HAND GESTUNO PARALLEL COMMUNICATION USING NEURAL NETWORK IN IMAGE PROCESSING

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Abstract

This proposal is the new way of communication to the speech impaired people to interact with normal persons. ***.*** *Hand gesture recognition system act as a mediator between the computer and human using hand gesture. "Sign Language Communicator" (SLC) is designed to solve the language barriers between the people and deaf mutes. Image processing is used to better extract features from input images. Threshold based segmentation and slicing technique are used to segment the image. Initially the colored images are converted to gray scale image. YIQ, YUV, YCBCR, YCC (Luminance - Chrominance) these are the television transmission color spaces, sometimes known as transmission primaries. The skin recognized images is processed to get clear image. The Region of Interest (ROI) is used to filter the required portion of the image. Histogram of image is obtained to calculate the height to width ratio. Databases consist of predefined character. Classification system consists of a database that contains predefined patterns that is compared with a perceived object to classify into proper category. Neural network is used to train data and calculate performance and regression of the data. In the second phase, it consists of text is converted to sign image with voice we use character separation and identification, template matching. In character separation each character is separated using array. The separated character is to be identified by as individual string that is stored in the database. By the identified character template based approach is done to check with database image. Then our finalized sign image is obtained. This is mainly used for in deaf mutes school while teaching .*

Keywords: *Hand Gesticulation, Image Splitting up, Pattern Matching, Neural Network, Height to Width Ratio.*

1. Introduction:

The Communication is the exchange of information and this is effective if all use a common language. Sign languages are the only medium through which most of the educated deaf-mutes communicates. Sign language has proven effective in communicating across a broad spectrum of requirements from everyday needs to sophisticated concepts. More than 25% of the world population suffers from speech impairments. Linguistic string is the mode of communication of speech and auditory impaired people. For an ordinary person to communicate with impaired person, a translator is needed to convert the sign language into natural language and vice versa. It restricts the communication between speech and hearing impaired people and ordinary people

2. System analysis:

Existing System:

The Research has been a deal with the linguistic string gesture/posture and identified the sign and converted that sign into text and voice. The design phase and development phase were conducted together using a more agile software architecture where it improves with more added functionalities and algorithm developments with the evolution of system design. Main part of the design was to find a best fitting algorithm for logistic string posture recognition. Image processing techniques with Hu-moment classification was found as the best approach. To improve the accuracy of the system, a new approach; height to width ratio filtration was implemented along with Hu-moments. System is able to recognize selected linguistic string signs with the accuracy of 84% without a controlled background with small light adjustments. **Proposed System:**

The Image processing is a method to convert visual aspects images into digital form for some operation to be performed. In order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Images are in static image or dynamic image of sign perform by human. In particular, the features that we extract from sign or hand gesture images should be invariant to background data, translation,
scale, shape, rotation, angle, coordinates, movements etc.

Feasibility study:

This research paper stated the feasibility study of convolutional neural network for sign language recognition. It is mainly focusing on the human computer interaction, that is needed for the communication between the deaf-mutes and normal person, which is essentially needed for today's world. The gestures of deaf mutes are captured as a video and processed frame by frame to get the required text/voice and vice-versa. It is mainly focused on solving the society's problem, It is mainly implemented in deaf-mutes school at primary stages for easy understanding and recognition. Through this performance is inferior to that of conventional schemes. The accuracy of recognition is 59.6% to 73.2%. The ultimate use of this project is Dual communication which is a variation compared to other project .The feasibility study of the project mainly emphasis on identifying the potential problems and addressing the need of the project. Feasibility study can be technical and financial in nature. This project mainly focuses on the technical feasibility of the project using image processing.

3. DESCRIPTION OF THE RESEARCH WORK

Sign to Text Process

Preprocessing

The Preprocessing is very much required task to be done in hand gesture recognition system. The database taken here which is standard database in gesture recognition i.e. ASL. Preprocessing is applied to images before segmentation from hand images. Preprocessing consist of filtering and enhancement process.

