

**CSE1905 - TECHNICAL ANSWERS TO REAL WORLD  
PROBLEMS**

**(TARP)**

**Project Report**

**TITLE:- ANIMATED SIGN LANGUAGE GENERATION  
SYSTEM**

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**Vellore Institute of Technology**  
(Deemed to be University under section 3 of UGC Act, 1956)

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## **DECLARATION**

I hereby declare that the report titled “**Animated Sign Language Generation System**” submitted by us to VIT Chennai is a record of bona-fide work undertaken by me under the supervision of **Janaki Meena**, School of Computer Science and Engineering, Vellore Institute of Technology, Chennai.

Signature of the candidate

P. SUBHASHRI (19MIA1008)

MADASU DEEPIKA (19MIA1066)

## **CERTIFICATE**

Certified that this project report entitled “**Animated Sign Language Generation system**” is a bonafide work of P. Subhashri (19MIA1008), Madasu Deepika (19MIA1066) and they carried out the Project work under my supervision and guidance for CSE1901 – Technical Answers to Real World Problems (TARP).

Janaki Meena  
SCOPE, VIT Chennai

## **ACKNOWLEDGEMENT**

We would like to acknowledge that our assignment has been completed and I am ensuring that this was done by us and not copied. In this accomplishment, we would like to express our special gratitude to all my teachers and most importantly our principal Mrs. Janaki Meena of Vellore Institute of Technology, without their guidance and feedback it is not possible to complete this project. Finally, we would like to thank my parents and friends who helped me a lot in finishing this assignment.

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MADASU DEEPIKA (19MIA1066)

## **ABSTRACT**

In this paper, it is built up in the sense of high motivation towards helping the physically challenged people. The Deaf and Dumb people really strive hard to make a healthy and easy conversation with the normal people. There are 430000000 number of people with hearing loss in the world. And in India, 63000000 number of people are deaf or hard of hearing. The act of communicating or exchanging information, ideas, or feelings is referred to as communication. Both parties must be able to speak and understand the same language for two people to create communication. Deaf and dumb persons, however, use various communication methods. Inability to hear or speak is referred to as being deaf or dumb. They use sign language to communicate with each other and with everyday people, yet everyday people do not value sign language as much as they should. Communication between a normal person and a deaf or dumb person is challenging since not everyone is familiar with or understands sign language. But on the saddest part, there are only 630000 who knows to speak sign language. So, in view with this problem, we were interested to start working on this title. In our project, we tried to cover up to do the recognition and translation. The text or speech is converted or conveyed in the form of a signing avatar. In this project, we aimed to create a system that would be beneficial for differently abled individuals who struggle with communication when they interact with average people by creating a system that would aid them in expressing themselves clearly and simply. By converting speech or text to sign language animations, our system aids those who have trouble hearing or speaking. The final product will be a 3D animation of a character or person made with the Blender 3D tool. Thus, this will bridge the gap in the communication between the deaf and dumb and the normal people. In future, we would try to work on the opposite case, where the sign language would be converted into text.

## **INTRODUCTION**

Communication is one of the main act of sharing information. We usually share or exchange ideas, words, emotions, feelings, etc. This is one of the basic activity in out day to day life. For establishing communication between two people, both are in need to possess knowledge for understanding the communicating language in common. That is the only way to converse with a person. But in the case of deaf and dumb, their means of communication will be slightly different. They converse or communicate only using the Sign language that is very known for them among themselves. But while communicating with the normal people, this sign language manner would not work in many instances as many of the normal people are not educated in the sign language. They don't even take the importance of this so seriously. So, we carried on working on the topic to break the barrier between them up to some extent. We tried to generate signs for the text they use.. A webpage is built to generate the output in the form of signing avatar. Front-end development, followed by Speech recognition, followed by Text Pre-processing, finally Creating a 3D animation of a character is the work done. In this case, Audio input on a Personal Digital Assistant(PDA). Then, the conversion of audio to text using Google Speech API. Dependency parser for analysing grammatical structure of the sentence and establishing relationship between words. SL Generation takes place, SL of input sentence using grammar rules. Finally, Generation of Sign language with signing Avatar take place. In the webpage that we built, we have 6 available use cases. They are Homepage, Converter, Log-In, Sign-up, Contact, About. This way our project is carried out. The homepage is what has the title, welcome quotes, etc. Then the Converter page is the main area where we the conversion of text or speech (input) into Sign language takes place (output). Then the Log-in and Sign-up pages have some details and formats for getting in to the webpage. Then comes the Contact and About page which contains our details and content that we wished to present. This is the overall map of our project and the webpage. Let's see the detailed process further.

According to 2011 census, in India

- 6.3% of the total population (i.e. 63 million) are suffering from significant hearing loss
- Out of these people, 76-89% of the Indian Deaf have no knowledge of language, either signed or
- spoken/written

Reason behind the low literacy rate can be either of the following

- Lack of Sign Language interpreters.
- Unavailaility of ISL tool.
- Lack of researches on ISL.

## **OBJECTIVE**

Our objective is to help people suffering from the problem of hearing. There have been many projects done on the sign languages that convert sign language as input to text or audio as output. But audio to sign language conversion systems have been rarely developed. It is useful to both normal and deaf people. In this project we introduce new technology that is audio to sign language translator using python. In this it takes audio as input, search that recording using google api, display the text on screen and finally it gives sign code of given input using ASL (Alphabetic Sign Language) generator. All the words in the sentence are then checked against the words in the dictionary containing images and video representing the words. If the words are not found, its corresponding synonym is replaced. Set of gestures are predefined in the system. This system can be implemented in many areas including Accessing Government Websites wherein no video clip for deaf and mute is available or filling out forms online where no interpreter is present to help.



## **LITERATURE SURVEY**

- **STATISTICAL AND SPATIO-TEMPORAL HAND GESTURE FEATURES FOR SIGN LANGUAGE RECOGNITION USING THE LEAP MOTION SENSOR**

The experiments in this work consider the problem of SL gesture recognition regarding how dynamic gestures change during their delivery, and this study aims to explore how single types of features as well as mixed features affect the classification ability of a machine learning model. 18 common gestures recorded via a Leap Motion Controller sensor provide a complex classification problem.

The Drawbacks are, Firstly, the number of chosen raw features prior to extraction was set based on an F-score cutoff point, due to which the quality of the extracted features is less. On the point of feature selection, this study focused on F-scores for comparability, but other methods of selection must also be explored and compared.

- **TOWARDS ZERO-SHOT SIGN LANGUAGE RECOGNITION**

This paper tackles the problem of zero-shot sign language recognition (ZSSLR), where the goal is to leverage models learned over the seen sign classes to recognize the instances of unseen sign classes. In this context, readily available textual sign descriptions and attributes collected from sign language dictionaries are utilized as semantic class representations for knowledge transfer.

The Drawbacks are, First, some of the differences across sign descriptions are subtle, both visually and textually. Second, many dialects exist, even the same sign can be expressed in many different forms.

- **SIGN LANGUAGE RECOGNITION SYSTEM USING TENSORFLOW OBJECT DETECTION API**

In this paper, a method is proposed to create an Indian Sign Language dataset using a webcam and then using transfer learning, train a TensorFlow model to create a real-time Sign Language Recognition system. The system achieves a good level of accuracy even with a limited size dataset.

The drawbacks are, Though the system has achieved a high average confidence rate, the dataset it has been trained on is small in size and limited. The dataset is small hence the system cannot recognize more gestures.

- END-TO-END SIGN LANGUAGE TRANSLATION VIA MULTITASK LEARNING

This paper extends the ordinary Transformer decoder with two channels to support multitasking, where each channel is devoted to solving a particular problem. To control the memory footprint of our model, channels are designed to share most of their parameters among each other.

As this approach is both model and task agnostic, this approach could have also been extended to other language understanding (NLU) tasks using various deep learning architectures.

