Firebase:* Google Cloud Platform, offered by Google, is a suite of cloud computing services that runs on the same infrastructure that Google uses internally for its end-user products. Firebase is a platform developed by Google for creating mobile and web applications

## IV. MPLEMENTATION

Our system aims for greater recognition of action without training. This makes the system work in public places where there is no long-term training space. Action capture and recognition speed can be adjusted in the app to include both slow and fast ASL performers. Since the glove can only hold the shape of the hand and not the position or movement of other body parts, e.g. arms, elbows, face, etc. therefore only stand out in this project. The symbols of the letters 'j' and 'z' are ignored as they involve body movements. Two custom symbols have been added to the input set. The first is for space between words and the other is for complete position. This is not part of the sign language, but has been added to the English equivalent of the sentence being executed.At the beginning of the operation of the glove by processing the action, after capturing the action then you will receive a message that you will enter in the application, then the action will also show a hand touch or remove failure.

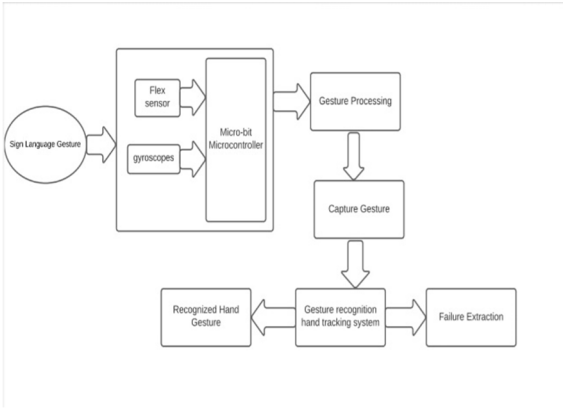



Figure 2 :Internal System Glove

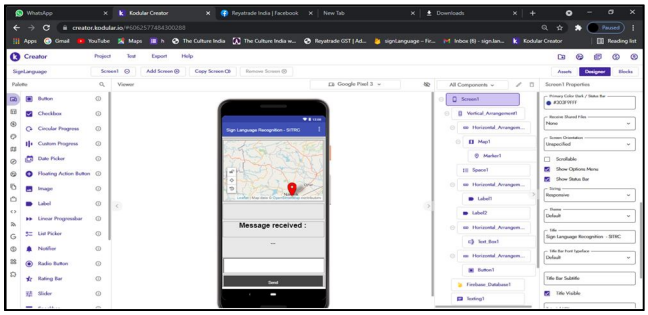



Figure 3 :Internal System Application

In above figure you can see internal system of an application.

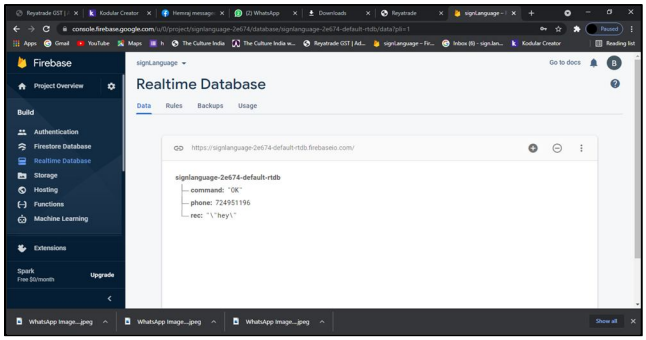



Figure 4: Database representation

In above figure their is realtime database which is fire on cloud its automatically stores and sends messages.

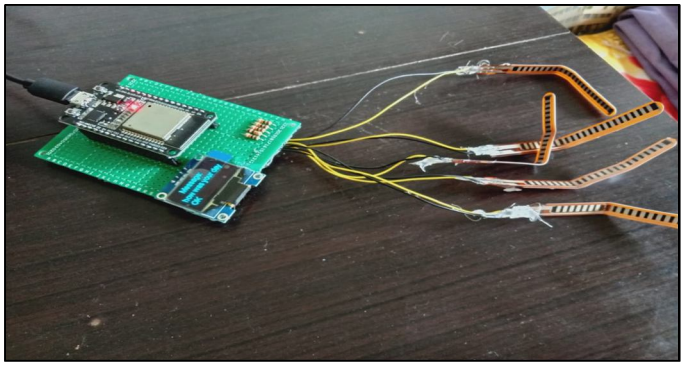


Figure 4: Internal Structure of Glove

In above figure in internal system of glove ESP32 controller interfaced with flex sensors and OLED Screen .The below figure is complete glove ,where the gesture has performed and you can see output messages on OLED Screen.

