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Hand-Written Character Feature Extraction by Android Mobile Phone Using Digital Image Processing

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ABSTRACT: This paper is based on hand written character feature extraction by Android Mobile Phone using digital image processing. This is handy application of Hand Written Character Feature Extraction, the most popular mobile phone device is used to capture image, this mobile phone is available every where. The image captured by android mobile phone live in form of video and it is saved there, again it is converted in gray scale format, binariesed image and some morphological operation performed on it, at last we found block of each character from complete images. .

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I. INTRODUCTION

Handwriting recognition has been an active and challenging area of research. Handwriting recognition system plays a very important role in today's world. There are many areas where we need to recognize the words, alphabets and digit. There are many application postal addresses, bank cheque where we need to recognize handwriting. There are basically two different types of handwriting recognition system online and offline handwriting recognition. So handwriting recognition has been studied from many decades. Handwriting recognition system can be used to solve many complex problems and can make human's work easy.

The hand written character recognition basically can be divided in two parts one phase is up to feature extraction of hand written characters and second is classification and recognition of characters. Hence, in this project we are going to resolve first part which is based on digital image processing. There are so many steps involve to convent hand written character to computer readable form and make available a character for matching that is next phase of Hand written character recognition. The steps which are involved in image processing are acquiring / reading image, convert to gray scale image, convert to binary image, Edge detection, Plot the Object Location, Feature Extraction.

Fig. :1 Hand writing on compute

Aim and Objective of Study

- This paper is based on extraction of characters from the image. Many time we require to identify the characters written on images like signboards, direction boards, Messages, Warnings etc. This paper will provide solution for these kind of problems.
- This techniques can be used in other applications of digital image processing like vehicle number plate recognition etc.
- This is useful, because images are captured through Android Mobile Phone.

II. BLOCK DIAGRAM

Normally handwritten recognition is divided into six phases which are image acquisition, pre-processing, segmentation, feature extraction, classification and post processing. The block diagram of the basic character recognition is shown in fig below.

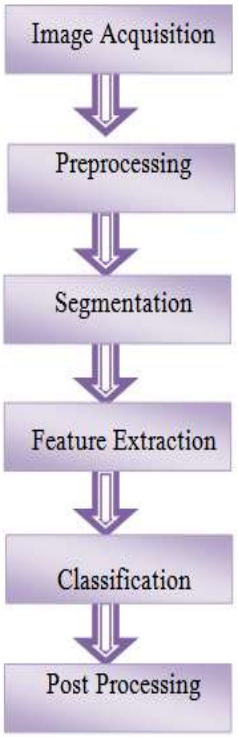

Fig. 2 : Block Diagram of Character Recognition

III. ALGORITHMS

STEP 1. Start process.
STEP 2. Image acquisition. (Capturing the image by flat scanner or camera)
STEP 3. Preprocessing (Finding Region of Interest)
STEP 4 Segmentation (Separation of characters in blocks)
STEP 5 Feature Extraction (Finding the characters for matching)
STEP 6 End of process.

IV. METHODOLOGY

Input Image

Here image is captured by Android Mobile Phone. This process live and continuous.

Now desktop/laptop in connect to Android Mobile Phone.

- This cell of codes read the image to MATLAB workspace
- Conversion to gray scale image from RGB image format.