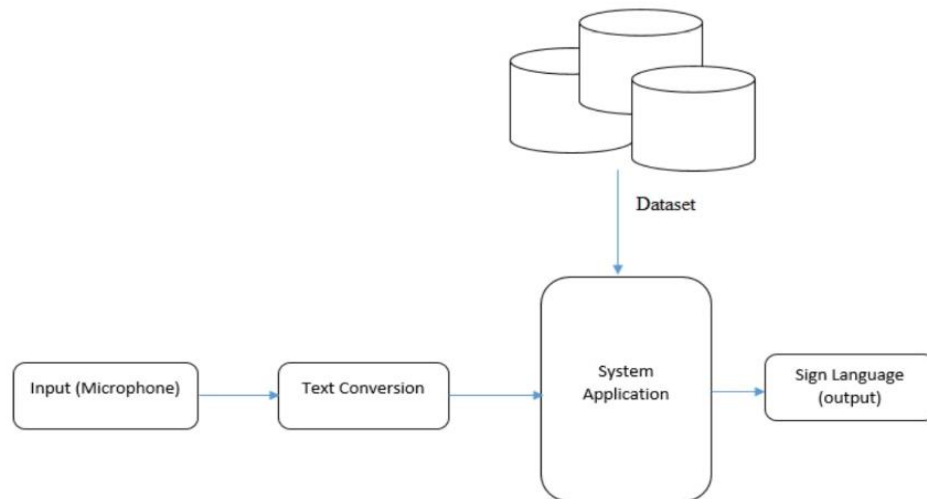
- ALL YOU NEED IN SIGN LANGUAGE PRODUCTION

This paper presents the fundamental components of a bi-directional sign language translation system, discussing the main challenges in this area. Also, the backbone architectures and methods in SLP are briefly introduced and the proposed taxonomy on SLP is presented.

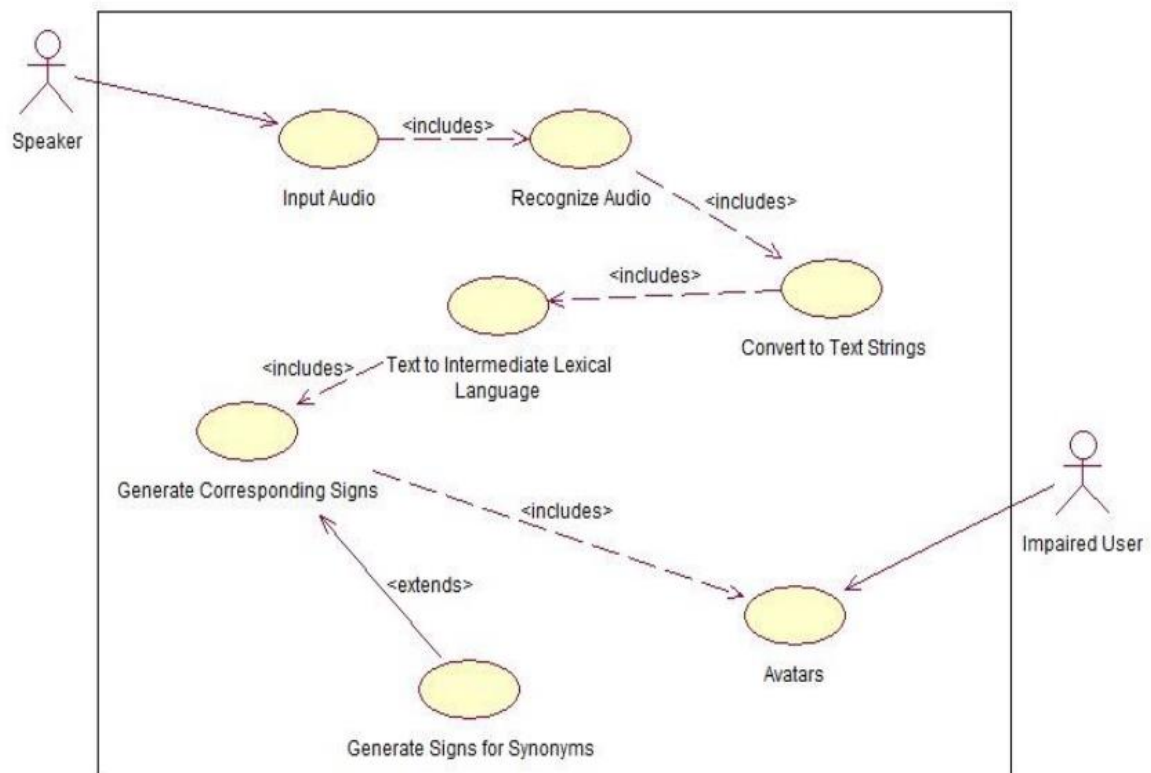
The possibility of high-resolution and photo-realistic continuous sign language videos. Most of the proposed models in SLP can only generate low-resolution sign samples. Conditioning on human key points extracted from training data can decrease the parameter complexity of the model and assist to produce a high-resolution video sign.

## SYSTEM DESIGN

### ■ ARCHITECTURE DIAGRAMS:



### ■ USE CASE DIAGRAM:



## **LANGUAGES:**

**HTML:** Hyper Text Markup Language is the code that is used to structure a web page and its content. For instance, content could be structured within a set of paragraphs, a list of bulleted points, or using images and data tables.

**CSS:** Cascading Style Sheets is used to style and layout web pages. For instance, to alter the font, colour, size, and spacing of your content, split it into multiple columns, or add animations and other decorative features.

**JavaScript:** It is a text-based programming language used both on the client-side and server-side that allows you to make web pages interactive. Where HTML and CSS are languages that give structure and style to web pages, JavaScript gives web pages interactive elements that engage a user.

Backend: Python in Visual studio code

### ▪ **MODULES:**

- Speech recognition
- Text Pre-processing
- A 3D animation of a character

#### **A. SPEECH RECOGNITION:-**

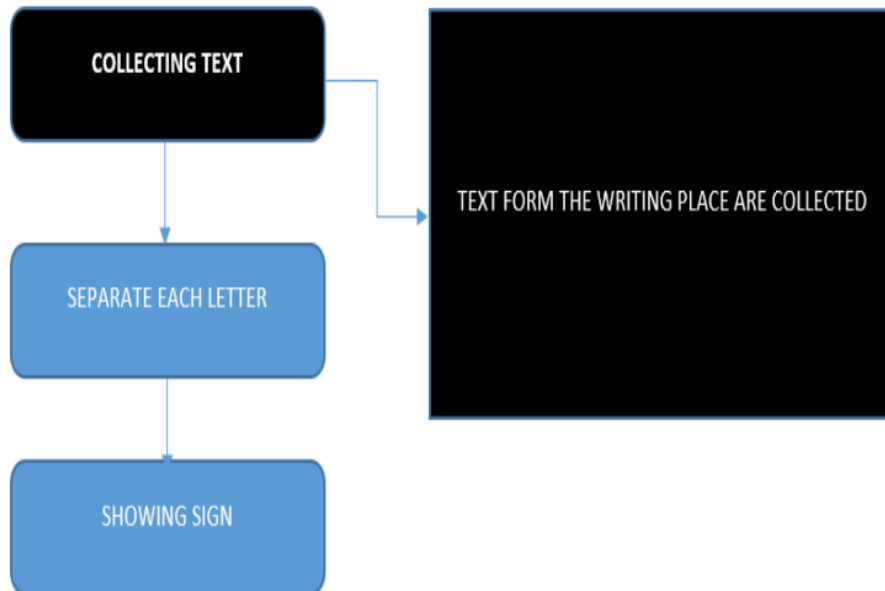
Speech recognition takes place using JavaScript Web speech API. When a word or phrase is successfully recognised, it is returned as a result, as a text string, and additional actions can be launched as a result. Speech recognition involves receiving speech through a device's microphone and checking it against a list of grammar (basically, the vocabulary you want to have recognised in a particular app).

