

SIGN LANGUAGE TRANSLATOR

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INTRODUCTION

- Gestures are the most common body language, which can be used for human computer interaction.
- Gesture recognition is a challenge while using gesture as a communication medium.
- We need to extract features and perform recognition based on those features.
- Mostly neural networks are used for this purpose.

PROBLEM DESCRIPTION

“How the problems faced by mute people can be accommodated with technological assistance and the barrier of expressing emotions can be overshadowed.”

EXISTING SYSTEM

Gesture detection :

~ Contact devices :- Data gloves

~ Non contact devices :- Information entropy algorithm

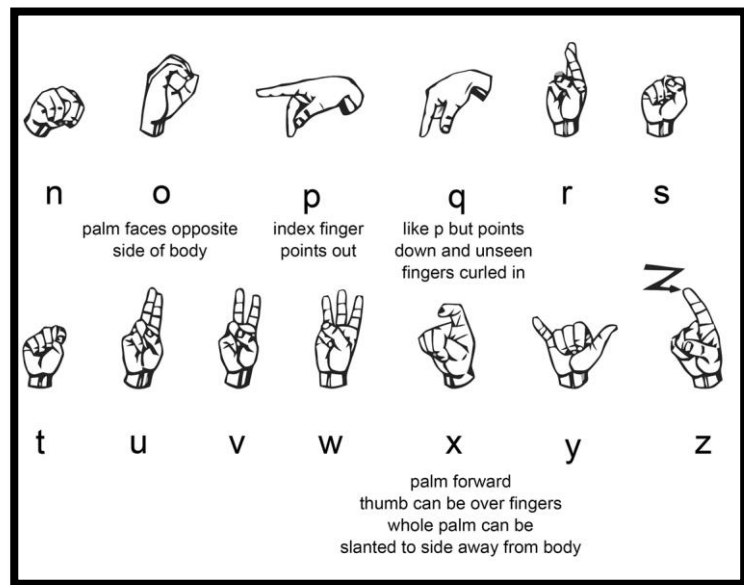
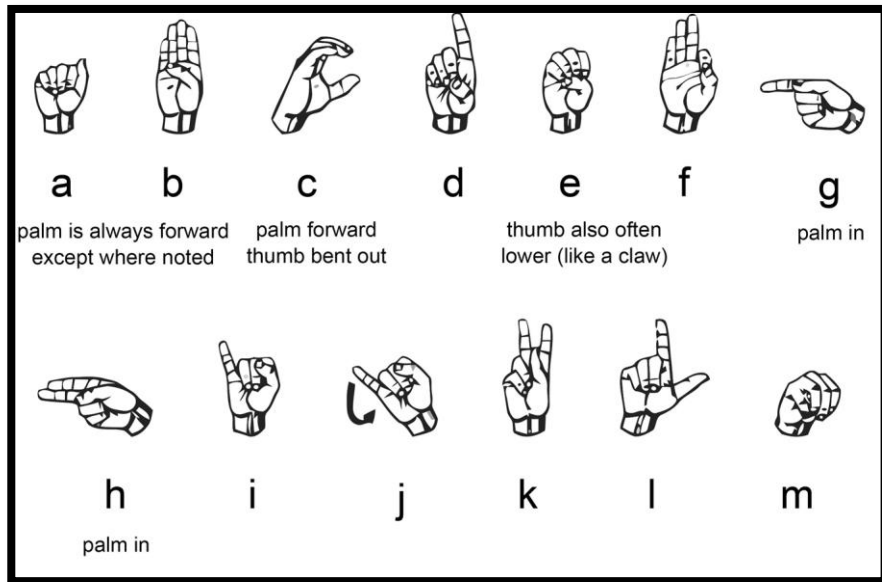
Kinect' Sensor by Microsoft

PROPOSED SYSTEM

Application that can recognize American Sign Language using a Convolutional Neural Network

Features :

- Real time (ASL) detection based on gesture made by user.
- Customized gesture generation.
- Sentence formations and TTS assistance





