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Location and Detection of a Text in a Video

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ABSTRACT: Recognizing and identifying the objects present in a video is a challenging task in the area of computer vision. The paper presents a method through image processing activities, to recognize a vehicle passing through a highway. The video of the vehicle is recorded and a frame, which contains the backside or front side of the vehicle, is separated for further processing. This single frame is an image, might have the vehicle object any where in it. A prior knowledge of the structure of the vehicle is used to locate the vehicle in the frame. The number plates of the vehicles normally will have significant features like with the specific background (White or Yellow) and the vehicle numbers are written in a rectangular area with these features is adopted to locate the number plate in the frame. Further segmentation is carried at character level using contour traversal method. A fourteen segment projection method is followed to recognize the characters of the segmented characters.The proposed method is able to segment and recognize the vehicles in the most of the ideal situations.

Keywords: *Video to image conversion, Edge detection, Contour traversal, Character segmentation.*

I. INTRODUCTION

Interest in the potential of digital images has increased enormously over the last few years, fuelled at least in part by the rapid growth of computer imaging. Users in many professional fields are exploiting the opportunities offered to access and manipulate remotely sensed images in all kinds of new and exciting ways[1]. However they are also discovering that the process of locating a desired image in a large and varied ambiance can be a source of considerable frustration [1].

Detecting the position of the text in digital images is of paramount importance in document analysis [1][2]. There are some research attempt made towards recognizing text in videos[3][4]. Image processing algorithms often consider the identification of text characters as trivial problem since those images of text characters. However the scenario is complicates when text is part of image. Image segmentation is required before the characters are being recognized. The presence and interpretation of text in these images can provide visual information in addition to possible text in the form of captions, subtitles or image objects. Input scenes are decomposed in to set of binary images where connected components are analyzed for the possible presence of text characters[3]. The process of locating text in a given image is the first step in the problem of text reading. The problem of text detection gets complex with the variations in fonts, sizes and textures. However in this case law enforcement makes the numbers written on the vehicle with normal font makes the recognition much easier.

Input is taken from a stationary camera, which continuously takes the video of the vehicles passing in front if it. To increase the performance of recognition, preprocessing activities like normalization, skew detection and correction and segmentation are performed. Quality of the video produced by the camera is not always consistent; hence it is required to preprocess the video.

The paper is organized as follows: In section 2 details about the preprocessing adopted for this application is presented. Section 3 discusses about contour traversal technique adopted to segment the rectangles present in the image. In section 4 an illustration is given about the details of segmenting the characters in a number plate. Experimental results and conclusions are presented in section 5 & 6 respectively.

II. PREPROCESSING

Generally all images contain some noise in the image. This noise should be removed before any further processing is done [5]. There are several standard algorithms available, which can be used for noise for removal and smoothening.

2.1 Gaussian Convolution

Gaussian convolution is typically used for image smoothing, in which large changes in intensities between adjacent pixels are diminished by weighted averaging. It uses a symmetric normalized 2-D Gaussian

smoothing operator G (x, y) for its convolution kernel. In Gaussian convolution method, substitution of the values of x and y as given in figure 1 and logically placing on the image to produce smoothened image. Normally, the center value of the mask is dominating as shown in table 1. The mask shown in table I is derived from equation (1) for =0.4.

$$G(x,y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

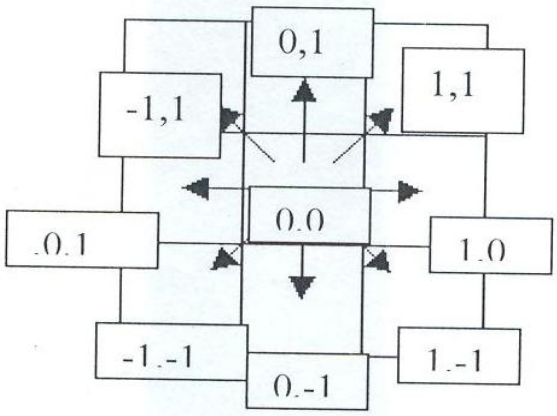

Fig 1: Gaussian Convolution

Table 1: The Gaussian Mask for $\sigma = 0.4$ before normalization (Sum of the weights =1.7722)