#### **B. TEXT PRE-PROCESSING:-**

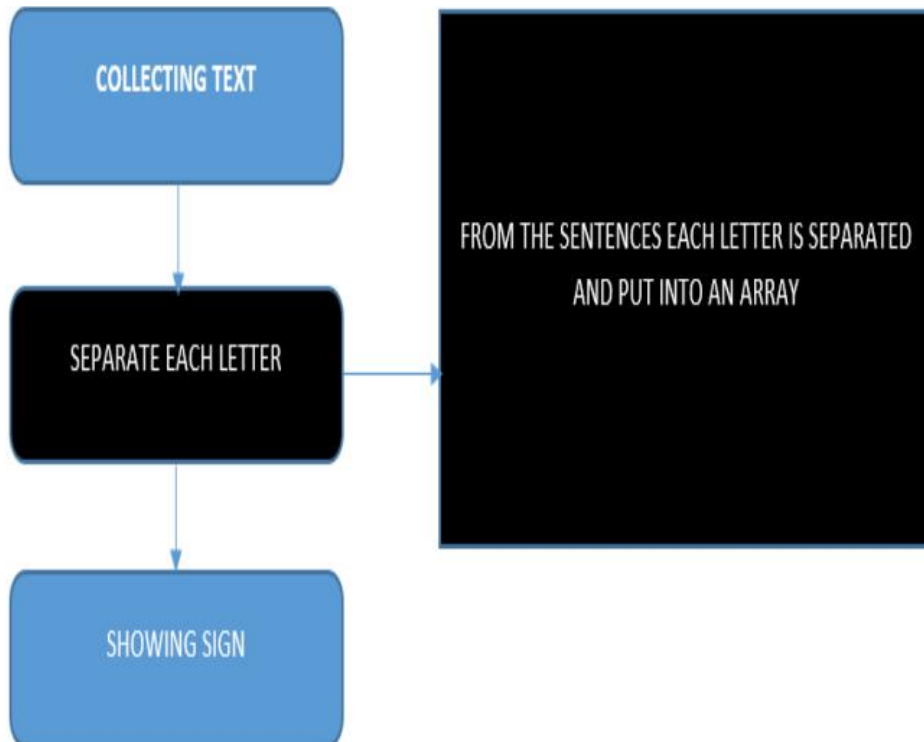
This Text pre-processing is done using the Natural Language Toolkit known as NLTK. NLTK is a toolkit build for working with NLP in Python. It provides us various text processing libraries with a lot of test datasets. A variety of tasks can be performed using NLTK such as tokenizing, parse tree visualization, etc. We give audio as input to the machine. The machine records that audio input. Then machine translates the audio into text and displays it on the screen. The NLP system parses the text into components; understand the context of the conversation and the intention of the person. The machine decides which command to be executed, based on the results of NLP.

- BLOCK DIAGRAMS

1. Text Collection



2. Text separation



### 3. Sign Language conversion

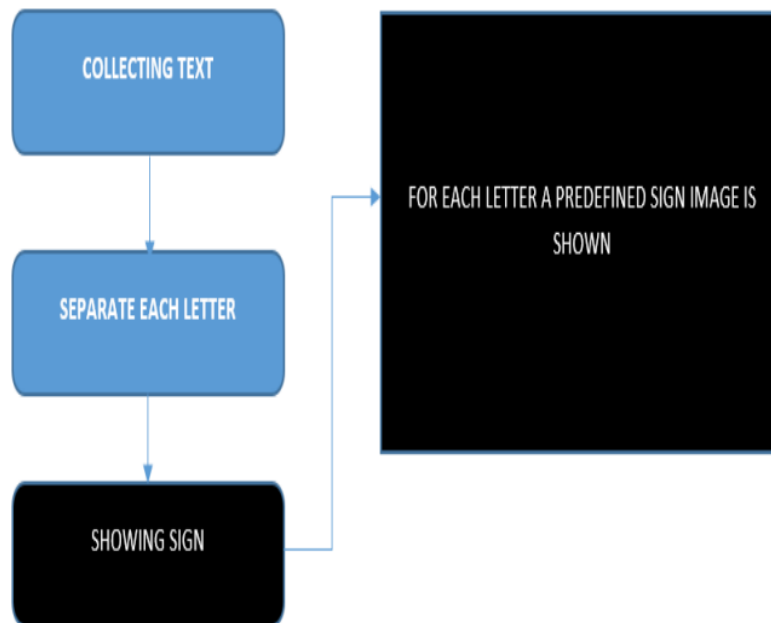


Fig shows that after separating the text a set of predefined gestures for each letter is displayed on the screen.



Fig shows the predefined gestures used in this project that will be shown by our animation. As per the audio input given it shows sign code.

### C. 3D ANIMATION:-

A 3D animation of a character (avatar) created using Blender 3D tool. 3D character animation is the process of creating three-dimensional images that are in a moving state. Creating character animation in 3d involves adding a thought, personality, and emotion in the characters. A 3d character animation is created to explain the letters through actions. It shows each letters in the word (text/speech) given as input.



Good



HOME



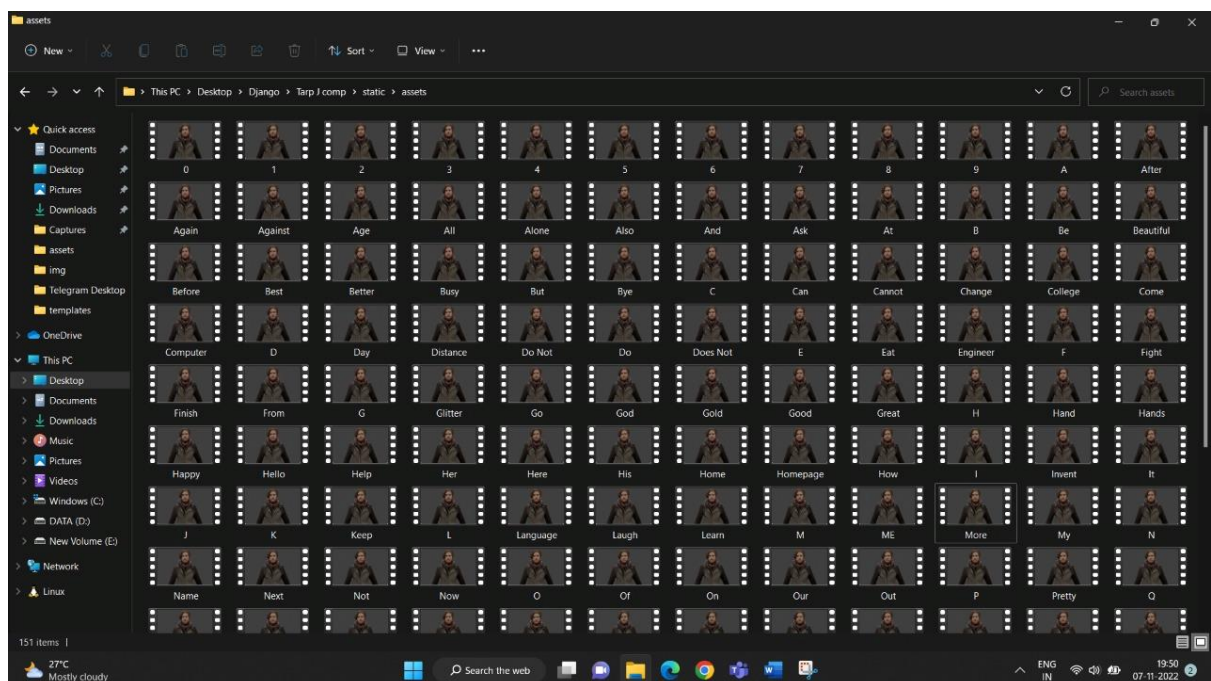
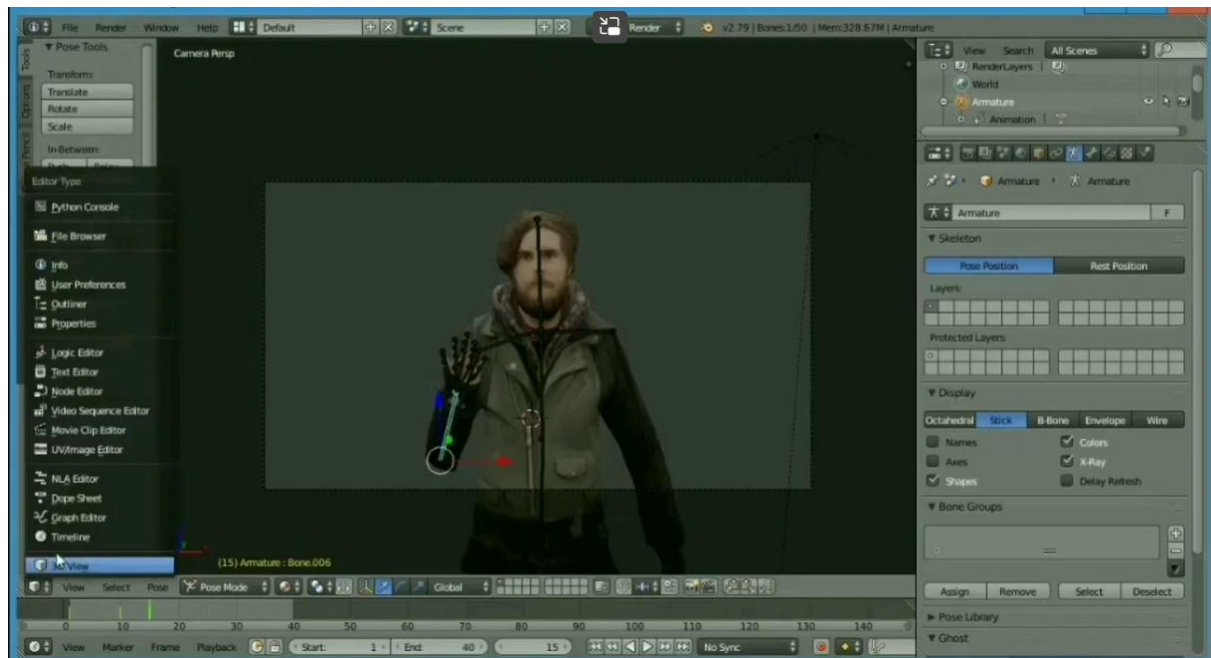
0

