SIGN LANGUAGE RECOGNITION AND MESSAGE NOTIFICATION

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ABSTRACT

Human computer interaction moves forward in the field of Sign Language Recognition interpretation. Indian sign language (ISL) is a good way to help the indian hearing impaired people to interact with normal people with the help of computer. The sign language Recognition system is a method of communication for deaf-dumb people. Gesture recognition remains a very challenging task in the field of computer vision. The images are of the palm side of right hand and are loaded at runtime i.e. dynamic loading. The method has been developed with respect to single user both in training and testing phase. The images are converted into text by identifying the finger tip position of static images using image processing techniques. The proposed method is able to identify the images of the signer which are captured dynamically during testing phase. This allows to repeat the training procedure of data model without significant effort. It also recognize the sign and display the word or letter as a tag. During the time of emergency, it identifies the sign and sends notification to the nearest location.

I.INTRODUCTION

Indian sign language for deaf community of India, which can be used as a means of communication between friends and families of deaf people . Indian sign languages is one of languages to text using OpenCV. The project presents a methodology which recognizes Indian sign languages and translates into normal text. Deaf and dumb people relay on sign language interpreters for communications. However finding experienced and qualified interpreters for their day-to-day affairs throughout life period is very difficult task and affordable. Hence, Gesture Identification system will prove to be reliable and consistent solution to such persons. A Typical Hand Gesture Recognition system consists of mainly four modules, Gesture acquisition, Tracking and segmentation, Feature extraction, classification and recognition.

A.IMAGE PROCESSING

Computer recognition of sign language is an important research problem for enabling communication with hearing impaired people. The system does not require the hand to be perfectly aligned to the camera. The project uses image processing system to identify, especially English alphabetic sign language used by the deaf people to communicate. The

idea consisted of designing and building up an intelligent system using image processing, machine learning and artificial intelligence concepts to take visual inputs of sign language's hand gestures and generate easily recognizable form of outputs. Hence the objective of this project is to develop an intelligent system which can act as a translator between the sign language and the spoken language dynamically and can make the communication between people with hearing impairment and normal people both effective and efficient. The system is we are implementing for Binary sign language but it can detect any sign language with prior image processing.

B.WHY IMAGE PROCESSING?

Image processing procedures such as image enhancement and restoration are used to process degraded or blurred images.As per medical imaging is concerned most of the images may be used in the detection of tumors for screening the patients.

C.APPLICATION OF IMAGE PROCESSING

- Convert signals from an image sensor into digital images.
- Improve clarity, and remove noise and other artifacts .
- Extract the size, scale, or number of objects in a scene.
- Prepare images for display or printing.
- Compress images for communication across a network.

D.TYPES OF IMAGE PROCESSING

1. Neural Networks

Convolutional neural network use the data image to learn and it gain a lot of power when images are constructed with multiple layers. To keep track of number of parameters as the network grows and to control the numbers. It required large amounts of training data and also it required measurements to be selected to drive the network.

2. Digital image processing

It is to perform image processing on digital images. As a digital signal processing, digital image processing has many advantage over analog image processing. It allows a much wider range of algorithms to be applied to the input data .Images are defined over two dimensions if digital image processing may be modeled in the form of multidimensional systems.

II.SIGN LANGUAGE RECOGNITION

A.SKIN COLOR BASED

Sign language is one of the most widely used sign language in the world with the method of fingerspelling as a representation of the alphabet. It is getting more and more attention of the researchers due to its applicability in many areas such as deaf people communication system, virtual reality, human computer interaction, machine control in the industrial field and many more. The process involve the detect of background color that are market and the average color will be stored in matrix array for skin color identification. The application starts with two pre-sampling steps that are used for collecting the background

color and the user hand using the layers that are displayed on the screen. This color data is used to calculate the threshold value for obtaining binary to process the image for labelling.

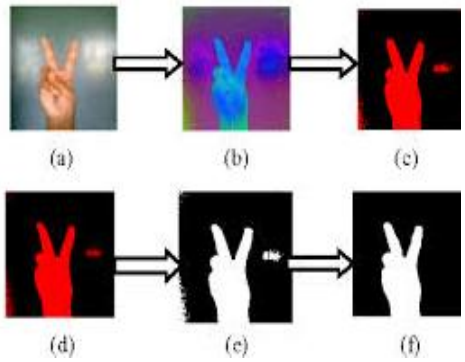


FIG 1: RGB image

C.FINDING HAND COLOR

After the average color is processed the image will be stored in a matrix array format. After the color data for hand is obtained, the upper and lower borders for hand area are calculated based on threshold value, which can be represented as 2 dimensional array. The original color of the frame is RGBA which will be converted to obtain the best color samples to detect the same hand in different light conditions.

D.PALM IMAGE EXTRACTION

The images which are converted as RGB color are further converted into gray scale images which are in turn converted into black and white image. The images are then processed to extract outline images of palm for hand tracking to recognize .By pointing the palm for extraction of gesture so that the process for recognition can be easier.