MODULES DESCRIPTION

Core Modules :

1. Scanner
2. Data Pre-Processing
3. Gesture Processing
4. Custom Gestures
5. Predicted Output

Scanner

- The module that uses the webcam to capture images
- OpenCV is used for capturing the images

Data Pre-Processing

- Here we are converting the image to HSV format
- HSV is alternative representation of RGB
- This HSV values are adjusted to get sharper image
- OpenCV package is used

Gesture Processing

- This module act as the classifier .
- We are using a CNN with 3 convolution layers.
- Dataset : ASL alphabet by Kaggle
- Training Data : 45500 (1750x26)
- Test Data : 6500 (26x250)
- The Evaluation Results 90% of accuracy with 9% loss.
- This module returns an alphabet corresponding to the sign.

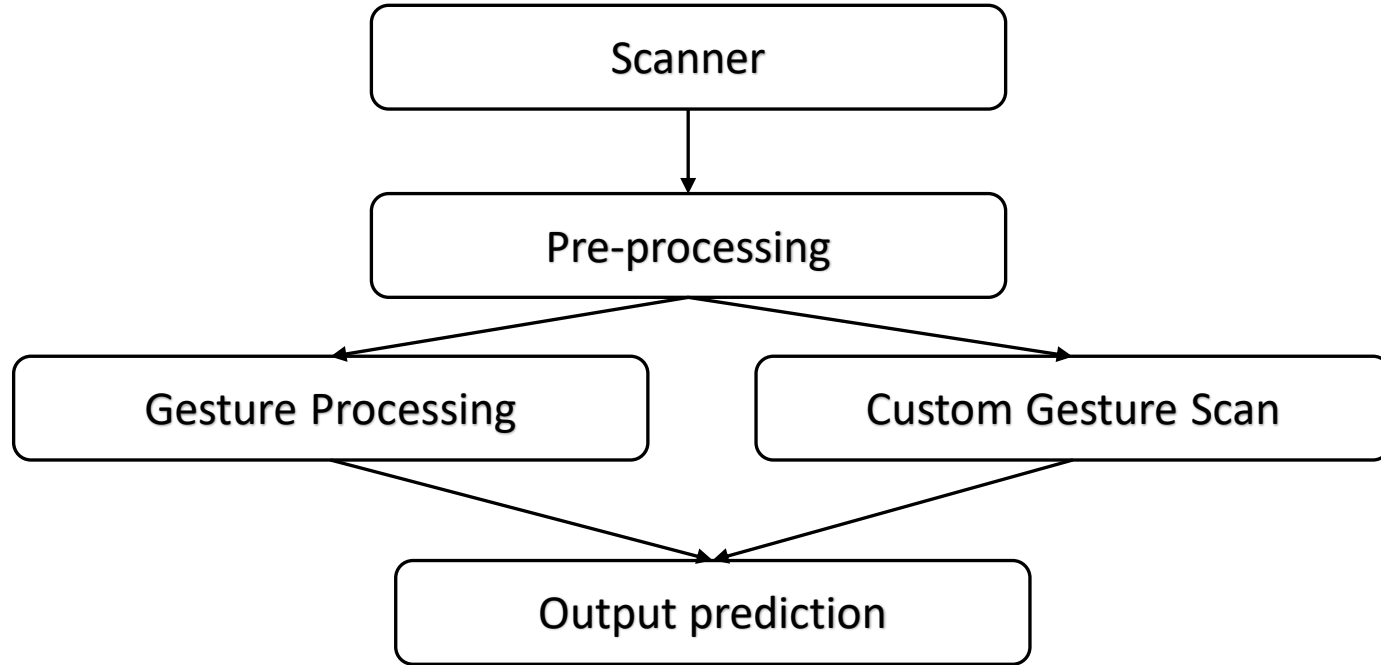
Custom Gestures

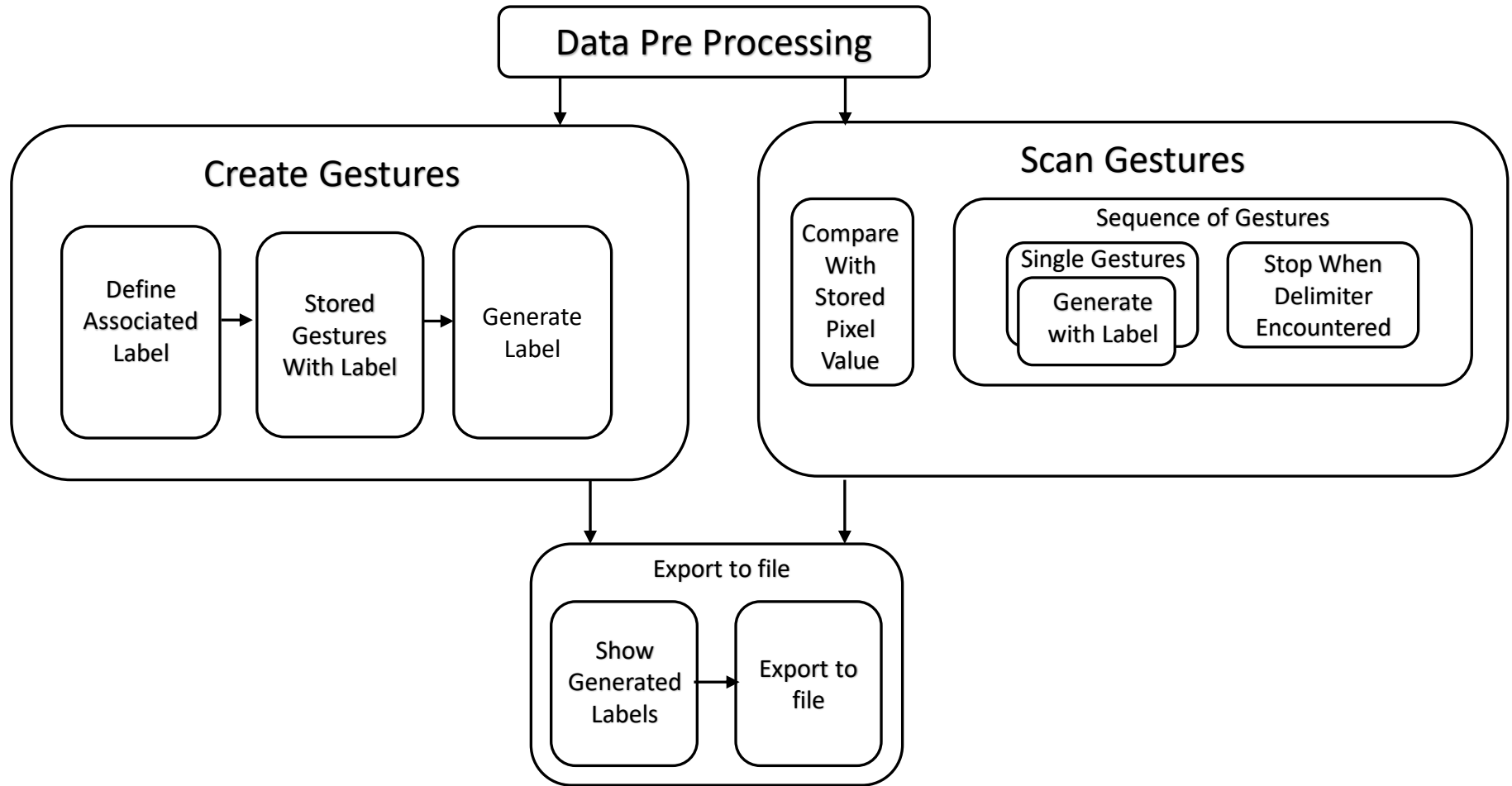
- User can define gesture with custom meaning like words, emotions etc.
- Initially image is captured and its HSV mask is generated
- HSV file is saved as a .png file
- The file is saved in a directory named with the word that means

Predicted Output

- Gestures are recognized and corresponding meaning can be displayed
- These outputs can be combined to form sentences