## IMPLEMENTATION OF THE SYSTEM

- We built the webpage. Each component of the whole process uses different kinds of methods.
- The process flow or the workflow is as follows.

### *i. CREATING ANIMATION FOR THE DATASET*

The animation character must be created for the dataset. This is the primary step in executing the project. Thus, the animated character was created using 3D Blender.





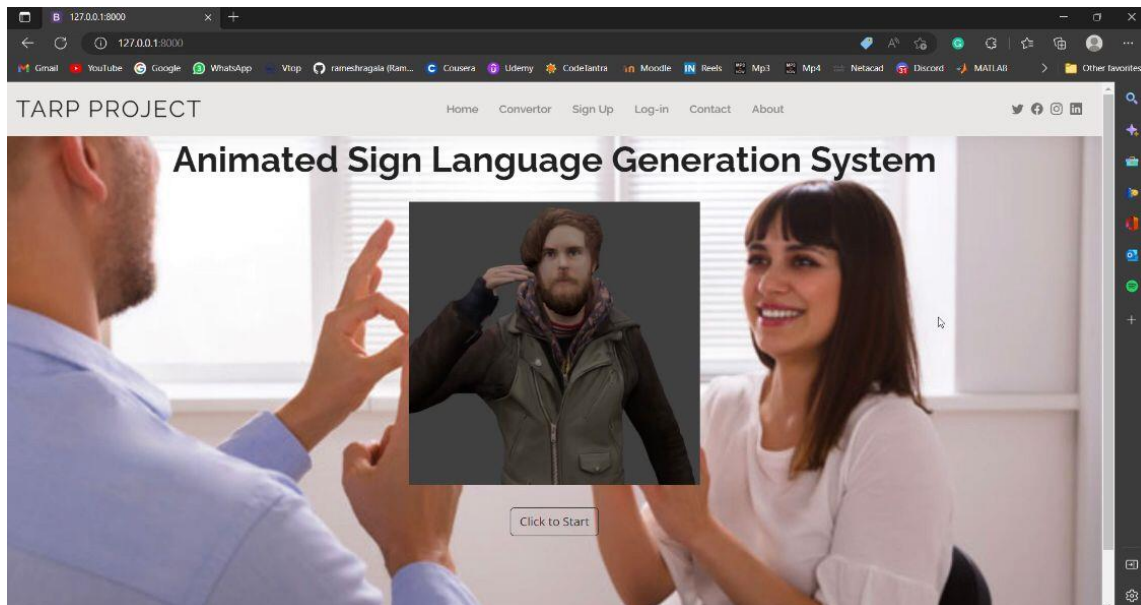
- The images shows that after separating the text a set of predefined gestures for each letter is displayed on the screen.
- The predefined gestures used in this project as per the audio input given it shows sign code are mentioned above.

## ii. CREATING OUR WEBSITE:

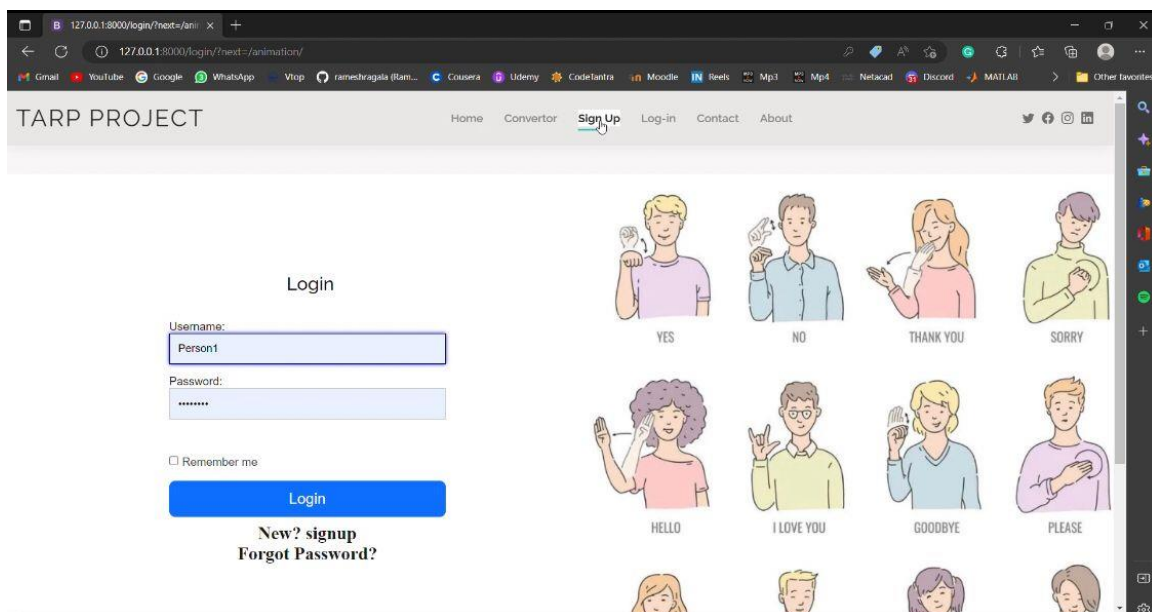
### ➤ The Home page

The homepage has the Nav bar consisting home, convertor, singup, login, contact and about.