E.SIGN DETECTION

The edge image are further taken through scan process and detection phase. The process includes

I. Feature points marking
II. Determination of heights of fingers in position and persons edge marking.
III. Calculating the angle between the line joining and the feature points of fingers with the reference point.

the details mentioned above are then compared with the available images data which were obtained through some images.

F.BINARY OF THE HAND REPRESENTATION

After the limit of each colors is obtained, the next binary images of hand representation can be computed by performing on each binary image using the logical operation. By performing the logical operation the binary hand representation can be identified. The same process is done in the background color to produce a binary image of the hand. Then the blurring is done for accurate image and the next process is performed

using morphological operations to remove noise and to gain optimal result for hand representation.

G.CONTOUR AND FEATURE EXTRACTION

The result of hand representation on binary image will be used to search contours and edge marking of hand and fingers. Furthermore, the contour will be described for next operation such as drawing bounding box, convex hull, and convexity defects. This steps are use to find the gesture of hand to for identifying the gesture.

There will be drawn a circle on the palm of the hand for hand tracking. This circle is useful for finding the midpoints that will be used as features along with the location of the finger to train the image with dataset and then in the prediction of the results will be found using OpenCV. In this Gray line represents contours, red line is convex hull. The location between the red lines of contours with convex hull is called convexity defects to identify the sign. The location of the fingertips is calculated using a defect point. And the Redundant defect points will be eliminated by checking the depth and angle of the defect point using convex hull.

F.DATA FLOW USING IMAGE PROCESSING

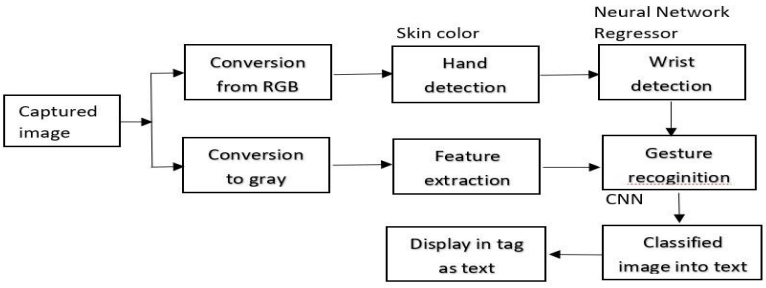


FIG 2 Image processing in flow diagram

The data flow of Image processing shows that, the captured image is been divided into

- Conversion from RGB
- Conversion to gray

On the basis of skin color, the Hand detection process has been carried out. Then the features that are required has been extractioned after the conversion to grey process. With the neural network regressor algorithm, the wrist detection been processed. The gesture has been recognized after the wrist detection using CNN algorithm. Then from Gesture algorithm the image has been classified into text. Finally, the text is displayed in tag.

G.CONVEXITY DEFECT

Convexity defect is a cavity in an object (blob, contour) segmented out from an image. That means an area that do not belong to the object but located inside of its outer boundary-convex hull. The image below shows it better than million of words. Areas between

fingers (all marked with arrows) in this schematics of a hand contour are the convexity defects.

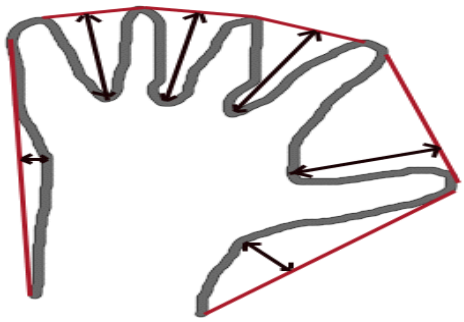


FIG 3 Convexity defect

H. IMAGE THRESHOLD

If the pixel value is greater than a threshold value, it is assigned one value or may be white, it is assigned another value may be black). The function is used openCV threshold. First argument is the source image, which should be a grayscale image**.** Second argument is the threshold value which is used to classify the pixel values. Third argument is the maxVal which represents the value to variable given if pixel value is more than the value or sometimes less than the threshold value.