0.00192026	0.0437049	0.00192026
0.0437049	0.994718	0.0437049
0.00192026	0.0437049	0.00192026

Table 2 The Gaussian Mask for $\sigma = 0.4$ before normalization (Sum of the weights =1

0.00163118	0.0371255	0.00163118
0.0371255	0.844973	0.0371255
0.00163118	0.0371255	0.00163118

Before performing any operation the picture is converte**d** to binary as it reduces complexity and decision is only to know the area of text in the image.

2.2 Edge Detection

Edges of the objects give more details about the boundary and shape of the intermediate component. After scanning picture horizontally, if there is a change in then it is considered that point as edge point. Scanning is performed on same picture vertically and if there is any change in color, then it is considered that point as edge point. Figure 2a shows the image before edge detection and 2.b shows the edges of the image. Robert cross operator [6] is used to detect the edges.

First form of Roberts Operator

$$\sqrt{[I(r,c)-I(r-1,c-1)]^2+[I(r,c-1)-I(r-1,c)]^2}$$

Second form of Roberts Operator

$$\nabla f \approx |z_5 - z_9| + |z_6 - z_8|$$

$$|I(r,c)-I(r-1,c-1)|+|I(r,c-1)-I(r-1,c)|$$

Where Vf is the gradient operator

$$h_1 = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \qquad h_2 = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

$w_1(x,y) =$

1	0
0	-1

$w_2(x,y) =$

0	1
-1	0

Z1	Z2	Z3
Z4	Z5	Z6
Z7	Z8	Z9

3*3 Image region

Fig: 2a Before Edge Detection **Fig: 2bAfter Edge Detection**

III. SEGMENTATION OF NUMBER PLATE

Number plates in any vehicle will have significant features, like with specific background and written on a rectangular portion. This knowledge enables the segmentation of number plates using contour traversal method, a rectangle which contains some characters. The method is illustrated below.

3.1 Contour Traversal

Contour traversal is widely used in image processing application. The chain codes are used to characterize a pixel on the contour. Chain code is a local feature, which gives the spatial association between two successive points. An arbitrary point is considered as starting point. Traversing along a contour of the object and reaching the starting point may produce a rectangle. Situation may arise where the contour traversal encounters two branches. In such situations the contour traversal is terminated.

This technique is used to recognize the closed loop present in the image. If there is more than one rectangle present in the image only bottom most rectangle where generally the number plate is present is only considered and the remaining rectangles present in the image is ignored.

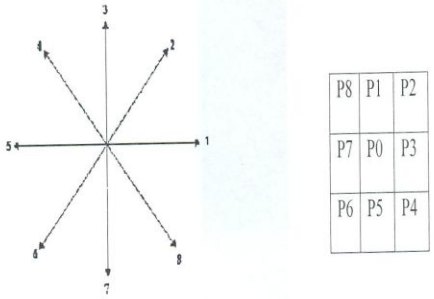

Fig: 3 Contour Traversal Techniques

IV. CHARACTER SEGMENTATION AND RECOGNITION

The segmented number plate has two distinct intensities, the foreground that is generally black and the background that is generally white/yellow. Segmentation is initiated by scanning the image horizontally and vertically. When a black pixel is encountered, scanning is continued until a white pixel encountered and all the co-ordinates of the black pixel as well as the white pixel as stored in an array and check for continuity. If there is continuity in black pixel then it is a character and if there is continuity in white pixel then it is considered as gap between two characters and these characters are segmented separately.

Fig: 4 Segmented Number Plates

Fig:5 Segmented Numbers from Number plate

Character using projection method

Segmented characters are taken as input to this stage of recognition [4]. A logical box with horizontal line in the middle enclosing the number is imagined. Logically divide the number in to vertically two halves. Horizontally project all left half bright pixels of the numbers on to the segments 'f' and 'e' and project all right half bright pixels of the number on to the segment 'b' and 'c'.

