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Sign Language Recognition System

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Abstract

Gesture based communication assumes a significant part for dump individuals to speak with typical individuals. It is extremely challenging for quiet individuals to pass their message on to ordinary individuals. Since ordinary individuals are not prepared to use gesture based communication. In crisis time it is undeniably challenging to pass on their message. The major technique used is to convert a hand gesture into text information. The proposed paper creator has utilised SVM calculation however in python SVM isn't exact in distinguishing hand motion so we are utilising Convolution Neural Network to prepare hand signal pictures and afterward this prepared model can be utilised to foresee those prepared hand motion from webcam.

Introduction

Communication via gestures has turned into a most normal technique for conveying to those individuals who can't talk. A language utilises the hand movements to communicate letters in order and words. Vision strategy has turned into the well - known technique utilised for sign acknowledgment in the previous many years. It is a framework which utilises a camera to detect the data that has been acquired through finger movements. It has been an enormous exertion and has gone into the advancement of vision-based sign acknowledgment frameworks around the world. Vision-based signal acknowledgment frameworks can be separated into immediate and roundabout techniques

The Main difficulties that this extraordinary individual confronts is the correspondence hole between - exceptional individual and ordinary individual. Hard of hearing and unable to speak individuals generally track down challenges to speak with ordinary individual. Hand Gesture Recognition system localizes and track the hand gestures of the dumb and deaf people in order to maintain a communication channel with the other people. The discovery of hand gestures should be possible by using web camera. The point of this task is to develop a system that can change hand gestures into text which is helpful in reducing the communication gap between Normal people and deaf mute people.

Literature Survey

1. Static Sign Language Recognition Using Deep Learning - Lean Karlo S. Tolentino, Ronnie O. Serfa Juan, August C. Thio-ac, Maria Abigail B. Pamahoy, Joni Rose R. Forteza, and Xavier Jet O. Garcia

A system was developed that will serve as a learning tool for starters in sign language that involves hand detection. This system is based on a skin-color modelling technique, i.e., explicit skin-color space thresholding. The skin-color range is predetermined that will extract pixels (hand) from non–pixels (background). The images were fed into the model called the Convolutional Neural Network (CNN) for classification of images. Keras was used for training of images. Provided with proper lighting condition and a uniform background, the system acquired an average testing accuracy of 93.67%, of which 90.04% was attributed to ASL alphabet recognition, 93.44% for number recognition and 97.52% for static word recognition, thus surpassing that of other related studies. The approach is used for fast computation and is donein real time.

2. Hand Gesture Detection based Real-time American Sign Language Letters Recognition using Support Vector Machine - Xinyun Jiang Glasgow College University of Electronic Science and Technology of China Wasim Ahmad James Watt School of Engineering University of Glasgow.

Sign language is an indispensable communication means for deaf-mute people because of their hearing impairment.At present, sign language is not popular communications method among hearing people, so that the majority of the hearing are not willing to have a talk with the deaf-mute, or they have to spend much time and energy trying to figure out what the correct meaning is. Sign Language Recognition (SLR), which aims to translate sign language to people who know few about it in the form of text or speech, can be said to be a great help to deaf-mute and hearing people to communicate. In this study, a real-time vision-based static hand gesture

recognition system for sign language was developed. All data is collected from a USB camera connected to a computer, and no auxiliary items (such as gloves) were required. The proposed system is based on skin color algorithm in HSV color space to find the Region of Interest (ROI), where hand gesture is. After completing all pre-processing work, 8 features were extracted from each sample using Principal Component Analysis (PCA). The recognition machine learning approach used was based on Support Vector Machine (SVM). The experimental results show that this system can distinguish B, D, F, L and U, these five American sign language hand gestures, with the successful rate of about 99.4%.

3. **A Real-Time System For Recognition Of American Sign Language By Using Deep Learning** – Murat Taskiran, Mehmet Killioglu, and Nihan Kahraman Electronics and Communications Engineering Yildiz Technical University Istanbul, Turkey.