Below that we have welcome page of our website consisting of Heading is Animated Sign Language Generation System, Hello Animation & Button to start

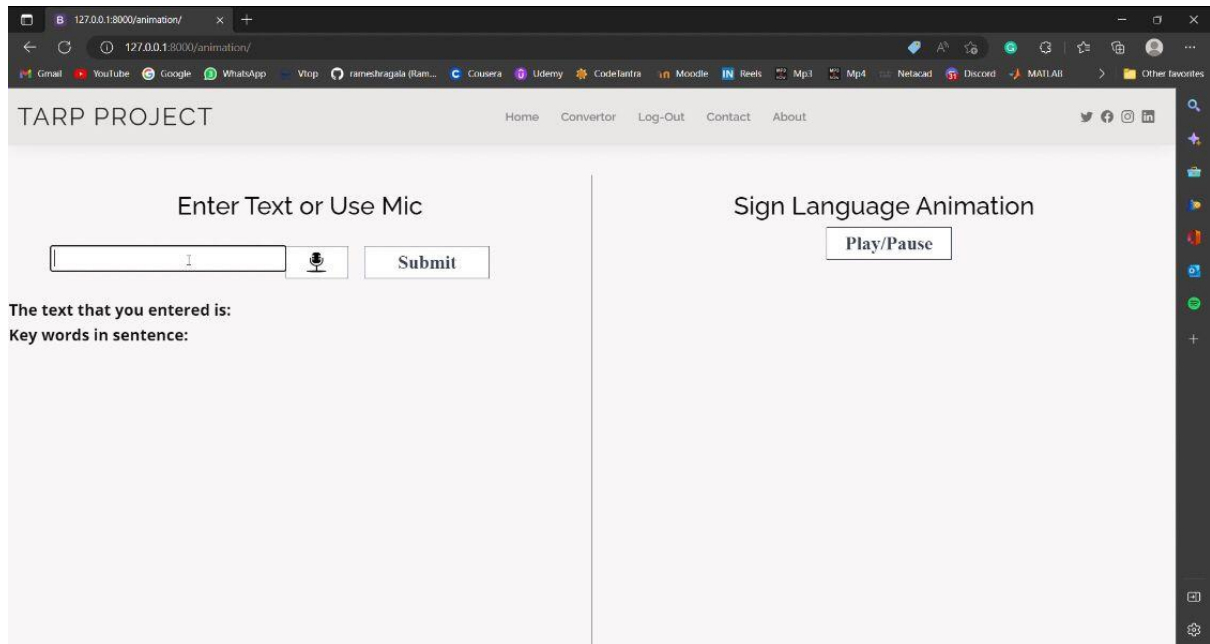


### ➤ Login page



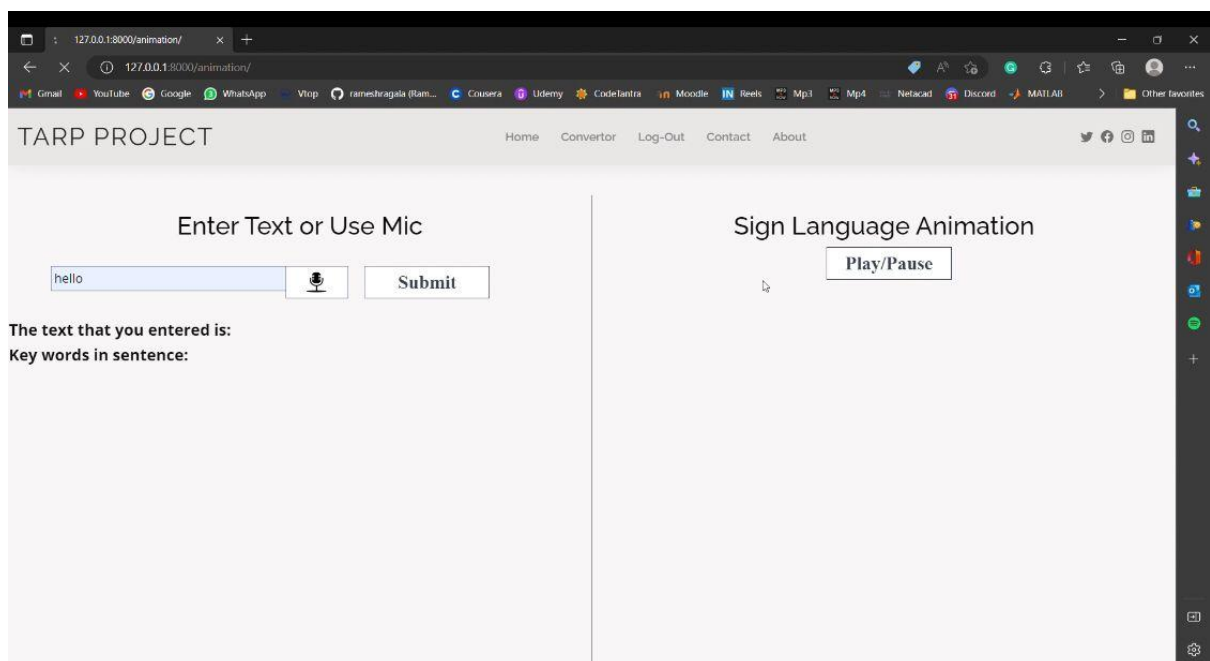
➤ The convertor page

The main part or page where the conversion takes place



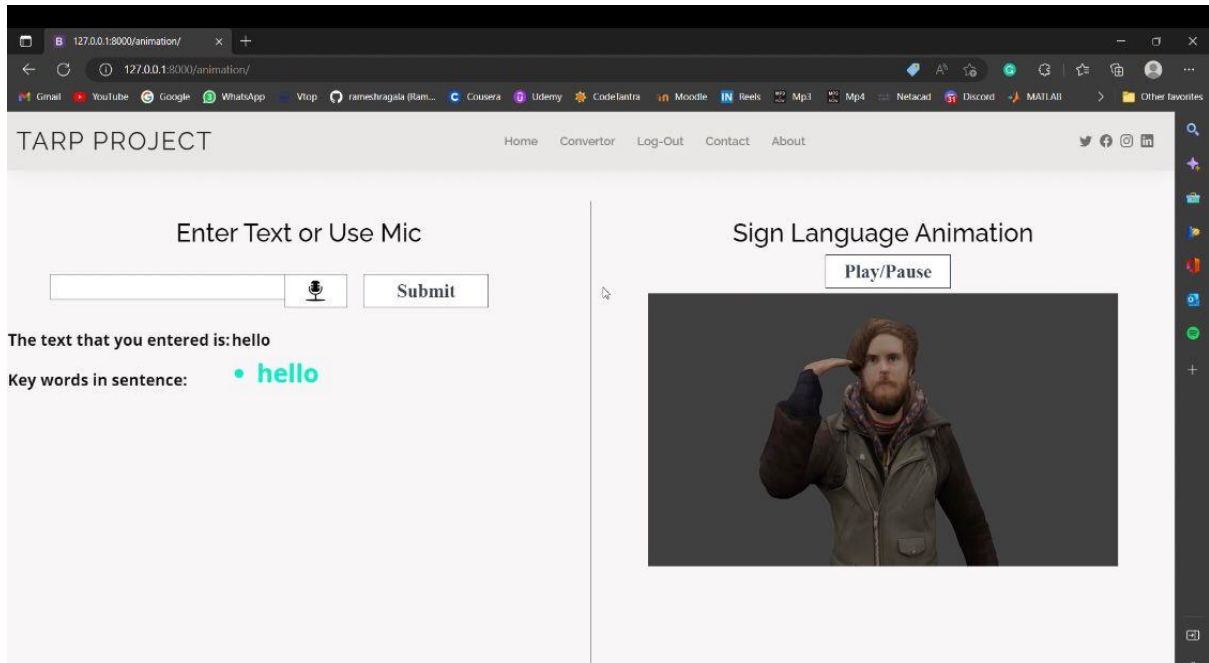
➤ Have used the word HELLO for testing

The word hello is tested



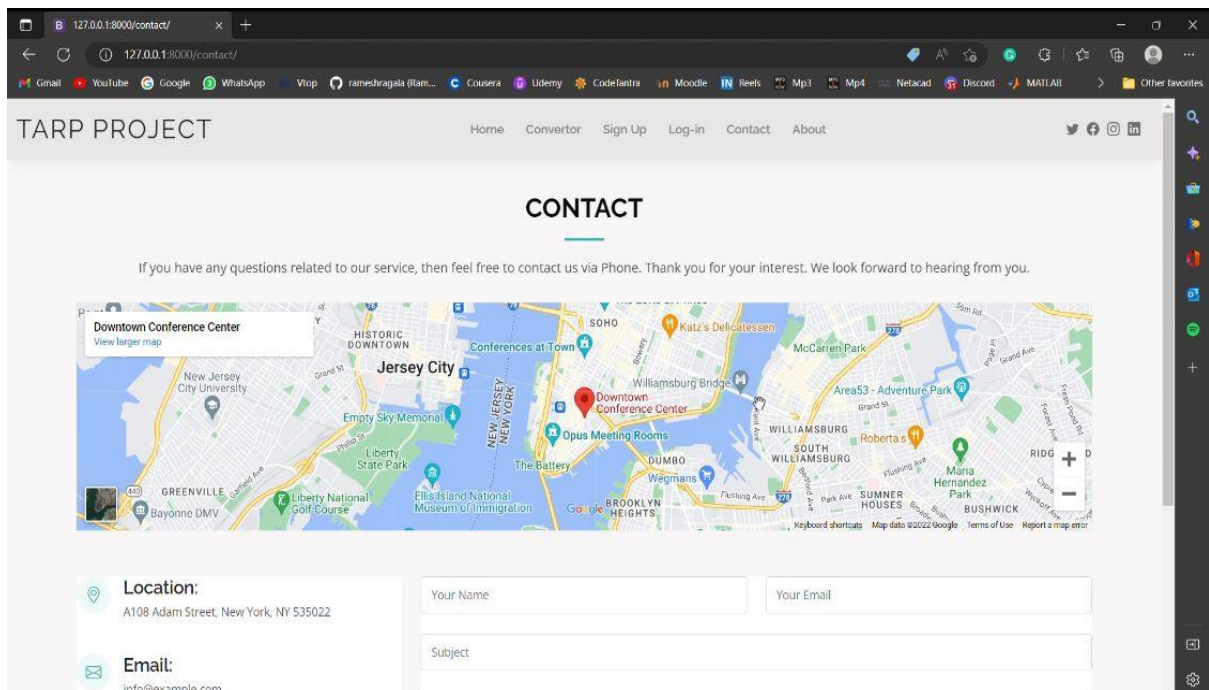
- The signing avatar is obtained for the text we entered

