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SIGN LANGUAGE ASSISTANT FOR SPECIALLY ABLED

[1]Vanshika Gupta, Tanishq Sharma[2], Saksham Sharma[3], Saurav Pant[4], Yash Kumar[5]

[1] Assistant Professor, Inderprastha Engineering College, Ghaziabad (U.P.), India

[2-5]Student, Inderprastha Engineering College, Ghaziabad (U.P.), India

Abstract: : In today's world where we make things easy for our needs. We have created a program for the deaf worldwide. A simple and efficient system is an hour's need and in this busy world translating is a very tedious task. The tool can detect hand gestures in realtime, captured using a webcam / camera. We used PYTHON IDE to process the program and display the translated text. Using TensorFlow, Keras, CNN to trainour model. A large database to increase the level of matching and have the right system or tool to keep things simple and stable.

We did not use external hardware to make the projectcost less and easier to move from one location to another. It can be used for heavy loads with large databases. By using the python we can easily process the image and insert it into database. TensorFlow, Keras modulesare very useful to use. The database is easily created and processed with the help of the modules we use. Creating a large database will help us to reduce theerror in feature detection and touch detection.

Keywords: Gesture Recognition, Sign Recognition, CNN, Histogram

I. INTRODUCTION

About 460 million people have a hearing impairment. And we know that there is not a small amount you canignore in this growing world. The language they can use is sign language. (Sign language - a means of communication for the deaf and hard of hearing). Includes simultaneous use of the following: facial expressions, posture and hand movements, finger spelling, body language, head movements, eye contact. In this project, we will translate sign language into real-time and tracking. Sign language recognition is one of the fastest growing fields in the research field. A research problem that is important in computer vision is the ability to communicate with deaf people. This system introduces effective and fast-paced fingerprint identification techniques that represent the sign language alphabet. Indian Sign Language (ISL)uses both hands to represent the letters of the alphabet and to touch. At first we must keep the relevant and pre-defined gestures on the local database. When the user makes any appropriate handgestures in front of the camera, the symbols are taken .The symbols are then stored on the local database.

When the user makes any appropriate handgestures in front of the camera, the symbols are taken .The symbols are then stored on the local database. The captured image is processed to remove the background. The extracted features are compared using a pattern matching algorithm. To calculate brandrecognition, features are compared with the test data base. Finally, the visual touch is converted into text. At first we must keep the relevant and pre-defined touch on the local database. When the user makes anyappropriate hand gestures in front of the camera, the symbols are taken .The symbols are then stored on thelocal database. These processed images are processed to extract the feature. The extracted features are compared using a pattern matching algorithm. To calculate hand recognition, features are compared with the test data base.
Finally, the hand gestures is converted to text anddisplayed on the screen.

II. LITERATURE REVIEW

Alignment algorithm are calculated for eachcandidate fingertips collected. Then finger names aredetermined according to their relative distances, and adirection vector is assigned to each finger. In “GestureRecognition” process, there are three layers includingfinger counting classifier, vector matching and fingername collecting. When a single hand gesture is used,system gives accuracy which varies from 84% to 99% .When same gesture is performed with both hands,accuracy varies from 90% to 100%.[1]

Chuan-Kai Yang, Quoc-Viet Tran and Vi N.T. Truong have proposed a system recognizing static hand signs of alphabets in American Sign Language from live videos and translating into text and speech. AdaBoost and Haarlike classifiers have been used for the classification during training process. After the training process, the classifier can

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recognize different hand postures. Process of testing the system consists of three stages: preprocessing stage, classification stage and text to speech stage. In "Preprocessing Stage", frames from the video stream are extracted and methods of image processing are used to obtain the features from the image. In "Classification Stage", the processed images in the preprocessing stage are used as input and classification is done by using Haar Cascade Algorithm. In"Text To Speech Stage", text recognized by the classifier is converted to speech by using SAPI 5.3. Performance measures of the system are: 98.7% precision,98.7% recall, 98.7% sensitivity, 99.9% specificity and 98.7% F- score. [2]

Yi Li has proposed Hand Gesture Recognition System using on Microsoft Kinect for Xbox. The system is built on Candescent NUI project and uses Open NI framework for data extraction from the Kinect sensor. There are three main processes in the proposed system:Hand Detection, Finger Identification, and Gesture Recognition. In "Hand Detection" process, firstly hands are separated from background by using depth information. Then two clusters of hand pixels are obtained by using K-means Clustering Algorithm to be able to detect hand by merging two clusters. Afterwards, convex hulls of hands are determined by using Graham Scan Algorithm and detection of hand contours is done by using contour tracing algorithm.[3]

Anis Diyana Rosli, Adi Izhar Che Ani, Mohd Hussaini Abbas, Rohaiza Baharudin, and Mohd Firdaus Abdullah have proposed a spelling glove work recognizing the letters of American Sign Language alphabet. The system has been designed targeting deaf-mute people to communicate with normal people. Firstly, the alphabet of the sign language is formed by the designed glove. When the sign language is formed, the bending sensor detects the position of each finger and yields various resistance value. Then Microcontroller that is connected to the spelling glove categorizes the position of bending of finger based on output voltage produced.After Microcontroller finds the combination position of each finger in library, LCD displays correct alphabet.Recognition rate is 70% [4].