Deaf people use sign languages to communicate with other people in the community. Although the sign language is known to hearing-impaired people due to its widespread use among them, it is not known much by other people. In this article, we have developed a real-time sign language recognition system for people who do not know sign language to communicate easily with hearing-impaired people. The sign language used in this paper is American sign language. In this study, the convolutional neural network was trained by using dataset collected in 2011 by Massey University, Institute of Information and Mathematical Sciences, and 100% test accuracy was obtained. After network training is completed, the network model and network weights are recorded for the real-time system. In the real-time system, the skin color is determined for a certain frame for hand use, and the hand gesture is determined using the convex hull algorithm, and the hand gesture is defined in real-time using the registered neural network model and network weights. The accuracy of the real-time system is 98.05%.

4. Two Way Communicator between Deaf and Dumb People and Normal People - Ahire, Prashant G., et al.

One of the most precious gift of nature to human beings is the ability to express himself by responding to the events occurring in his surroundings.Every normal human being sees, listens and then reacts to the situations by speaking himself out. But there are some unfortunate ones who are deprived of this valuable gift. This creates a gap between the normal human beings and the deprived ones. This application will help for both of them to communicate with each other. The system is mainly consists of two modules, first module is drawing out Indian Sign Language(ISL) gestures from real-time video and mapping it with human-understandable speech. Accordingly, second module will take natural language as input and map it with equivalent Indian Sign Language animated gestures. Processing from video to speech will include frame formation from videos, finding region of interest (ROI) and mapping of images with language knowledge base using Correlation based approach then relevant audio generation using Google Text-to-Speech(TTS) API. The other way round, natural language is mapped with equivalent Indian Sign Language gestures by conversion of speech to text using Google Speech-to-Text(STT) API, further mapping the text to relevant animated gestures from the database.

5. Automated speech recognition approach to continuous cue symbols generation - Ibrahim Patel and Dr. Y. Srinivasa Rao
The work described in this paper is with an aim of developing a system to aid deaf-dumb people which translates the voice into sign language. This system translates speech signal to American Sign Language. Words that correspond to signs from the American sign language dictionary calls a prerecorded American sign language (ASL) showing the sign that is played on the monitor of a portable computer. If the word does not have a corresponding sign in the sign language dictionary, it is finger spelled. This is done in real life by deaf for words that do not have specific signs like for proper names. Hidden Markov Model (HMM) is used for recognition of speech signal from the user and translated to cue symbols for vocally disabled people. The proposed task is a complementary work to the ongoing research work for recognizing the finger movement of a vocally disabled person, to speech signal called "Boltay Haath". The proposed AISR system integrated with Boltay Haath system could eliminate the communication gap between the common man and vocally disabled people and extend in both ways.

Existing System

The Steps followed in the Existing System are:

1. RGB Colour Format:

RGB colour format is composed of three primitive colours namely: red(R), green (G), blue (B). Many image-processing techniques use RGB colour model as a prerequisite. RGB is a device dependent model. Different systems produce different values. In order to get rid of distortions caused by light and shadows we can normalise the RGB values. The normalisation process proceeds using the following three equations

r=R/(R+G+B)

g=G/(R+G+B)

b=B/(R+G+B)

The sum of the Normalised components of RGB is unity i.e., (r+g+b=1).

2.Pre-Processing:

In this step, RGB Picture is transformed into Grayscale image i.e., The image will be in 3D format which will be converted into 1D format in order to ease the process. Average method is the basic and simple method that is used for converting image to grayscale. It can be given as,

Grey = (R+G+B)/3

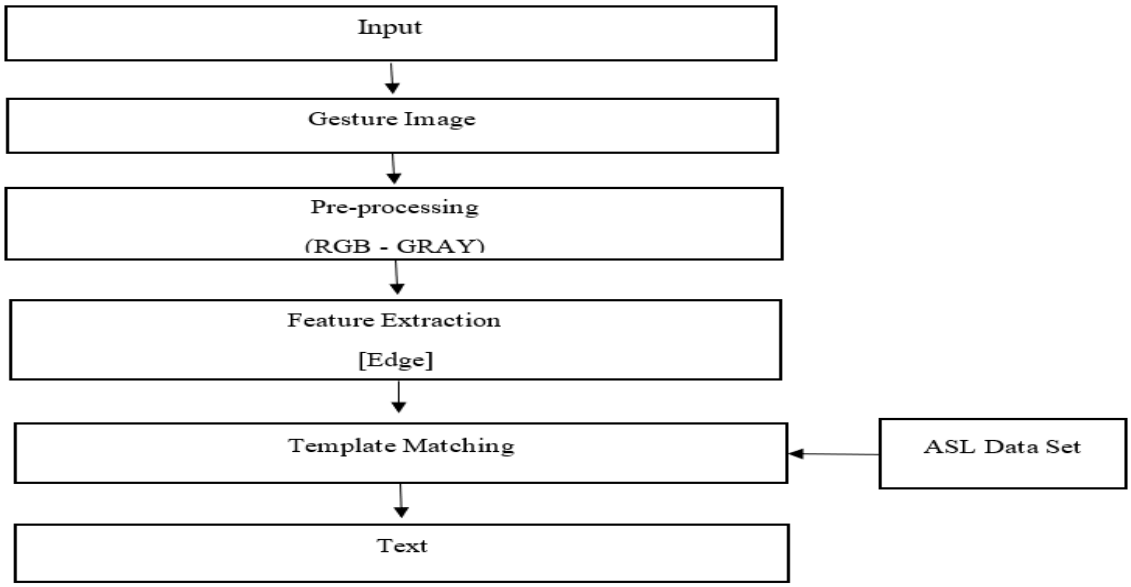
3.Feature Extraction:

In image analysis, determining the edges is important. Edge detection is useful to extract boundaries, corners, lines and curves. It removes the data that is not useful. According to Canny Edge detection algorithm works better than many other edge detection algorithms. There are 5 stages to detect edges using the algorithm. They are Image Soothing, Gradient magnitude, Non-maximum Suppression, Double threshold and Hysteresis.

4.Template Matching:

By using template-matching algorithm, identification of the pattern is possible. Here, the template image is the edge image obtained from edge tracking uses Sum of Absolute Difference (SAD) method. SAD method computes intensity values. This method computes the values by subtracting the pixel values of both the images and then adds the result, until no pixel is left produces least SAD value indicates the best match for a sign and its corresponding label is the output.

The Schematic diagram of the existing method can be given as:



Proposed Methodology

The steps followed in the proposed system can be represented a schematic diagram can be given as follows:

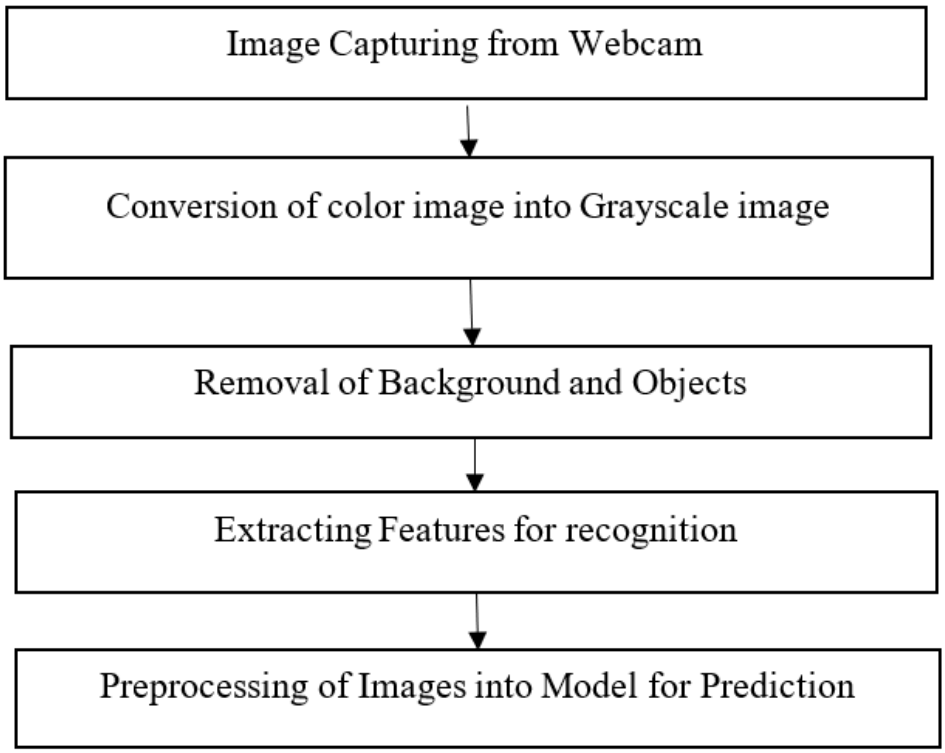


Fig. Capture and Training of the Dataset.

