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A NOVEL METHOD FOR TEXT LOCALIZATION IN COMPLEX IMAGES

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Abstract: - In this paper, an improved and efficient approach is proposed which locate text region in different backgrounds. Automatic text localization is highly challenging task. It is challenging due to some reasons such as differences in size, style, alignment and orientation. It is far more difficult to locate the text in the low contrast images as well as the images with the complex background. This algorithm is designed to locate the text in different kinds of images. The task of detecting the text area follows the following four steps: Firstly, the input colored image is converted to the gray image. Secondly, the noise is reduce by the using the median filter. After that, edges are detected with the help of canny edge detection method. Now, the entire connected components are extracted and all the holes in the image are filled. Finally, by using some appropriate condition, the text is obtained. We have applied proposed algorithm to several images to check its efficiency and robustness. The results obtained are satisfactory and therefore can be used in many real life applications.

Keywords: - Median Filter, Canny Edge Detector, Filled Image, Connected Component.

1. INTRODUCTION

With rapid development of the digital technology, more the more databases are multimedia in nature. Usually the databases comprises of images and videos. These images and videos may contain textual information. Text detection and extraction is a critical task in many computer vision problems such as tourist guide, mobile reading system for visually challenged persons etc. Magazines covers, book covers and other images are usually mixes with pictures. Separation of the text from these images is a very important issue as it the text may contain the useful and semantic information. It is difficult to extract the text from the images which may be subjected to various degradations like blur, low resolution, illumination variance etc.
Images are classified into three classes:

- Document image
- Caption text image
- Scene text image

Document images can be the scanned book cover, cover of CD or video images. Text and few graphics components are usually present in document image.

The artificially superimposed text on the video or images at the time of editing is known as caption text image. They are also known as overlay text or cut line text. It is difficult to extract text from caption image as text in these types of images may be moving, rotating, growing or shrinking.

Scene text image are the images in which text is present in the scene when the images or videos are shot. As the part of scene they occur naturally and contain useful information.

2. LITERATURE SURVEY

Since 1990s, the research on text detection and localization is carried out. Numerous text detection algorithms have been proposed from past few years. All these approaches take into consideration different attributes related to text in an image such as color, edges, connected components etc. These properties are used to differentiate the text regions from their background or other non-text regions within the images. All these approaches are divided into three categories.

- Edge based approach
- Connected Component based approach
- Texture based approach

Edge based approach

The high contrast between text and background is the main focus of the edge based approach. The color or the gray scale property of the text region or their differences regarding the background is used by this approach. It is difficult to detect the text in case of low contrast images or images with the similar backgrounds [1]. Half transform is used in edge based method [2]. In this method, the first step is to detect the edges and then finally applying some heuristic rules to discard the non-text regions.

Connected component based approach

The text is considered as the set of separate connected components in case of connected based approach. This approach is based on the properties of the color or gray in the text region or their differences regarding the background. To locate text localization, [3] use color features. An improved method based on connected components was proposed in [4]. This approach is very simple to implement but sometimes fails to detect the text in the images with complex background [5].

Texture based approach

This approach mainly uses the concept of textural property. To differentiate the text from the background or other non-text regions, the distinct textural properties are used [6]. This approach is highly complex in nature which is its main drawback. To analyze the textural properties of texts a support vector machine (SVM) is used. The filters that have been one of the major tools for texture analysis is Gabor filter [7, 8].

3. PROPOSED METHOD

The block diagram of the proposed text detection and extraction algorithm is shown in fig.1. The input may be color or gray scale image. If the image is colored image then it is converted to the gray image. The algorithm then follows the noise reduction step so as to get the more accurate result. In our algorithm the input image is the colored image and the output is the segmented text on the clear background.

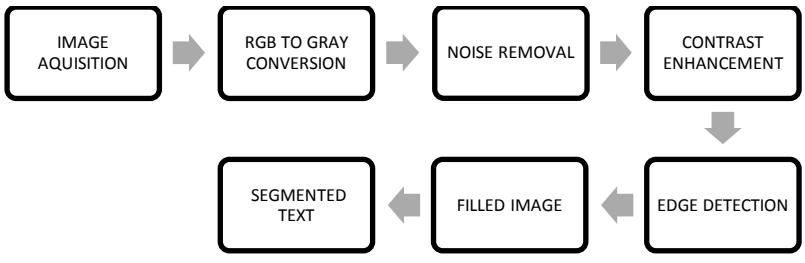


Fig.1. Block diagram of proposed system

a. Image acquisition

The first and foremost step for text localization is acquisition of image. The process of retrieving an image from the some hardware based source is known as image acquisition. No processing is possible without an image. The image is captured by the digital camera in different illumination conditions. The image captured is shown in fig.2.

Fig.2 Input Image

3.2 RGB to Gray Conversion

In this step, the input colored image is converted into gray scale image through the RGB to gray scale conversion technique. Gray image is the image in which each pixel contains only the intensity information. In this step, 8-bit gray value of each pixel(s,t) is calculated. The Matlab function for this conversion is :
p = rgb2gray(q) ;
where, q is the input colored image and p is the output gray image.