Md. Mohiminul Islam, Sarah Siddiqua and Jawata Afnan have proposed another Hand Gesture Recognition study based on American Sign Language. The system works in four steps for gesture recognition including image acquisition, preprocessing, feature extraction and feature recognition. In "Image acquisition" step, a database of 1850 images of 37 signs is created by collecting image samples of each sign of the sign language from different people. "Preprocessing" step prepares the image received from camera for feature extraction step by removing noise and cropping image toobtain portion from wrist to fingers of a hand for sign detection. "Feature extraction" step applies different algorithms for feature extraction of hand gesture recognition system including K convex hull for fingertip detection, eccentricity, elongatedness, pixel segmentation and rotation. Artificial Neural Network, Backpropagation Algorithm is used for training. Gesture recognition rate of the system is 94.32%. [5].

Jun-Wei Hsieh, Teng-Hui Tseng, Wan-Yi Yeh and Chun- Ming Tsai have proposed a sign language recognition system in order to detect English letters and numbers. The color data, skeleton data and depth data which are obtained from the input Kinect are used for detecting palm area of hands. Then Otsu thresholding method is used for extracting palm and morphology closing operation is used for closing the holes in the palms. Then SURF descriptors and features are extracted. Finally, Brute-force and SVM are used for recognition the letters and numbers in the sign language. The accuracy rate obtained by the classification of the numbers and letters with SVM is 100%.The alphabet is also trained by SVM with the accuracy of 70.59%[6].

Deriche, S. I. Quadri and M. Mohandes have proposed an image based recognition system for Arabic Sign Language. Region growing technique and Gaussian skin model are used respectively for face detection and hand tracking. Hidden Markov Models is used for classification of the signs. Proposed system has accuracy rate of 93%.[7].

Raja S. Kushalnagar, Lalit K. Phadtare and Nathan D. Cahill have proposed a system for synthesis of American Sign Language. The proposed system uses MS Kinect andOpen NI library. Skeletal and depth data is read in from the Kinect, then detection of the palm orientation and classification of hand shape is done. A three-dimensionalextension of the shape context classification algorithm isused for the classification of hand shape. Theclassification method classifies correctly 10 shapes of 40 hand shapes of the Hamnosys set. [8]

Novel training method for sign language recognition has been proposed by Shuqiong Wu and Hiroshi Nagahashi.The system proposes a new training method for Haar- like features based on AdaBoost classifier, including a hand detector which combines a skin-color model, Haar- like features and frame difference based on AdaBoost classifier for detecting moving right or left hand and a new tracking method which uses the hand patch extracted in the previous frame in order to create a new hand patch in the current frame. The detecting rate of the system is 99.9% and the rate of tracked hands which are extracted in proper size is more than 97.1%. [9].

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Chana Chansri and Jakkree Srinonchat have presented astudy of recognizing Thai sign language.The proposedsystem receives the color and depth information from the Kinect sensor for hand detection. Then Histograms of Oriented Gradients technique is used for feature extraction of images. Finally the extracted features are trained by using Neural

Network.The accuracy rates are obtained from differentdistances from Kinect sensor such as 08.m, 1.0m and 1.2 m are in order of 83.33%, 81.25%, 72.92%.[10]

III. WORKING

Creating a gesture

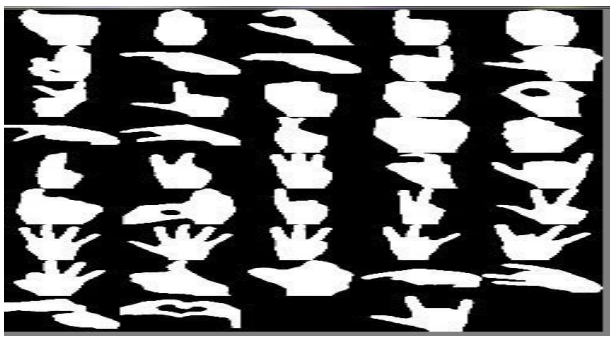
First set your hand histogram. You do need to do it ifthe lighting conditions change. A windows "Set hand histogram" will appear. "Set hand histogram" will have 50 squares (5x10).Put your hand in those squares. Make sure your hand covers all the squares. Press 'c'. 1 other window will appear "Thresh". On pressing 'c' only white patches corresponding to the parts of the image which has your skin color should appear on the "Thresh" window.
Make sure all the squares are covered by your hand.In case you are not successful then move your hand a little bit and press 'c' again. Repeat this until you get a good histogram. After you get a good histogram press 's' to save thehistogram. All the windows close.
On starting executing this program, you will have to enter the gesture number and gesture name/text. Then an OpenCV window called "Capturing gestures" which will appear. In the webcam feed youwill see a green window (inside which you will have to do your gesture) and a counter that counts the number of pictures stored.
Press 'c' when you are ready with your gesture.
Capturing gesture will begin after a few seconds. Move your hand a little bit here and there. You canpause capturing by pressing 'c' and resume it by pressing 'c'. Capturing resumes after a few second After the counter reaches 1200 the window will close automatically. After capturing all the gestures you can flip theimages. When you are done adding new gestures run the load_images.py file once. You do not need to run thisfile again until and unless you add a new gesture.