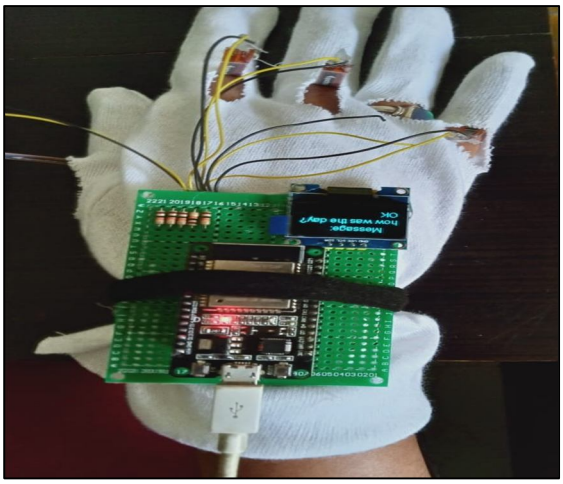


Figure 5: The Complete Glove

The accuracy level of the software was found to be 88%. This figure is low because the training was done on samples of people who did not know sign language and were given a sign-language tract. Therefore, there has been significant variability in the samples. Some samples even provide completely inaccurate sensory reading. Testing is also done for the same type of people.All the system is good to use.

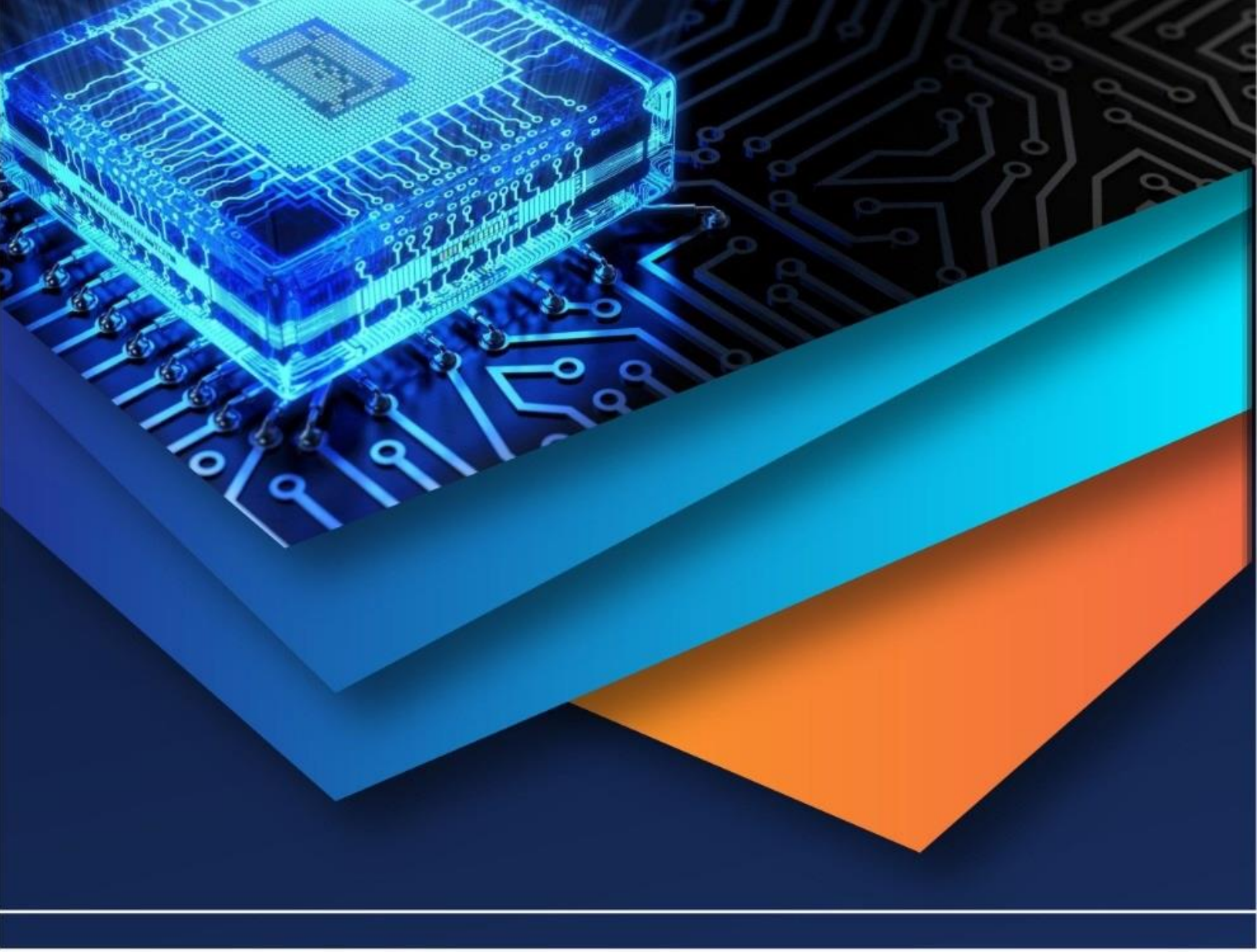
## V. CONCLUSION

"Sign Language Recognition using Smart Glove" is to be one of the beneficial methods of easy communication within the hearing incompetent & speech incompetent people, general society. The gloves area unit is portable with the least weight and less power. The system translates the hand actions to the text. With this hearing, incompetent groups will need the gloves to build gestures in holding with signs. Thus, this system plays an important role for especially impaired people. Shortly, this glove is extended by implementing inbuilt sensors like temperature sensor is worked to calculates the body temperature, the pressure sensor is used for used to see the heartbeat of body.

## REFERENCES

[1] Cao Dong, Ming C. Leu, Zhao Zheng Yin, “American sign language Alphabet Recognition Using Microsoft Kinect", Computer Vision and Pattern Recognition Workshop, IEEE conference, pp:2015http://lemelson.mit.edu/winners/thomas Pryor-and-Navid-azodi. http://www.ijste.org/articles/IJSTEV2I9089
[2] Nguyen Dang Binh, Toshiaki Ejima “A new Approach Dedicated to Hand Gesture Recognition” (Intelligence Media Laboratory, Kyushu Institute of Technology), Japan 2006IEEE int. Conf. on cognitive informatics (icci”06) Y.Y. Yao, Z.Z. Shi, Y. Wang, and W. kinsner (Eds.).
[3] “Conversation of Sign Language to Speech with Human Gestures", ISBCC’2015 by Rajaganapathy. S, Aravind. B, Keerthana. B, Sivagami.M
[4] Wen Gao and Gaolin Fanga,” A Chinese sign language recognition system based on SOFM/SRN/HMM. Journal of Pattern Recognition”.2389-2402,2004.