DATA FLOW DIAGRAM





REQUIREMENTS

Minimum Hardware Requirements

- Intel Pentium Dual Core E6600 2.6Ghz / AMD Athlon II X2260
- 512 MB Disk Space
- 2GB RAM
- 256 MB VRAM
- USB Keyboard, Mouse & Speaker
- 2MP VGA webcam & Monitor

Software Requirements

- OS : Window 7 or later, Linux or macOS
- Python 3.6.
- TensorFlow framework, Keras API
- Real-time computer vision using OpenCV
- Industrial standard GUI application (PyQT5), Tkinter.
- Offline TTS assistance for python



SAMPLE OUTPUT SCREENSHOTS



This notebook is open with private outputs. Outputs will not be saved. You can disable this in [Notebook settings](#).

Help Last saved at 9:56 AM

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+ Code + Text Busy Editing

```
Epoch 13/25
800/800 [=====] - 456s 570ms/step - loss: 0.1197 - acc: 0.9563 - val_loss: 0.1003 - val_acc: 0.9563
Epoch 14/25
800/800 [=====] - 456s 571ms/step - loss: 0.1084 - acc: 0.9627 - val_loss: 0.0840 - val_acc: 0.9627
Epoch 15/25
800/800 [=====] - 456s 570ms/step - loss: 0.1039 - acc: 0.9630 - val_loss: 0.0927 - val_acc: 0.9630
Epoch 16/25
800/800 [=====] - 458s 572ms/step - loss: 0.0951 - acc: 0.9673 - val_loss: 0.0927 - val_acc: 0.9673
Epoch 17/25
800/800 [=====] - 456s 569ms/step - loss: 0.0907 - acc: 0.9690 - val_loss: 0.0749 - val_acc: 0.9690
Epoch 18/25
800/800 [=====] - 455s 569ms/step - loss: 0.0923 - acc: 0.9682 - val_loss: 0.0761 - val_acc: 0.9682
Epoch 19/25
800/800 [=====] - 456s 570ms/step - loss: 0.0846 - acc: 0.9696 - val_loss: 0.0940 - val_acc: 0.9696
Epoch 20/25
800/800 [=====] - 459s 573ms/step - loss: 0.0793 - acc: 0.9727 - val_loss: 0.0851 - val_acc: 0.9727
Epoch 21/25
800/800 [=====] - 459s 574ms/step - loss: 0.0696 - acc: 0.9756 - val_loss: 0.0833 - val_acc: 0.9756
Epoch 22/25
799/800 [=====>.] - ETA: 0s - loss: 0.0726 - acc: 0.9754
```