Using OpenCV, we will be having a live feed from the web cam and every frame that detects a hand in the ROI (Region of interest) created will be saved. RGB image will be convert into grayscale image. The objects present in the image, background of the image will be removed. The features will be extracted for recognition of the Hand Gesture. Captured Images will be pre-processed and the Model is produced which is used for the Prediction of the Hand Gesture.

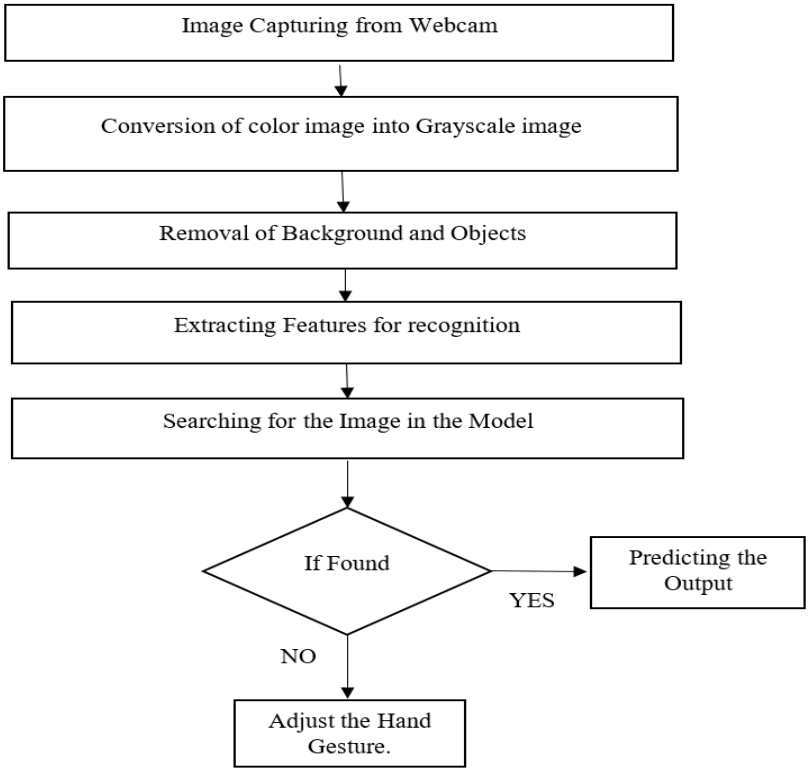
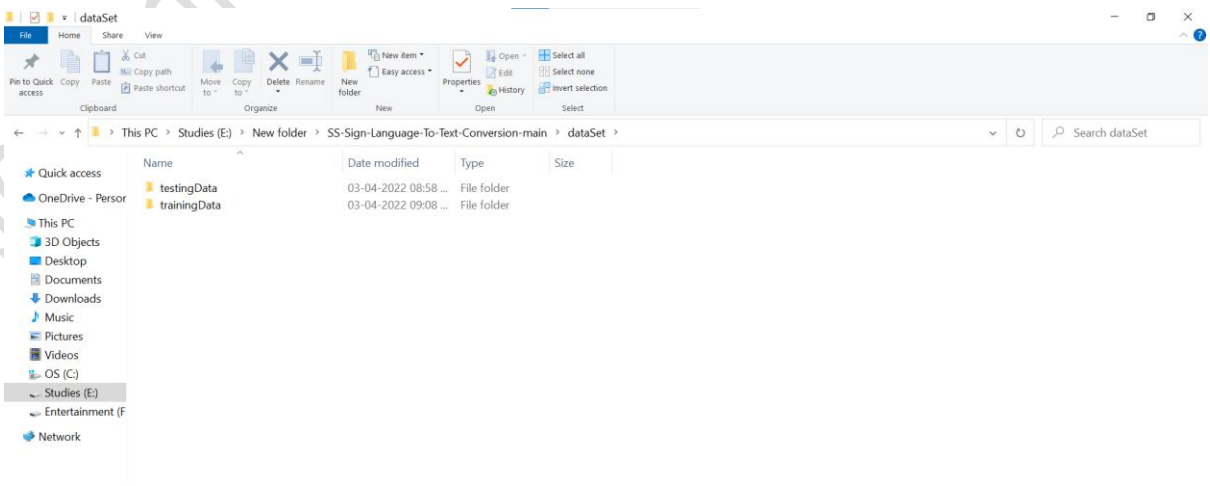


Fig. Prediction of Hand Gesture.