3.1Segmention:

The division of an image into meaningful structures, image segmentation, is often an essential step in image analysis, object representation, visualization, and many other image processing tasks. A great variety of segmentation methods has been proposed in the past decades, and some categorization is necessary to present the methods properly here. A distinct categorization does not seem to be possible though, because even two very different segmentation approaches may share properties that defy singular categorization. The categorization presented in this section is therefore rather a categorization regarding the emphasis of an approach

than a strict division. Threshold based segmentation and slicing technique are used to segment the image. They may be applied directly to an image, but can also be combined with pre- and post-processing techniques.

COLOR SPACE: A color space is a method by which color can specify, create and visualize. As humans, color is defined by its attributes of brightness, hue and colorfulness. A computer may describe a color using the amounts of red, green and blue phosphor emission required to match a color. A printing press may produce a specific color in terms of the reflectance and absorbance of cyan, magenta, yellow and black inks on the printing paper. A color is thus usually specified using three co-ordinates, or parameters.\ YIQ, YUV, YCBCR, YCC (Luminance - Chrominance) these are the television transmission color spaces, sometimes known as transmission primaries.

YIQ and YUV are analogue spaces for NTSC and PAL systems respectively while YCbCr is a digital standard. This color spaces separate RGB into luminance and chrominance information and are useful in compression applications (both digital and analogue). These spaces are device dependent but are intended for use under strictly defined conditions within closed systems.

3.2Post Processing:

In the post processing, we are doing binary image morphological operations like erosion and dilation process. This can eliminate the noise and unwanted segmented areas. Morphological transformations were used to get a more clear hand image. The basic morphological transformations are called dilation and erosion, dilation add boundaries in an image and erosion remove pixel , they arise in a wide variety of contexts such as removing noise, isolating individual elements, and joining disparate elements in an image. The skin recognized image was processed with both dilation and erosion to get the image clearer.

3.3Feature Extraction:

In the feature extraction phase what is most important is to get possible precise features as output. Features selected for classification are hand contour, orientation histogram, convex hull, convexity defects and hu moments. The convex hull for the hand shape was computed and the poly line minimum area covering box and the rectangle was identified. Then the center of the box was computed. The Region of Interest (ROI) of the image was set to the minimum rectangle. In the algorithm Region of Interest (ROI) plays a major role as it is the area subjected to matching.

4. Research Work

4.1Text To Sign

4.1.1Character Separation and Identification:

In character separation and identification, the input text is separated into character by character and identifies the corresponding character stored in database. That is implemented in matlab in matrix format by identifying the more white and black region.

4.1.2Template Matching:

When the bulk of the template image initiate the matching image, a template-based approach may be effective. As aforementioned, template-based approach require sampling of a large number of points, it is possible to reduce the number of sampling points by reducing the resolution of template images by the same factor and performs the operation on the resultant downsized images providing a search window of data points within the search image so that the
template does not have to search every feasible data point. The output sign for the required text is obtained by comparing it in template matching.

4.1.1 Sign to Text

Image Preprocessing:

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Hand gesturing Segmentation:

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Sign detection:

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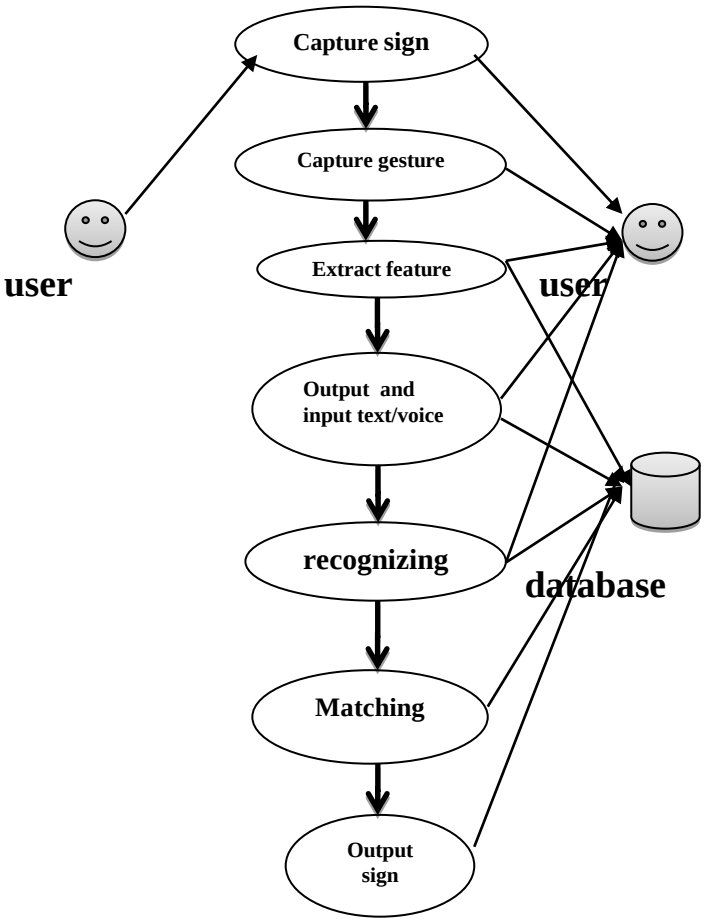
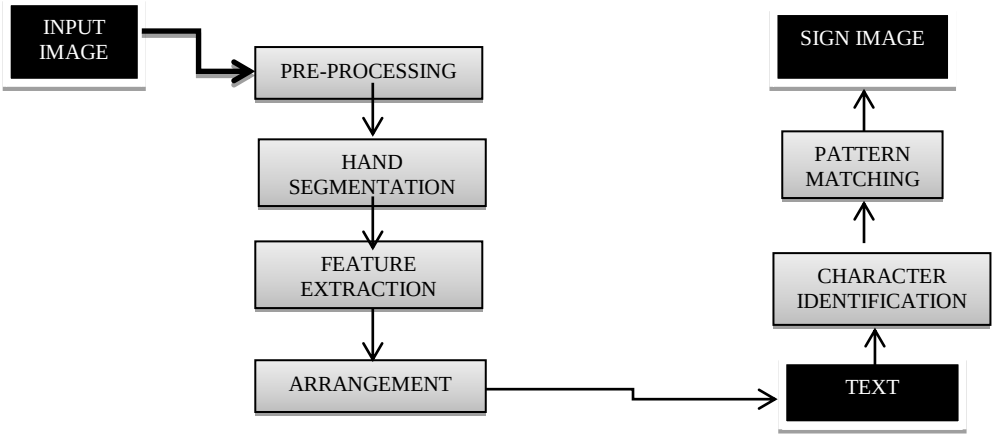
System architecture:



The user communicates with the system by capturing an image, where the captured and does the process of removal of noise. Then the removals of minute noises are too removed. The removal of noise is done by preprocessing. The fine outline of the image is obtained by edge detection After edge detection some noise occur it is removed by the post processing. Then the feature extraction to know what the image represents in character. Feature extraction is obtain by using neural network. The input sign is getting back as the text or character to know the sign by the user. If they are a normal person means they can give the input in text format.



In this approach, the movement of the hand is captured by a camera. The image contains background pixels other than the hand, as a hand will never fill a perfect square. The system captures the hand signs image from the unique image and recognize the skin-colored area and acquires the hand divided out from the rest of the background. Next, the binary mask for skin pixels is constructed

ALGORITHM:

The algorithm used for the color segmentation using thresholding is shown below:

STEP 1: Capture an image of the gesture from the camera.

STEP 2. Determine the range of HSV values for skin color for use as threshold values.

center x= ∑ i=0 n xi n:

center y= ∑ i=0 n yi

F(Cr, Cb)€S

STEP 3. Convert the image from RGB color space to HSV color space.