[5] Nicholas Born., “Senior Project Sign Language Glove”, electrical engineering dept. California Polytechnic State University,1- 49,2010.

[6] Kirsten Ellis and Jan Carlo Barca.” Exploring Sensor Gloves for Teaching Children Sign Language. Advances in Human-Computer Interaction”.1-8.,2012
[7] Solanki Kumar, “Indian Sign Language using Flex sensor Glove” International Journal of Engineering Trends and Technology (IJETT)vol.4, n0.6 June 2013.
[8] “Translating Indian Sign Language using flex sensors to text and voice messages”, International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 5, May 2015 by Sachin Bhat, Amruthesh’s M, Ashik, Chidanand Das, Sujith.
[9] “Hand Gesture Recognition to Speech Conversion in Regional Language ", International Journal of Computer Science and Network, Volume 4, Issue 1, February 2015by B.D. Jadhav, 2 Nipun Munot, 3 Madhura Hambarde, 4 Juli Ashtikar JSPM’s Rajashri Shahu College of Engineering, Pune, India.
[10] “Sign Language to Speech Conversion Using Arduino”, International Journal of Recent Innovation in engineering and Research Scientific Journal ImpactFactor – 3.605 by Yash Jhunjhunwala1,Pooja Shah2,Pradnya Patil3, and Jyoti Waykule Sou. Sushila Danchand Ghodawat Charitable Trust’s Sanjay Ghodwat Group of Insitutions.
[11] Abhinandan Das, Lavish Yadav, Mayank Singhal, Raman Sachan, Hemang Goyal, Keshav Taparia RaghavGulati, Ankit Singh, Gaurav Trivedi “Smart Glove for Sign Language Communications” Indian Institute of Technology Guwahati, Assam 781039, India. Published on 978-1-5090-4291-3/16/$31.00 ©2016 IEEE.
[12] Paul D. Rosero-Montalvo1,2, Pamela GodoyTrujillo1, Edison Flores-Bosmediano1, Jorge Carrascal-Garc´ıa3, Santiago Otero-Potosi3, Henry Benitez-Pereira3 and Deigo H. Peluffo Ordonez 4" sign language recognition Based on Intelligent Glove Using Machine Learning Techniques" published on 978- 1-5386-6659/18/$31.00 ©2018 IEEE.
[13] Neha Rajput1, Mrs Neetu Sikarwar "A REVIEW ON IOT BASED SIGN LANGUAGE CONVERSION" © 2018, IRJET ISO 9001:2008Certified Journal.



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