As the word hello is a gesture, we get the sign action by avatar in single stroke.

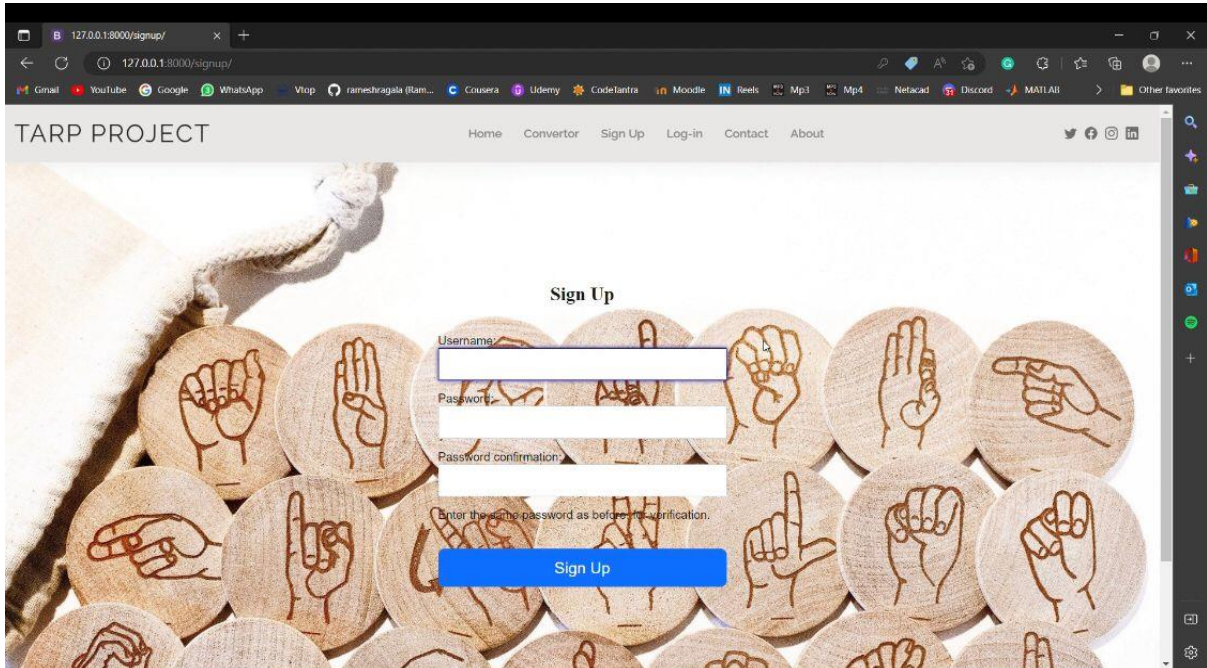


If the input is a normal word (other than gestures) each alphabet in the word is split up and shown up in sign language actions by the 3D character.

- The Contact Page



## ➤ The Sign-Up page



TARP PROJECT

Home Converter Sign Up Log-in Contact About

### Sign Up

Username

Password

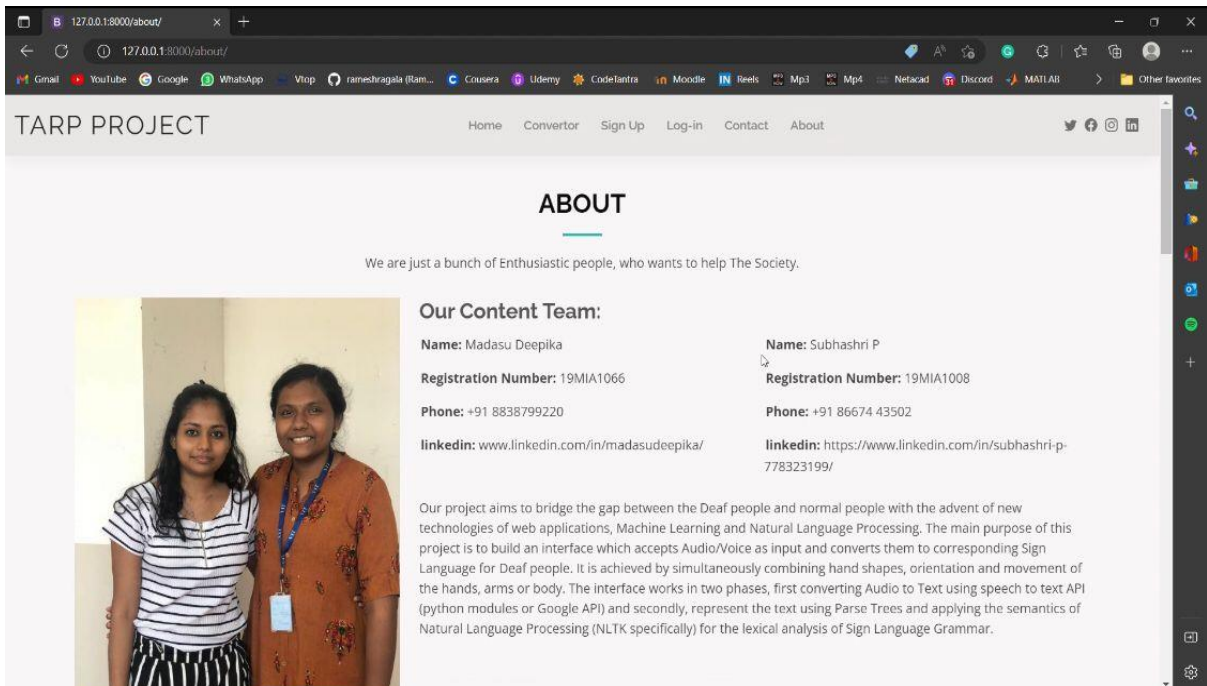
Password confirmation

Enter the same password as before for verification.