Displaying all gestures

To see all the touches saved in the 'symbols /' folder use the display command given in the folder.

Training a model

Training can therefore be done with TensorFlow or Keras. If you want to train using TensorFlow then run cnn_tf.py file. If you want to train using Keras usethe file cnn_keras.py. If you are using TensorFlow you will have test sites and metagraph file in the tmp / cnn_model3 folder.If you use Keras you will have a model in the root directory with the name cnn_model_keras2.h5. You do not have to re-train your model all the time.If you add or remove a touch you have to do it retrain it.



Using fun_util.py

Text Mode (Press 't' to go to text mode)
In text mode you can create your own words using spelling or using predefined touches. The text on the screen will be converted into speech by taking your hand out of the green box.Make sureyou keep the same touch in the greenbox for 15 frames or else the touch will not be converted to text.

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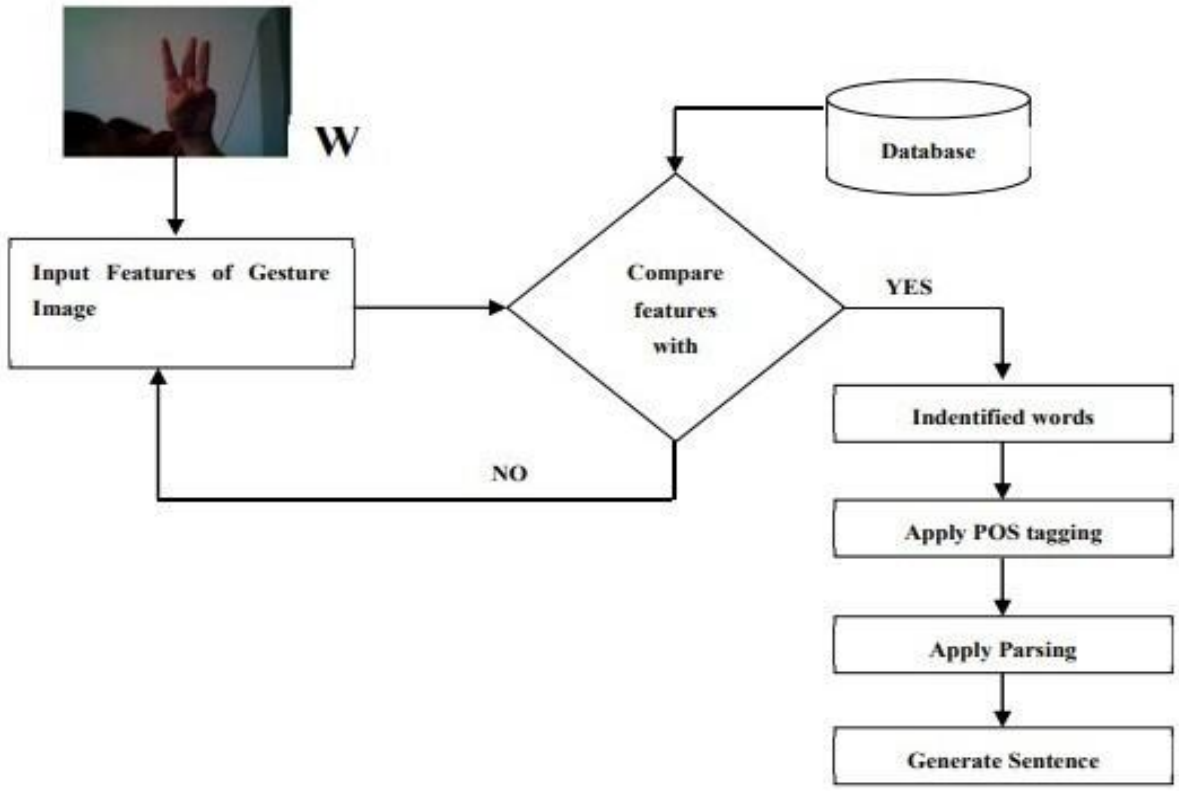

IV. CONCLUSION

We have stored 44 alphabets of 26 alphabets and 10numbers of American Sign Language and other touches.We also trained the model in these images. When we perform a proper hand gesture inside the frame / green box, the system compares this action to the pre-stored gestures on the local storage . If the current gestures matches any of the saved one, the text on the screen will be converted to text in the handwriting in the green box while ensuring thatwe maintain the same touch in the green box with 22-25 frames..

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