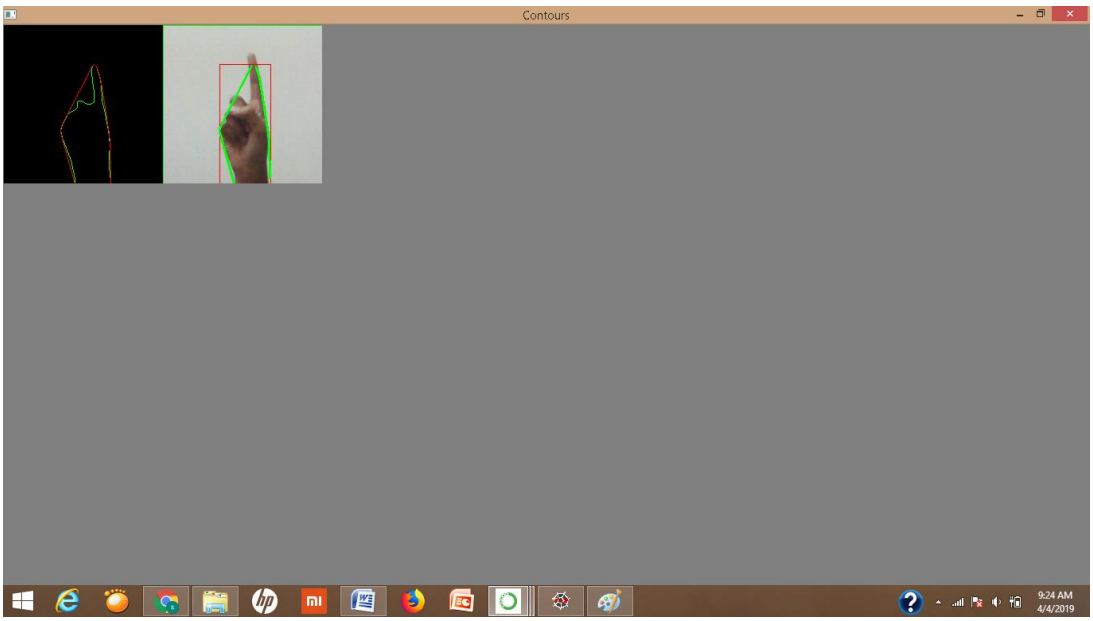
DATA TRAINING

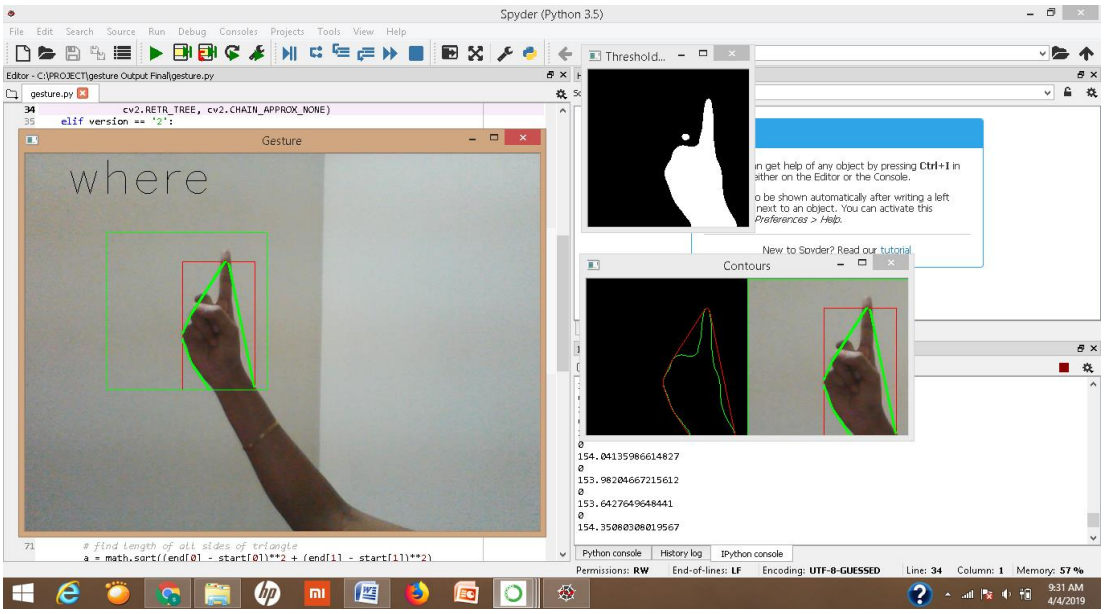
The process and content for training the data are often referred to as labelled or human labelled data or ground truth labelled data which is designed to train specific machine learning models with an end application in perspective. The labels are done for the image in the sequential order such as 1 to A, 2 to B and so on. While training the data set the sequence should not be reversed because it can be ascertained and the prediction results will also be wrong. The result of feature extraction will be predicted based on the data set that has been stored during the training to produce sequence label then compared with alphabetical order and display on screen.

DISPLAY TEXT

Optical character recognition is used for conversion of images of typed gesture, handwritten or printed text into machine-encoded text. Each image has to be trained with images of each character, and worked on one at a time. This process involves photo scanning of the text character-by-character, analysis of the scanned in image, and then translation of the character image into character codes, such as ASCII, commonly used in data processing

III.IMPLEMENTATION DETAILS





By image processing to identify the gesture and converting into text is done by various process using threshold value and with contours .Integrated Development and Learning Environment which is the basic platform for python and the used for gesture recognition with various resource.

CONCLUSION

A sign language recognition system proposed for human computer interaction using image processing technique is being implemented with accuracy comparable. Identifying the sign language through image processing and to display those gesture into normal text .So that it helps the normal person to communicate with deaf and dump people. Generating the training and test dataset from the same person which lead to higher accuracies. A dataset with more variation and a higher quality can really boost the accuracy of our current models. Based on the observation, we can conclude that the results mainly depend on value while converting the grey image to the binary image and finding contours.An additional work in emergency situation can be done by tracking the location and by access the dataset so that the text which is recognised from sign gesture in transferred as message notification in emergency.

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