[Sign Up](#)

## ➤ The About Pages

In this About page, personal contents/details of us are added. The picture, names, mobile numbers, and profile links are given.



TARP PROJECT

Home Converter Sign Up Log-in Contact About

## ABOUT

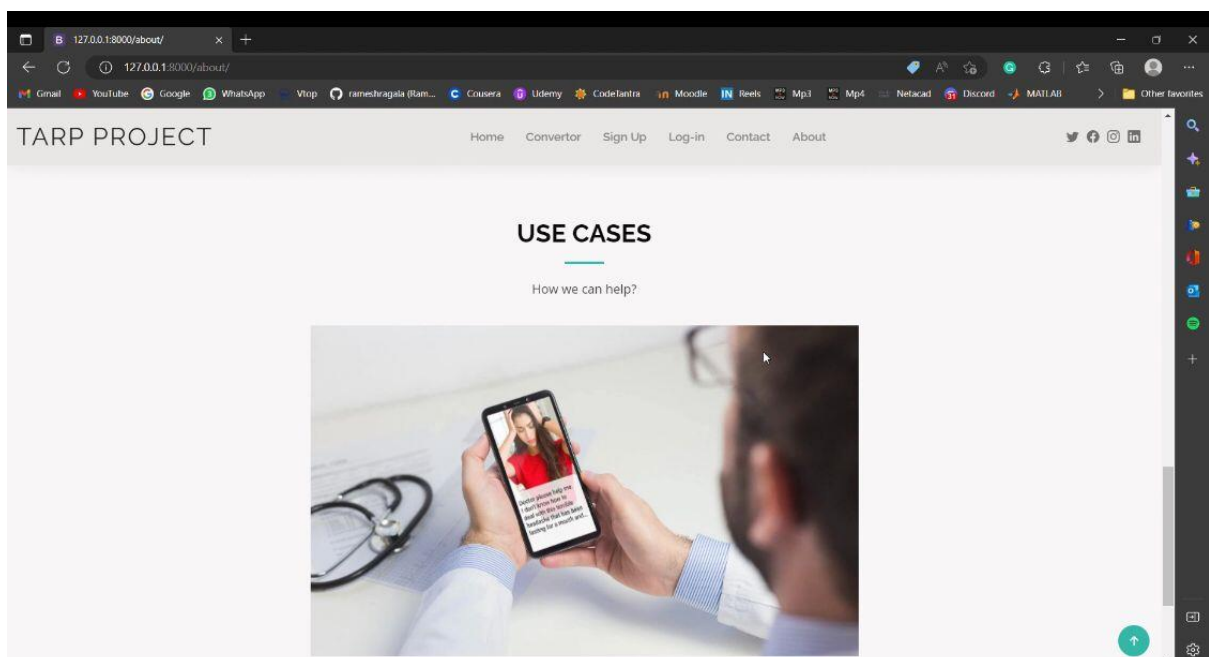
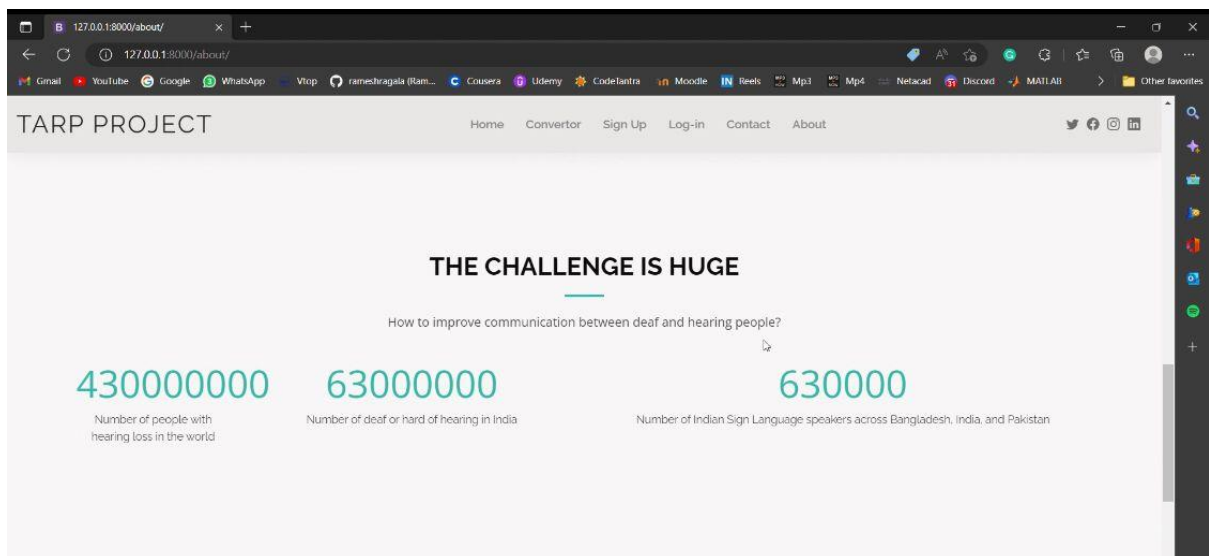
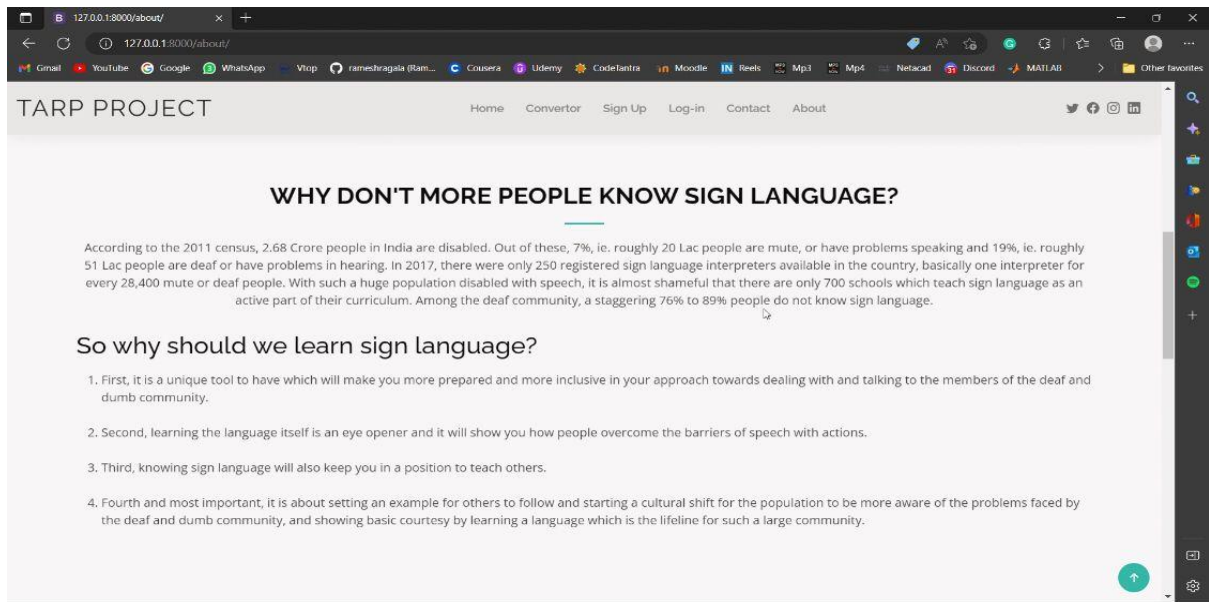
We are just a bunch of Enthusiastic people, who wants to help The Society.