STEP 4. Alter all the pixels falling in the threshold values to white.

F * g}= {f} . {g}

STEP 5. Convert all other pixels to black

STEP 6. Save the segmented image in an image file

Sign to text: (Input images):

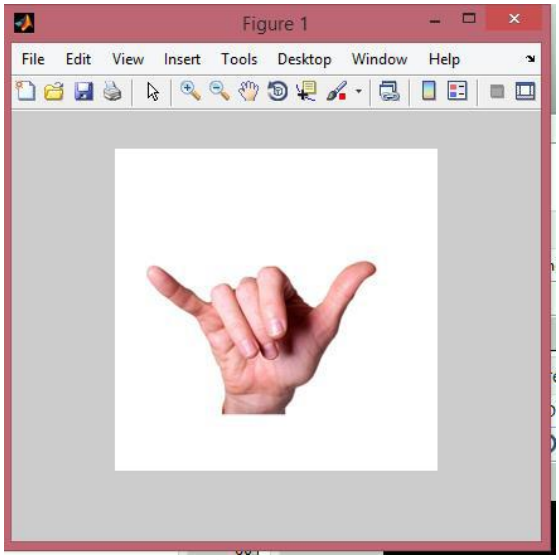


Figure A2.1

The figure A2.1 is a Captured image is given as the input as sign language using different alphabets.

Pre processing image :

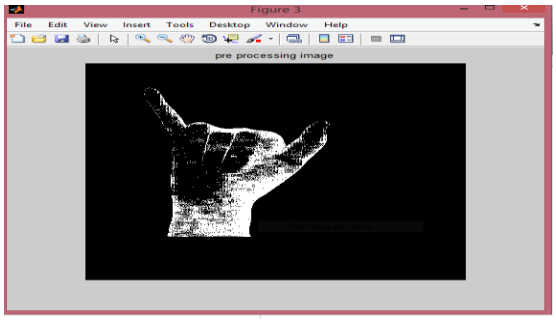


Figure A2.2

The figure A2.2 is a Input image which has the noise in captured image the process of dilation takes place **.**

Segmented images:

Figure A2.3

The input image contains more noises. So remove the noises in the input image. The minute noises are removed in segmented images show in figure A2.3

Feature extraction:

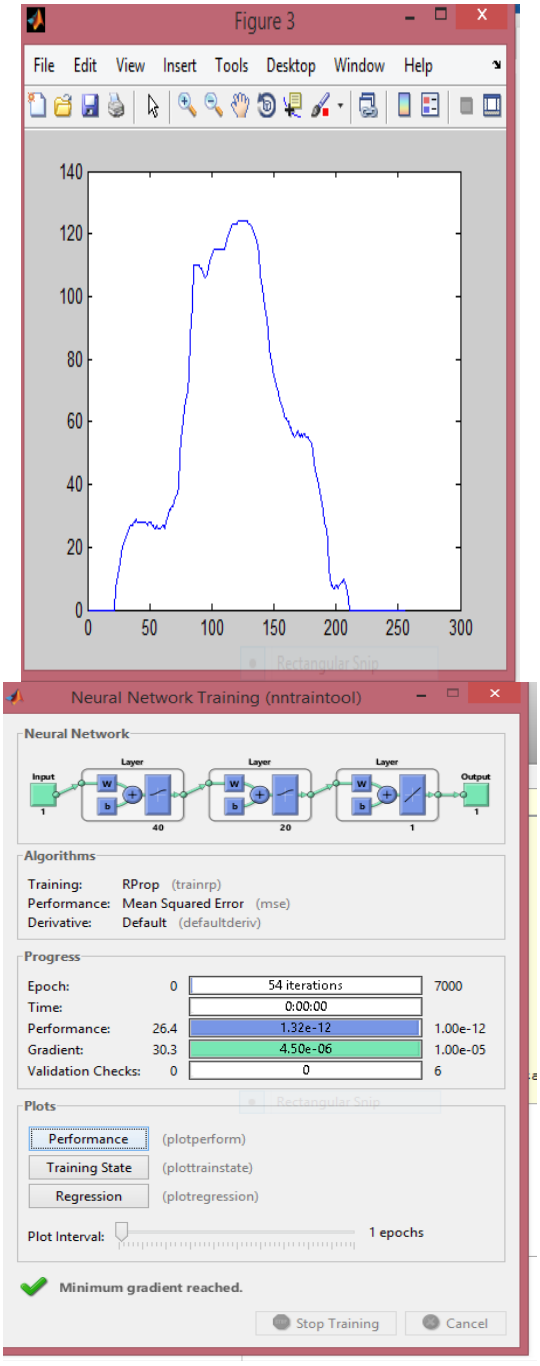


Figure A2.4

Extracting the image by neural network to obtain the image .to know the correct alphabet .

Classification:

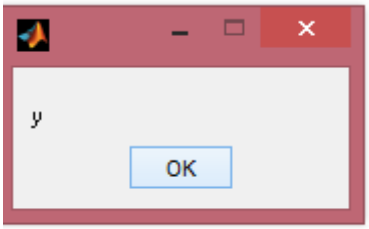


Figure A2.5

The final output is obtained in text. Where the sign is converted to alphabets

Text to Sign and Audio

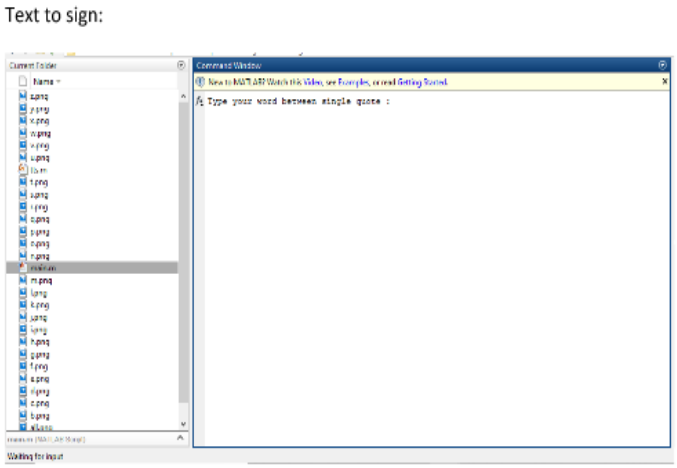


Figure A2.6

The alphabets are stored in the database. hence to know the word in sign language enter the respective word in single quote[‘’].

Output:

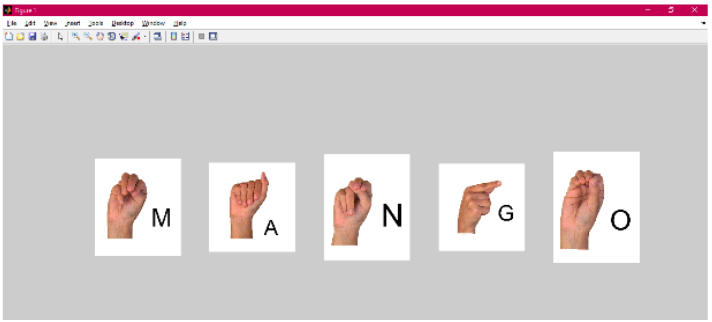


Figure A2.7

Hence the text is received and audio will be heard to the normal person .Its is an easy way of communication to learn the text in basic level.

Result and analysis

- The Implementation of this proposal is properly tested by black box testing and white box testing.
- Hence, the sign is obtained as text and text is obtained as sign with voice.
- Height and width ratio is used to identify the exact character. Template based approach is used to obtain the exact sign image and voice.
- Further, the outcome of the project is attached in the form of screenshots:

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