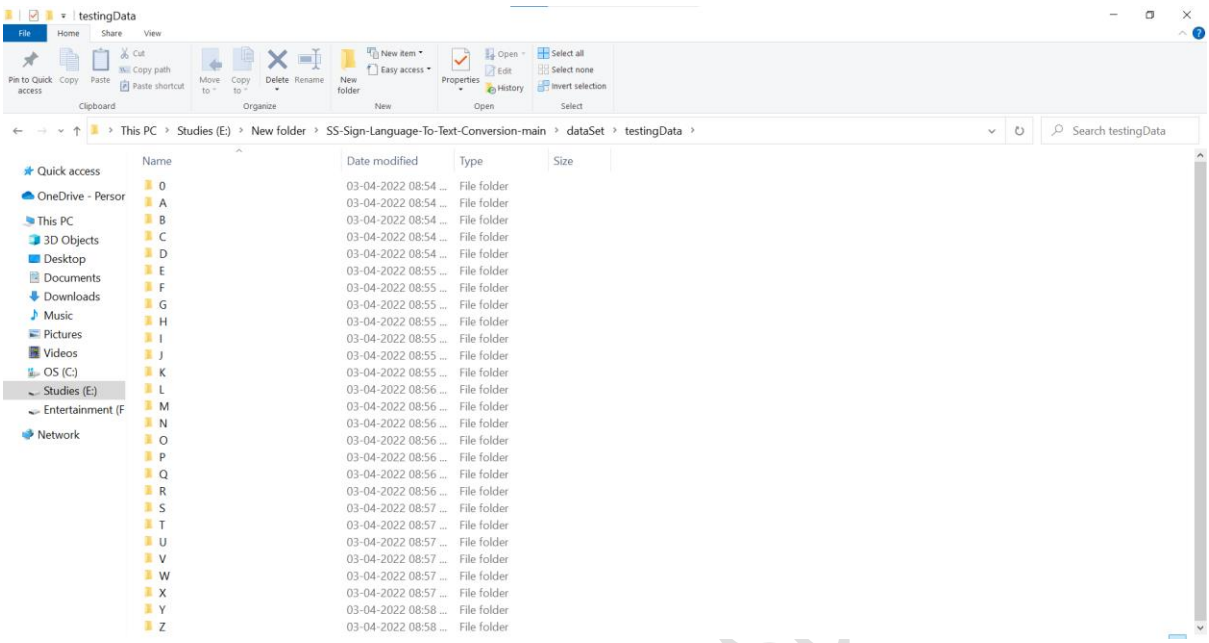
With the help of webcam using OpenCV, Capture the image and hand gesture in the ROI(Region Of Interest).The Captured image will be in the format of the RGB which will be converted into Grayscale image. After the conversion of Image into Grayscale the objects present in the Image and the background of the image will be removed. The features of the image will be extracted for recognition of hand gesture, if the image was found in our model then Output will be predicted if not then the hand gesture needed to be adjusted.

Results

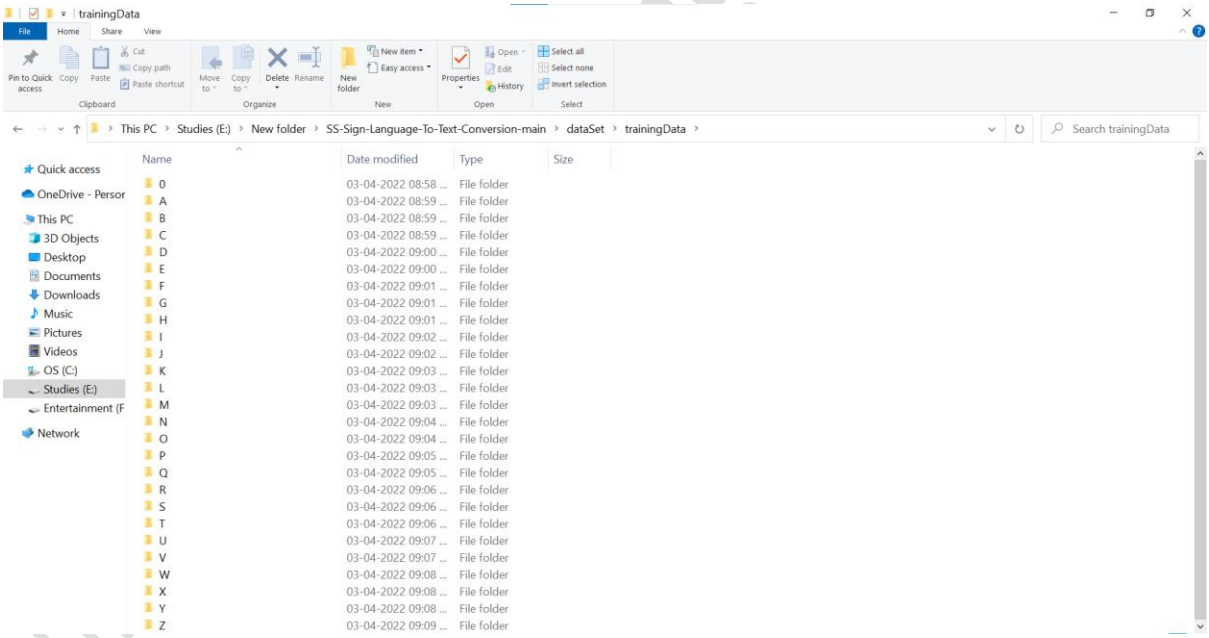
The Created Dataset can be displayed in the below picture:



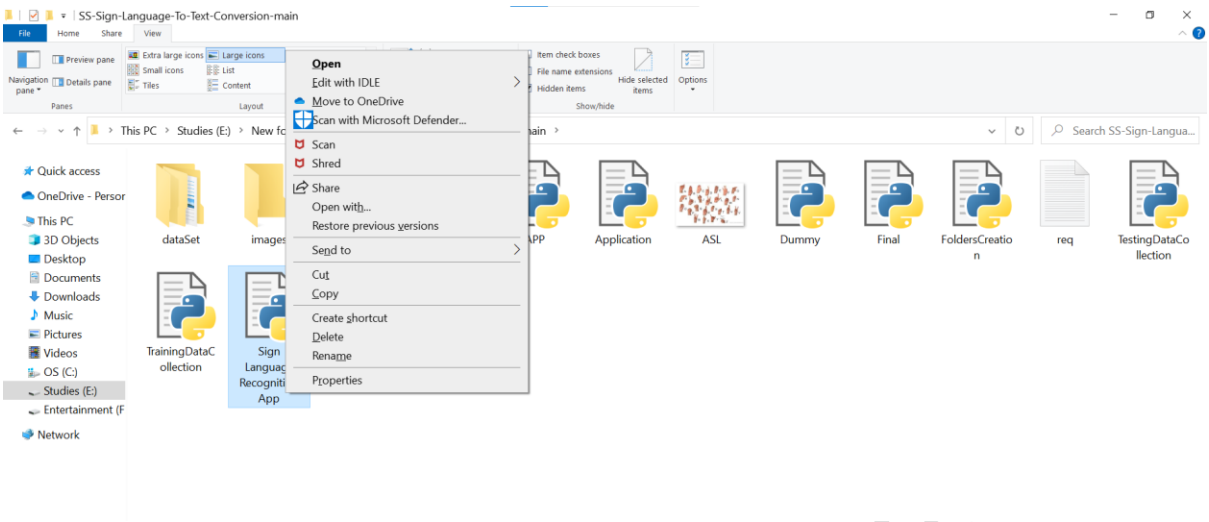
Testing Dataset can be displayed as follows:



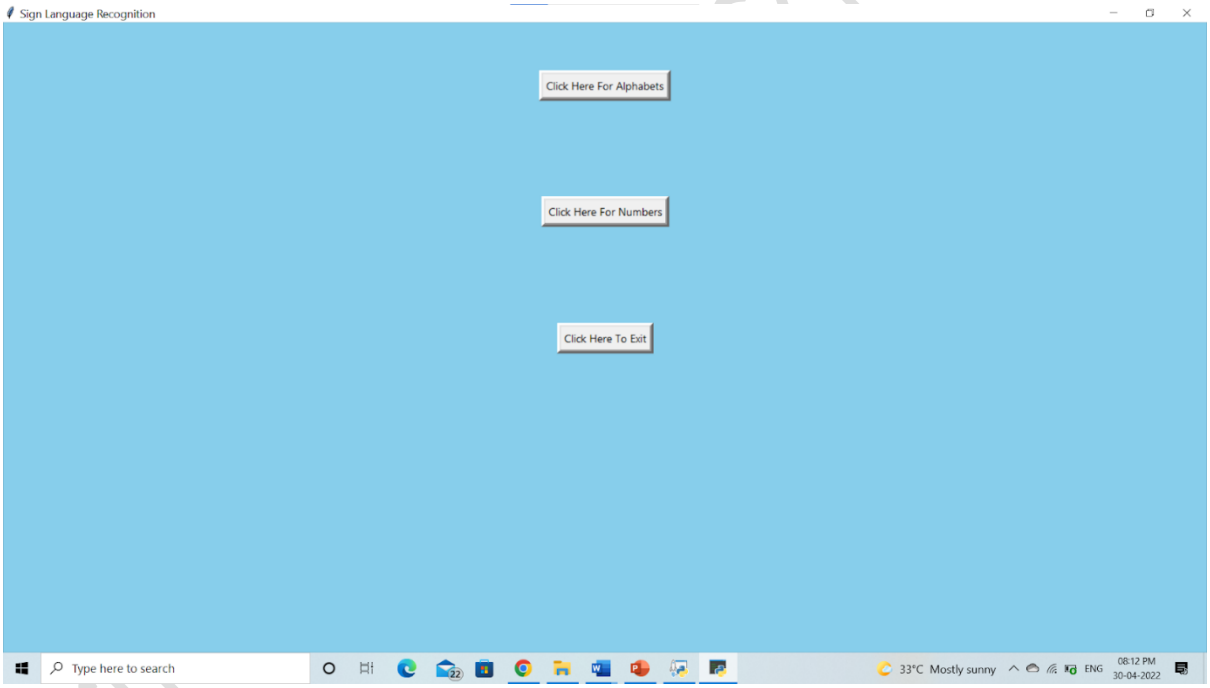
Training Dataset can be displayed as follows:



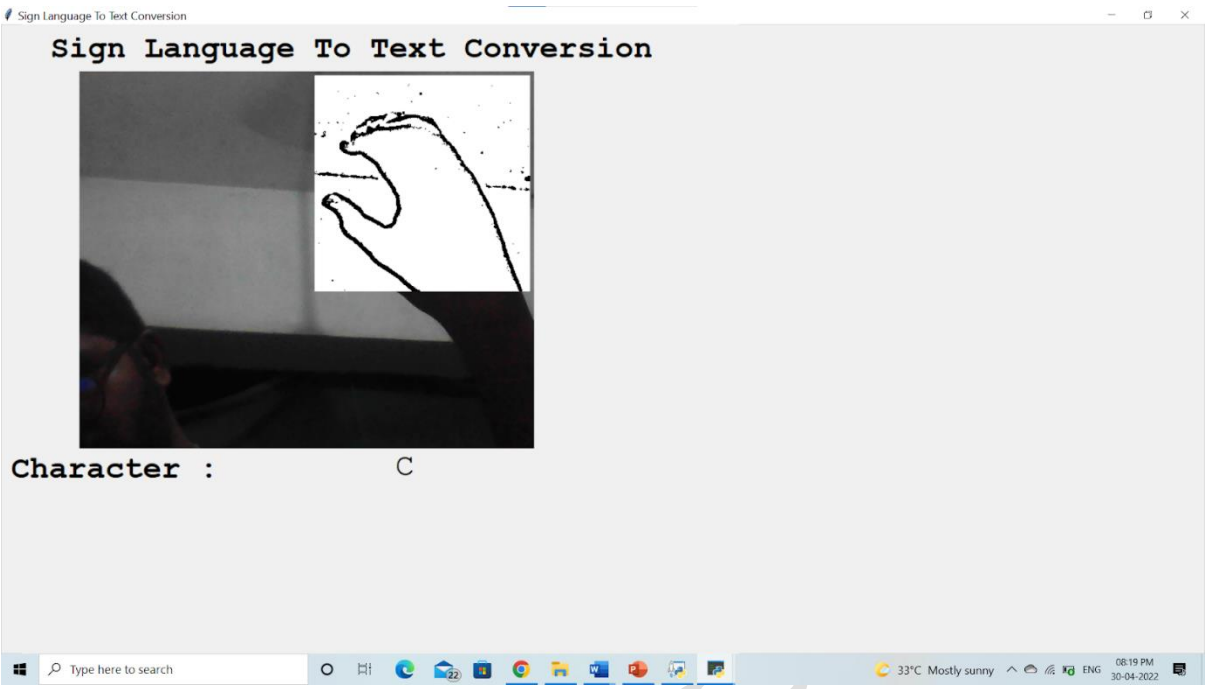
Opening of the Graphical user interface can be given as follows:



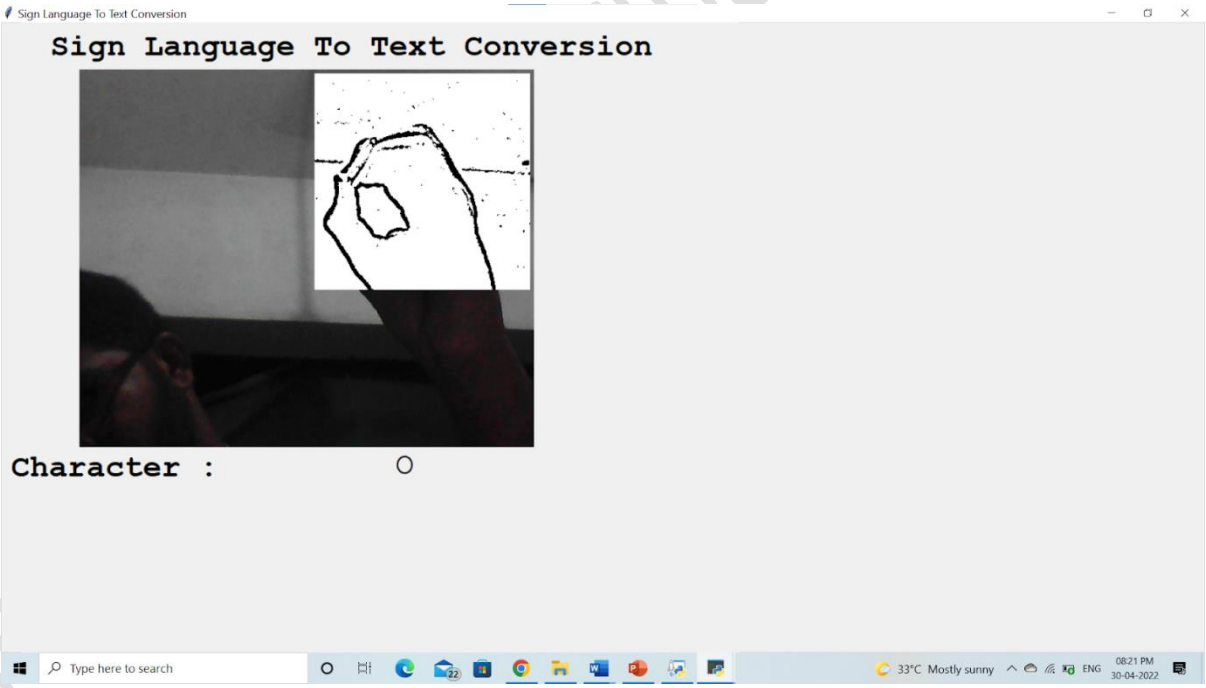
The Graphical user interface can be given as follows:



In the above screen we need to click on 'Click here for alphabets' button in order to recognise the hand gestures for the alphabets. We need to 'Click here for Numbers' button in order to recognise the hand gestures for the Numbers. We need to 'Click Here to Exit' button in order to Exit.



In the above screen the Character C is Recognised from the App.



In the above screen the Character O is Recognised.

Here you just need to show gesture properly as shown in the above screen and while adjusting your hands you may get a wrong prediction but when you correct your gesture then prediction will go accurate.

When we run project for each application following things will be done

- Extract the image from webcam
- Convert image to Grey format and background removal
- Extract features from image
- Recognise and display the output

Future Scope and Conclusion

Sign language recognition for dumb and deaf people was executed successfully. Here the image is taken as input and gives text as the output. Implementation of this system gives upto 90% accuracy and works successfully in most of the cases.

In this project, built a machine learning model which can predict the hand gesture from webcam and then recognize the gesture and produce the output. Final result gets displayed in the static text when image is captured from the webcam. Hand gesture converts into through feature extraction and classification of an image. In future, we can develop a system that is two-way system where, conversion of sign to text and text to sign is possible. Developing a system, where interpretation involves dynamic gestures. Implementation can extend to mobile phones.

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