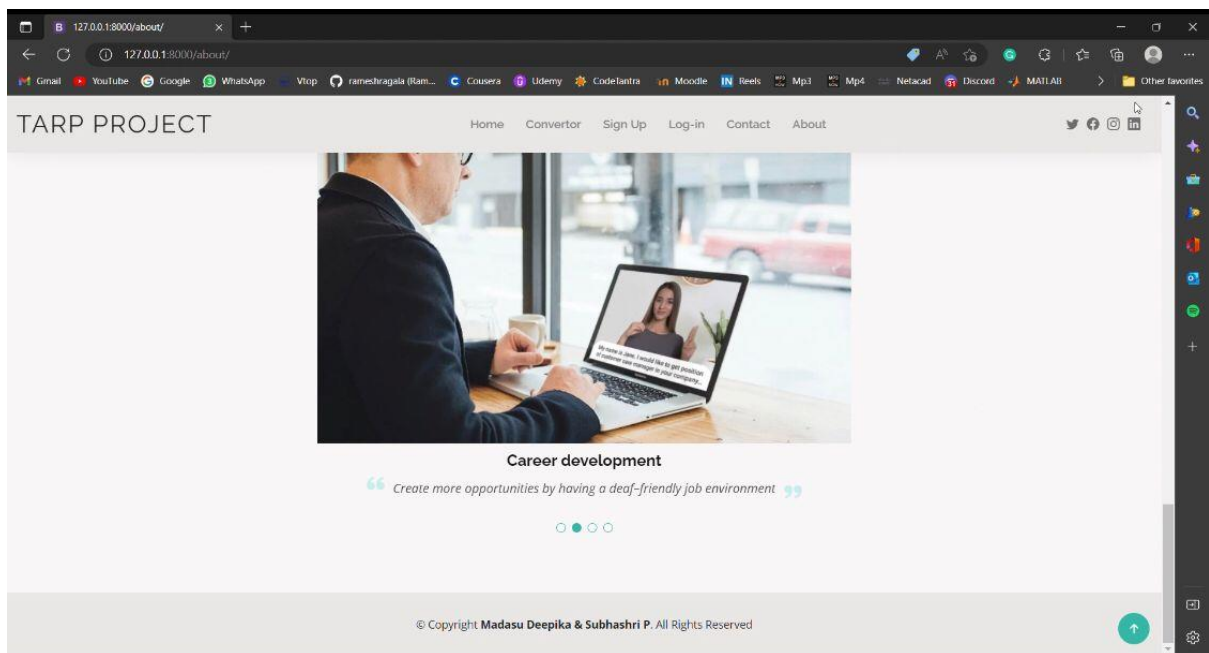
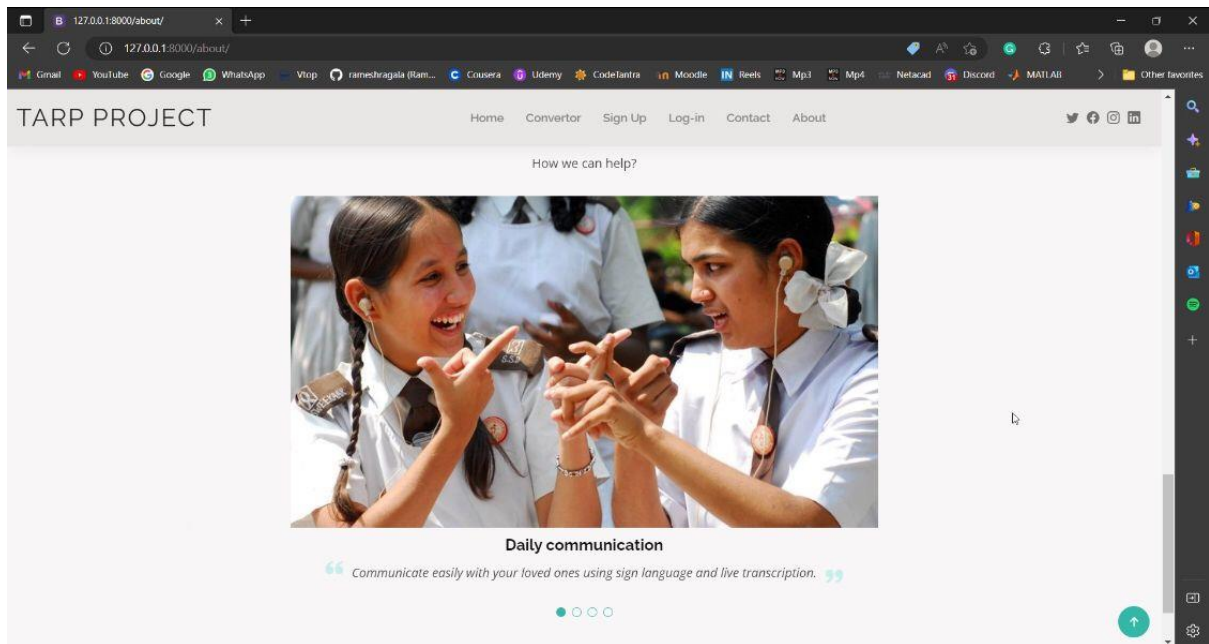
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Our project aims to bridge the gap between the Deaf people and normal people with the advent of new technologies of web applications, Machine Learning and Natural Language Processing. The main purpose of this project is to build an interface which accepts Audio/Voice as input and converts them to corresponding Sign Language for Deaf people. It is achieved by simultaneously combining hand shapes, orientation and movement of the hands, arms or body. The interface works in two phases, first converting Audio to Text using speech to text API (python modules or Google API) and secondly, represent the text using Parse Trees and applying the semantics of Natural Language Processing (NLTK specifically) for the lexical analysis of Sign Language Grammar.







- These are the other information available in the about section

## **CONCLUSION**

In this paper, we have built this application for converting the text or speech into sign language. There are a lot of communication barriers between normal people and people with hearing disabilities.

This project aims at devising a useful tool for disabled people so that the communication barrier can be reduced. This project is an attempt to make it easy for deaf people by converting speech into sign language video. The project displays an equivalent sign language symbol for the speech given as input.

## **FUTURE SCOPE**

Since deaf people are usually deprived of normal communication with other people, they must rely on an interpreter or some visual communication. Now the interpreter cannot be available always, so this project can help eliminate the dependency on the interpreter.

The system can be extended to incorporate the knowledge of facial expressions and body language too so that there is a complete understanding of the context and tone of the input speech.

Integrating hand gesture recognition system using computer vision for establishing 2-way communication system.

A mobile and web-based version of the application will increase the reach to more people.

In future, we will try to recognize signs which include motion. Moreover, we will focus on converting the sequence of gestures into text i.e., words and sentences, and then converting it into speech that can be heard and texts that can be read

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- ❖ K. Tikun, J. Maloo, A. Ramesh and I. R., "Real-time Conversion of Sign Language to Text and Speech," 2020 Second International Conference on Inventive Research in Computing Applications (ICIRCA), 2020, pp. 346-351, doi: 10.1109/ICIRCA48905.2020.9182877.
- ❖ International Journal of Engineering and Innovative Technology (IJEIT) Volume 9, Issue 10, April 2020 DOI:10.17605/OSF.IO/EZ6AG Page 30 Audio to Sign Language Translation for Deaf People Ankita Harkude<sup>#1</sup>, Sarika Namade<sup>#2</sup>, Shefali Patil<sup>#3</sup>, Anita Morey <sup>#4</sup> <sup>1,2,3,4</sup>Department of Information Technology, Usha Mittal Institute of Technology, SNDT Women's University, Juhu-Tara Road, Sir Vitthal Das Vidyavihar, Santacruz(W), Mumbai 400049