3.3 Noise removal

Removal of noise and the distortion from the image is the main aim of the filtering. The noise may occur in the image due to weather condition, camera quality etc. Here, median filter is used for the removal of noise as depicted in fig.3. It is a nonlinear digital filtering technique. It helps in noise reduction while preserving the edges. The function for median filtering in Matlab is:

p = medfilt2(q)

Fig.3 Image after Noise Removal

3.4 Contrast enhancement

The difference between the lowest and highest intensity level of pixels is known as contrast. The method for spreading the histogram of pixels level more effectively is histogram equalization. Adaptive histogram

equalization shows better contrast than histogram equalization. The difference between the histogram of gray image before and after contrast enhancement is shown in fig.4 and The Matlab function used is: p = adapt histeq(q);

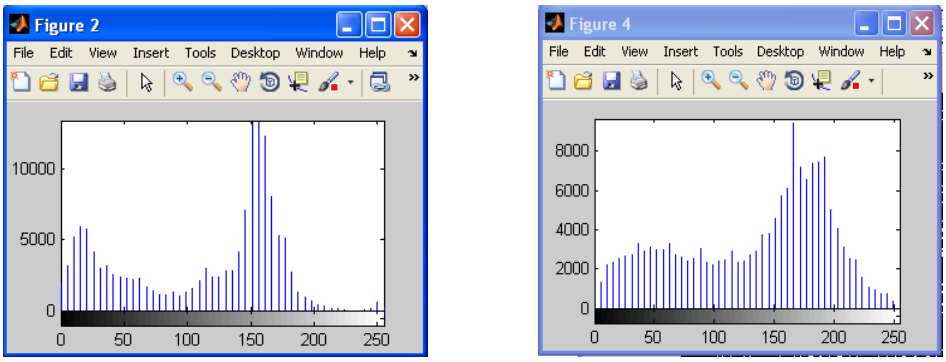


Fig.4 (a) Histogram before Contrast Enhancement (b) Histogram after Contrast Enhancement

3.5 Edge detection

In this step, the edges are detected using the canny edge detection method. Canny edge detection can be defined as the method that uses a multi-stages algorithm to extract all edges from an image. The image obtained by applying canny edge detection is the binary edge image. The function used in Matlab is: p =edge (q, 'canny');

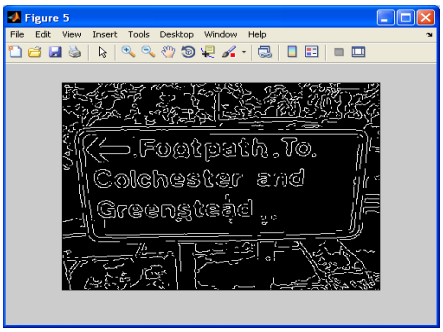


Fig.5 Edged Image

3.6 Filled image

Now, in this step we will detect all the connected components in the image and all holes are filled. While filling the image, all the connected components which cannot be reached is known as holes. The output of this step is the binary image with the holes filled with white color. The function used in matlab for filling the image with the background color is

p = imfill(q, 'holes');

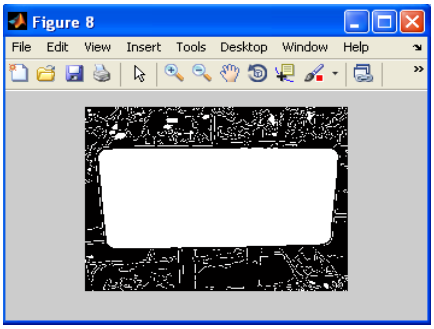


Fig.6 Filled Image

3.7 Segmented text

This is the final step of the proposed method. The aim of this step is to obtain the accurate location of the region containing the text. To find the exact location the region containing the text, region property is used. The function in Matlab is:

p = regionprops (q, 'Area', 'PixelList')

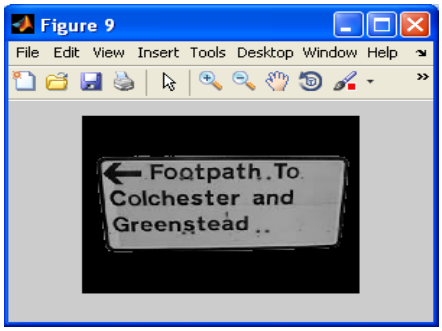
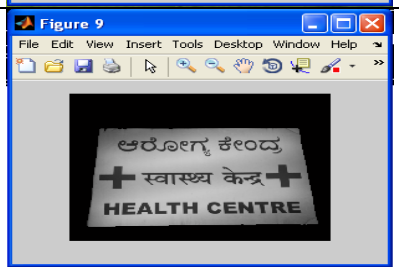
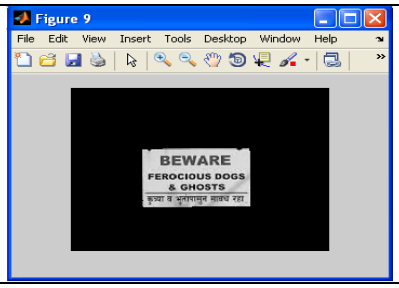


Fig.7 Segmented Text Image Image

4. EXPERIMENTAL RESULTS

The proposed method is tested on the various colored images to check the efficiency and accuracy of the proposed system. The table 1 shows the input captured images and their corresponding segmented text. The validity and the correctness of the proposed method can be seen by the results obtaind. The text region was detected accurately.

Table 1*: Results of proposed system*

Image Name	Input Image	Segmented Text	Accurate(Yes/No)
Sample 1			YES
Sample 2			YES
Sample 3			YES

Sample 4			YES

5. CONCLUSIONS

In this paper relatively a simple and efficient algorithm for detecting the text region is presented. It requires less processing time which is the essential requirement for the real time application. The system performs well even in case of illumination variance, refection effect and low intensity images. The proposed algorithm can be used in various real time application such as automatic toll collecting by detecting the number plate of vehicles, mobile robot navigation to detect the text based land marks etc. the future work may involves an appropriate technique to recognize the text as presented algorithm only detect the text box containing the text not a single character.

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