Similarly divide the numbers in to three parts horizontally. Vertically project all the pixels in the first part on to segment 'a', project all the pixels in the second part on to the segment 'g' and project all the pixels in the third part on to segment 'd'. Determine the dynamic thresholds of each segment. These thresholds are used to find whether sufficiently large number of pixels is projected on to the corresponding segments. Considering the string segments that cross the thresholds identify the number[8]. Figure 7 shows how the number '3' is divided horizontally and vertically.

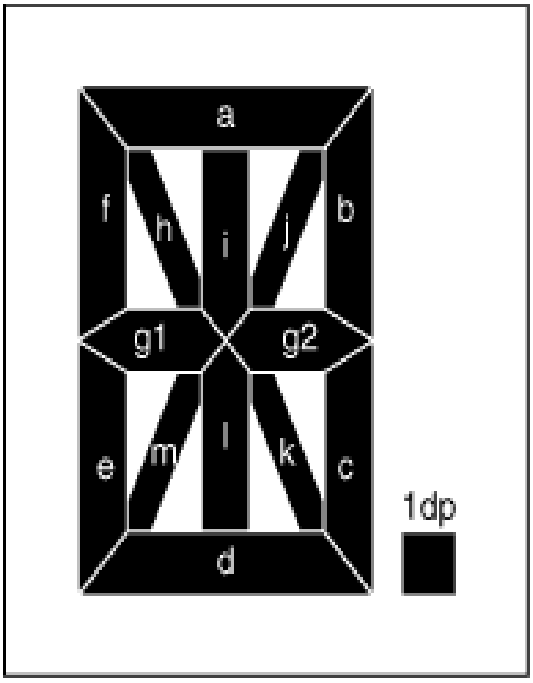

Figure 6: Segmentation of the logical box in to 14 lines

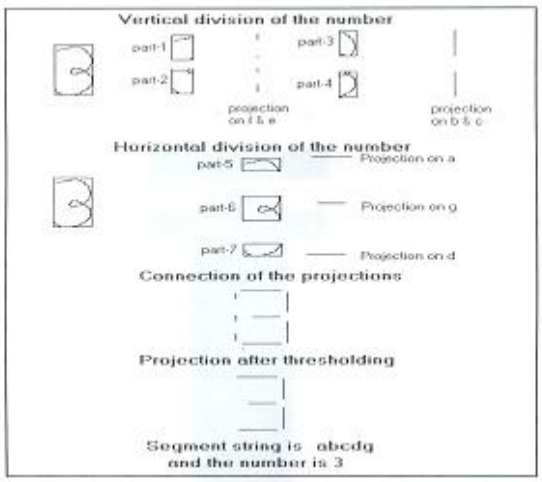

Fig: 7 Projection of Number 3 to segments and formulation of segments

V. EXPERIMENTAL RESULTS

Video taken by the stationary camera is to be converted to frames or picture frames. Software video works is used to convert the video in to frames. A best frame is selected out of the number of frames generated by the software and it can be saved as a bitmap file.

In experimentation a sample set of 25 different vehicle images are taken from a camcorder. The recognition of number plates and recognition of characters varies from 70% to 80% for different images. In this experiment it will only recognize English characters and as well as numbers. It is assumed that the number plate is written in normal font, however some of the number plates are written in fancy styles, is difficult to recognize.

VI. CONCLUSION

Segmenting the number plate in an image and recognizing the vehicle through its number is one the major task highlighted in the paper. The various activities involved in this process are taken from some existing algorithms. The simple recognition algorithm proposed here is suitable for recognizing the characters in a limited set. The performance of the algorithm as a whole has shown satisfactory results, which could be used to record the vehicle numbers in database. However it is a real time activity, further enhancement specially in video processing and handling partially visible number plates are required to make it complete.

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