Fig 1 : Model Training

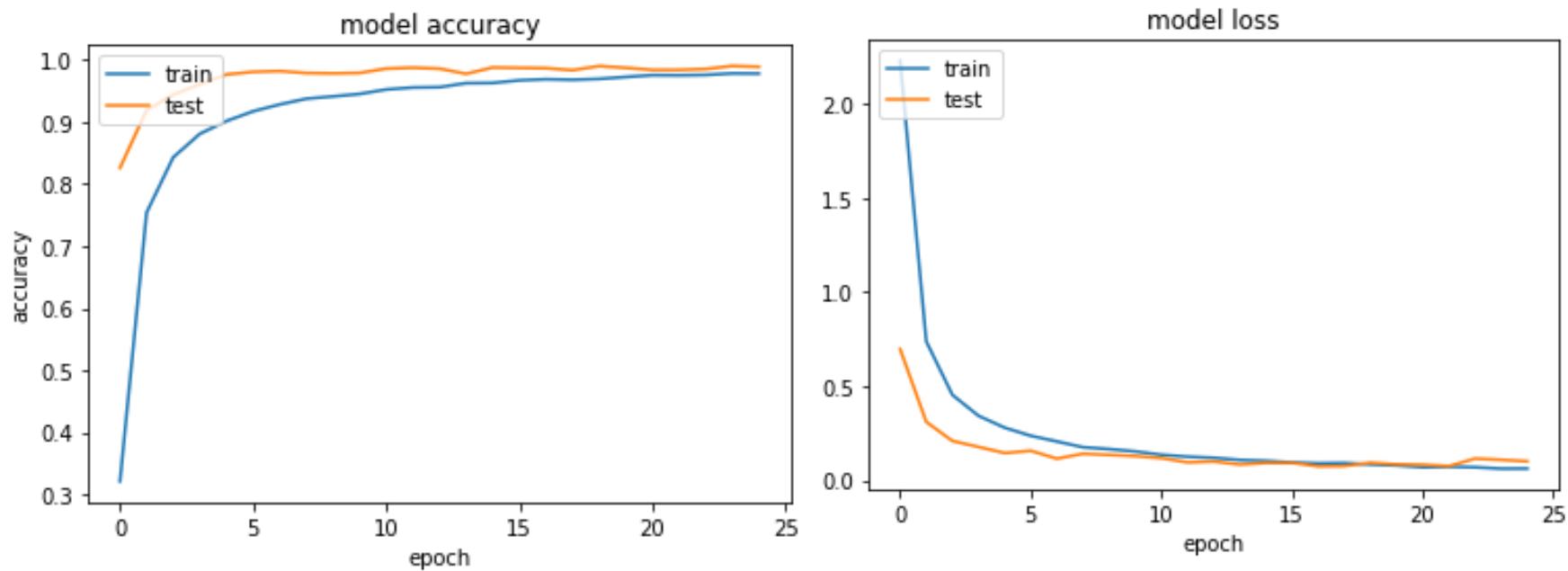


Fig 2 : Model Evaluation

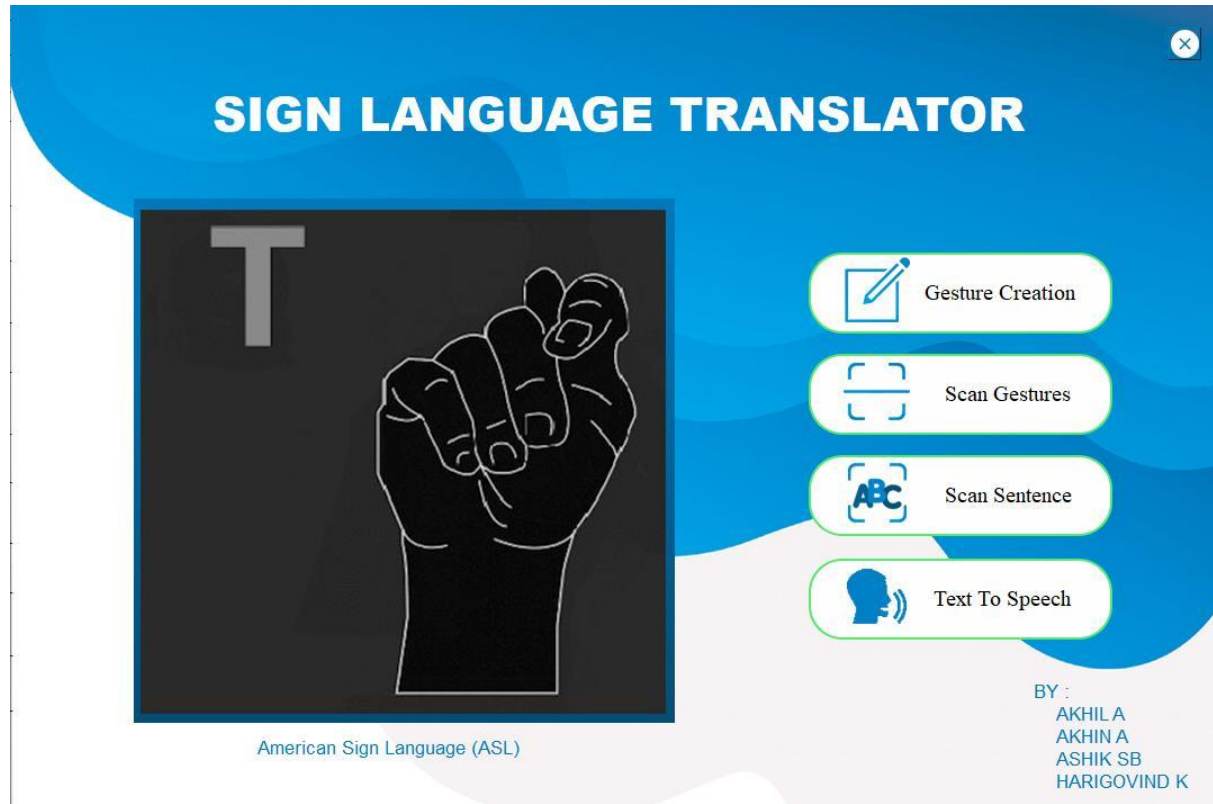


Fig 3 : Main UI



Fig 4 : Create Customizable Gesture

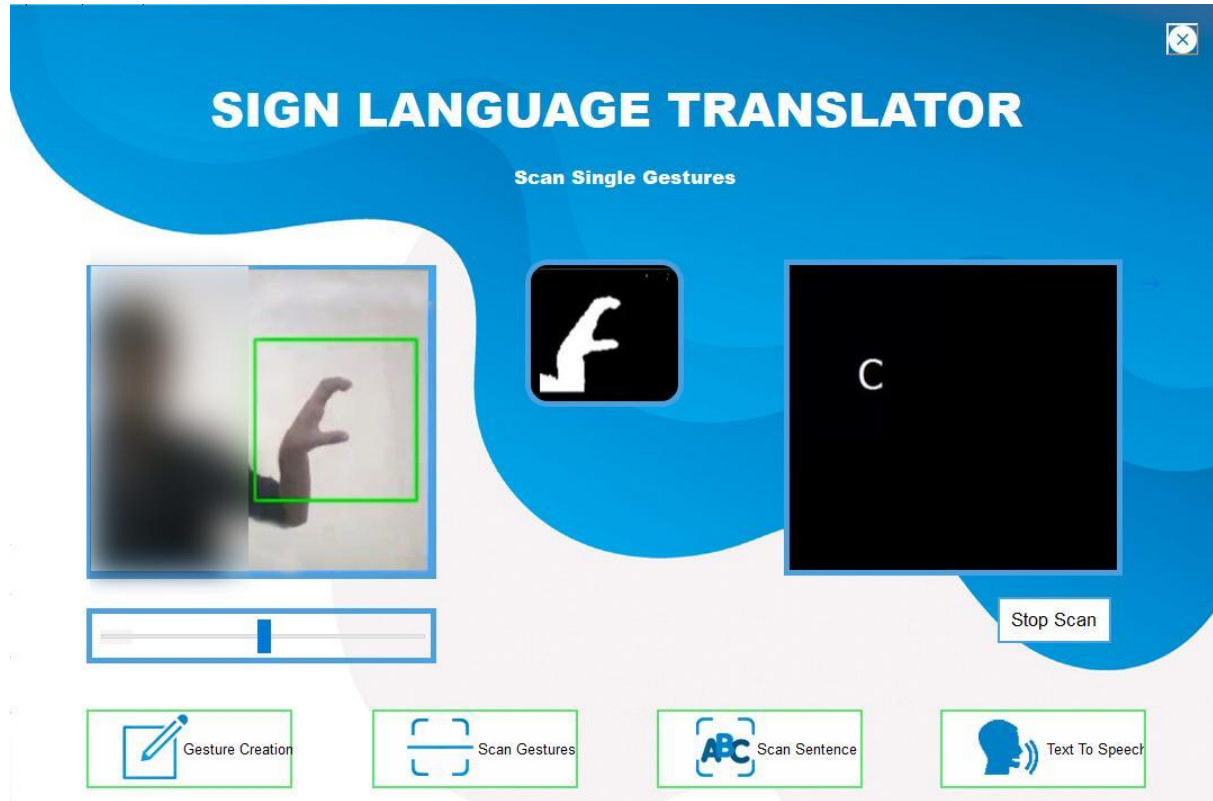


Fig 5 : Scan Single Gesture



Fig 6 : Stream Of Character Formation

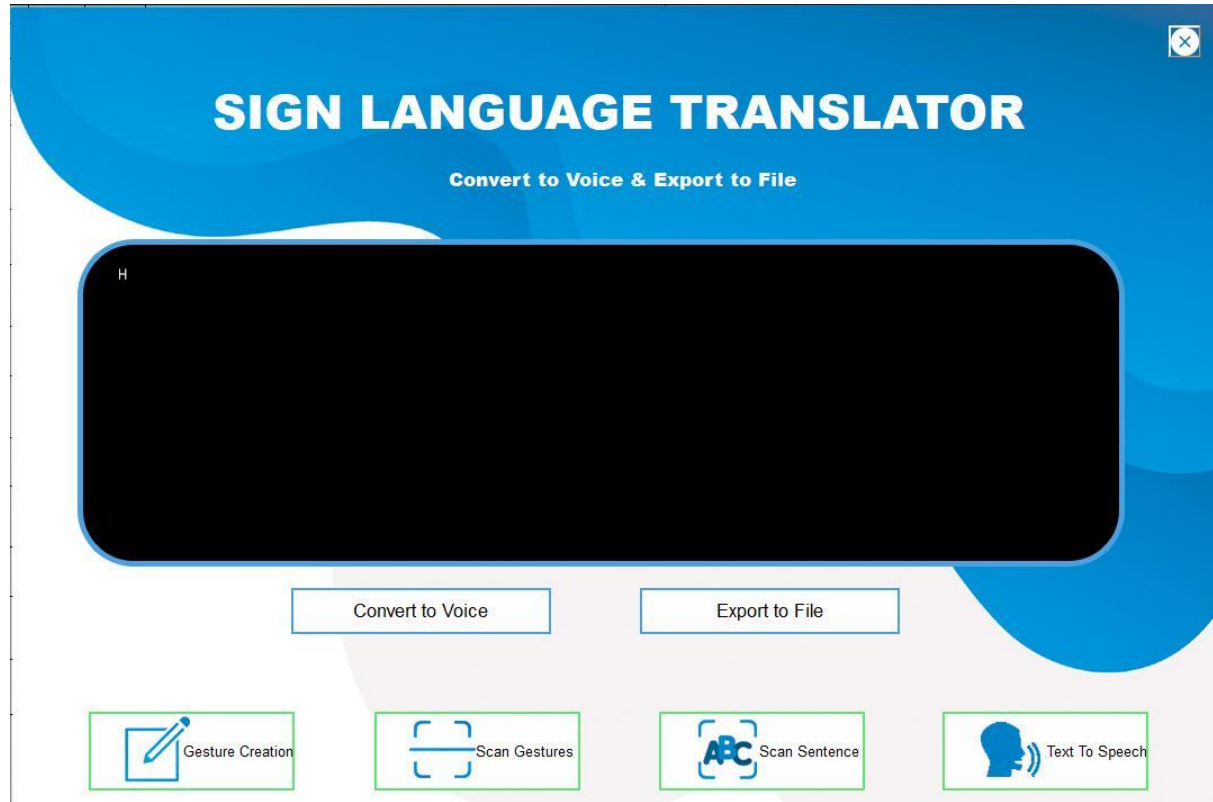


Fig 7 : Convert to Voice & Export to File

FUTURE ENHANCEMENT

- Image pre-processing can be improved using advance algorithms
- Contrast slider can be automated
- Software can be embedded in wearables
- Software can be modified for playing games and chatting

CONCLUSION

A method of gesture recognition based on CNN is introduced and evaluation of the model in a real-world environment. The experimental results show that our model can achieve good results. The network also supports the addition of more gestures. In the future, we can even use gestures to play games, chat and email with others. Although the accuracy obtained by the experiment has been very high, we feel that it is necessary to further improve for the application to real life

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