Fig. 3: Handwritten Characters

Edge Detection

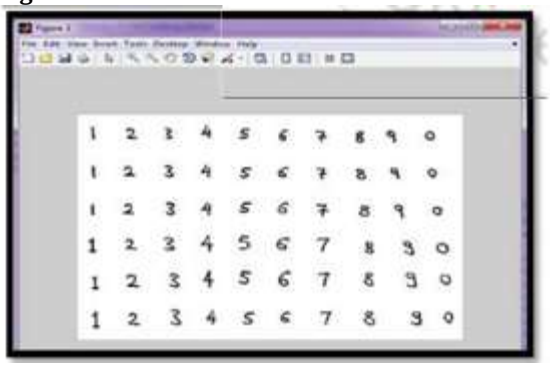

Fig. 4: Edge Detection

Edges characterize object boundaries and are therefore useful for segmentation, registration, and identification of objects. Edge detection of an image significantly reduces the amount of data and filters out useless information, while preserving the important structural properties in an image. However, the majority of different methods may be grouped into two categories, gradient and Laplacian. The gradient method detects the edges by looking for the maximum and minimum in the first derivative of the image. The Laplacian method which is being used in this test searches for zero crossings in the second derivative of the image to find edges

Fig.5 : Segmented Hand written Character

Object Location

Select a single number from the TEST image and the program identifies the number. If selecting more than one number, the program will identify a wrong one, so you must select a single number.

Binarization

Next step is binarization of gray-scale character images in offline character recognition. Binarization process converts a gray scale image into a binary image by using the fact that characters are usually composed of thin lines of uniform

Feature Extraction

The next part is the feature extraction in which handwritten numbers must be cropped individually and converted to 7x5 bitmap images then (35x1) to be in the form of the ideal numbers for the training process of the NN i.e reshaping the image. Feature extraction is the process to retrieve the most important data from the raw data. The major role of feature extraction is to extract a set of features, which maximizes the recognition rate with the least amount of elements. In feature extraction stage each character is represented as a feature vector, which becomes its identity. Due to the nature of handwriting with its high degree of variability and imprecision obtaining these features, is a difficult task. Feature extraction methods are based on 3 types of features- Statistical, Structural, Global transformations and moments. Structural and statistical features appear to be complementary in that they highlight different properties of the characters.

Fig.6 : Segmented Hand written Character

V. MATLAB CODE

1. Capturing Image in Matlab by using Mobile Phone live .

```
url = 'http://192.168.1.106:8080/shot.jpg';

ss  = imread(url);
fh = image(ss);

 while(1)
   ss  = imread(url);
   set(fh,'CData',ss);
   drawnow;
 end
```

2. Now Image is saved in Matlab.

3.Read Image

This cell of codes read the image to MATLAB workspace.

```
I = imread('training.bmp'); imshow(I)
```

4. Convert to grayscale image

This cell of codes convert the RGB to gray.

```
Igray = rgb2gray(I); imshow(Igray)
```

5. Convert to binary image

This cell of codes convert the gray to binary image.

```
Ibw = im2bw(Igray,graythresh(Igray)); imshow(Ibw)
```

6. Edge detection

This cell of codes detect the edge of the image.

```
Iedge = edge(uint8(Ibw)); imshow(Iedge)
```

7. Morphology

This cell of codes perform the image dilation and image filling on the image.

Image Dilation

```
se = strel('square',2);
Iedge2 = imdilate(Iedge, se); imshow(Iedge2);
```

Image Filling

```
Ifill= imfill(Iedge2,'holes'); imshow(Ifill)
```

8. Blobs analysis

This cell of codes find all the objects on the image, and find the properties of each object.

```
[Ilabel num] = bwlabel(Ifill); disp(num);
Iprops = regionprops(Ilabel); Ibox = [Iprops.BoundingBox];
 Ibox = reshape(Ibox,[4 50]); imshow(I)
```

9. Plot the Object Location

This cell of codes plot the object locations.

```
hold on;
for cnt = 1:50
rectangle('position',Ibox(:,cnt),'edgecolor','r'); end
```

VI. CONCLUSION

It is hoped that this detailed discussion will be beneficial insight into various concepts involved, and boost further advances in the area. The accurate recognition is directly depending on the nature of the material to be read and by its quality. From various studies we have seen that

selection of relevant feature extraction and classification technique plays an important role in performance of character recognition rate. This review establishes a complete system that converts scanned images of handwritten characters to text documents. This material serves as a guide and update for readers working in the Character Recognition area.

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