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Analysis of Edge Detection Algorithms for Content Extraction from Images

Vijaykumar K L, Savitri Raju

Department of Electronics and Communication, SDM College of Engineering and Technology, Dharwad, Karnataka, India

ABSTRACT

Detecting text regions in natural scene images has become an important area due to its varies applications. Text Information Extraction (TIE) System involves detecting text regions in a given image, localizing it, extracting the text part and recognizing text using OCR. This work basically concentrates on the detection and extraction of text in natural scene images. In this work, the test image will be pre-processed using RGB to Gray conversion, binarization, Edge Detection method and Geometric based Noise removal method. The features from the pre-processed image are extracted. After detecting text regions, characters are extracted and finally displayed. The purpose of this paper is to compare the basic methods Prewitt Edge Detector, Sobel edge detector and Robert edge detector with different structuring elements.

Keywords : Content extraction, Text region detection, Edge detection, Text localization, Prewitt operator, Sobel operator, Robert operator.

I. INTRODUCTION

Images are the most advantageous method for passing on or transmitting data as they rapidly pass on data about positions, sizes and between connections between the items. They portray spatial data such that it can be perceived as an article. Individuals are great at getting data from the pictures, on account of our intuitive visual and mental capacities. Around 75% of the data got by people is in the pictorial structure. The investigations of pictures that utilize an overhead viewpoint, including the radiation undetectable to human eye are considered. Content location and content extraction in regular scene pictures is testing due to the shifted conditions under which the picture is taken. Normal scene content comprehension going for removing content from every day pictures is the principle worry of this content. There are a few data hotspots for content data extraction in pictures (Ex shading, surface, movement, geometry, shape and so on.). It is constantly worthwhile to blend different data sources to upgrade the execution of content data extraction framework. Programmed content acknowledgment from the characteristic scene pictures gets a developing consideration in light of potential applications in picture recovery, mechanical autonomy and clever transport framework.

II. METHODS AND MATERIAL

A. Related Work

Many algorithms have been proposed for recognizing text data in an image. Each method gives robust results for specified set of images. However, results may be varying due to image size, orientation, contrast, and colour. In non-document images, detecting text is more challenging because of variation in text size and alignment. The simple block diagram for text information extracting system is shown in the figure 1.

Input image is any image that contains text information. The first step detects the regions where the text is present. Text localization refers to locate and enhance text areas. Character extraction refers to eliminate non-text regions from image, such that output image contains

only text. This image is sent to OCR system to obtain the characters that are extracted.

Edge-Based Text Extraction

As mentioned previously, edge-based algorithm is one of the popular schemes for text extraction. Edge-based methods focus on the high contrast between the text and the background and the edges of the text boundary are identified and merged [2],[6]. Comparison is done in terms of precision rate and recall rate.

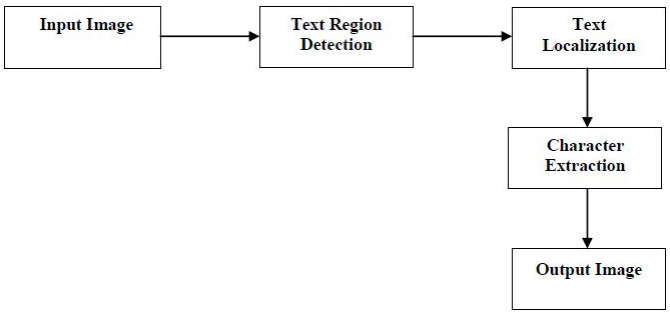

Figure 1. Procedure of Text Extraction from Image

APPROACH

A. Pre-processing

Pre-handling steps are important to enhance the execution and make the procedure productive to the time. This incorporates dark scaling and binarization of picture and sifting to evacuate commotion.

1. Gray scaling: The given picture is multicolor RGB picture, in which content may not be isolated from the foundation. In shading picture, every pixel is blend of R (Red), G (Green) and B (Blue) and values shifting from 0 to 255. For dark scaling, these qualities are included an extent of Red: 30%, Green: 59% and Blue: 11% to get the dim scaled [3] likeness that specific pixel.
2. Binarization: This believers dim scale picture into paired picture i.e. containing just Black (0) and White (1) pixels. Dim scaling gives an edge for binarization of picture. To be particular, this is finished by contrasting every pixel esteem with a limit esteem (that lies in the middle of high contrast) and setting that pixel worth to dark or white as its result [3].
3. Filtering: Any picture taken from camera contained commotion, for example, obscured picture, high recurrence clamor and repetitive sound. To enhance picture quality and for further handling on picture, Gaussian low pass channel is utilized.

B. Edge-Detection

Edges are those places in an image that correspond to object boundaries. Edges are pixels where image brightness changes abruptly. Specifically in text data probably more edges are present than non-text areas. We chose Prewitt amongst several edge-detectors available like Sobel, canny and Roberts. Choice of Prewitt is quite empirical. Prewitt edge-detector detects horizontal and vertical edges in an image and combines them to give resultant image.

C. Morphological Operations

In the wake of distinguishing content region(s), a bunch of it is made such that the all letters are secured. Morphological enlargement is utilized for this reason as expansion adds pixels to the limits of articles in a picture subsequently thickening that protest. Measure of thickness is characterized by the sort and size organizing component. Appropriate estimated organizing component ought to be picked such that minimum non-content range ought to be grouped inside. Here, organizing component „disk‟ with size 9 (a plate of range (9) is utilized. To uproot non-content questions fundamentally, morphological opening operation is utilized. Opening operation is disintegration trailed by enlargement. It is performed to expel objects of particular size from picture. This size is again controlled by organizing component. In the wake of performing such operations, the resultant picture holds bunches of content locales having pixel esteem 1 (white).

D. Character Extraction

This step refers to identify the characters as they are in original image. This is done by multiplying resultant image with binary converted original image. In this operation, pixels having value 1are recovered as same in original image and pixels having value 0 are present as background. However, the final image may contain some non-text part, extent of which is measured by precision rate. Final result is the white text in black background or vice versa, dependent on the original image.

III. RESULTS AND DISCUSSION

Performance of each algorithm are evaluated and compared in terms of precision rate [1] and recall rate [1]. Evaluation is done over 30 test images with different text size, colour contrast and orientation. Results are summarized in table 1 and 2. Precision and recall rates are calculated as follows:

Precision Rate =/(+) 100% (1)

Recall Rate =/(+) 100%(2)

False positives are the non- text region in the image and which is detected by the algorithm as a text regions. False negatives are the text region in the image which is not detected by the algorithm. Table 1 shows the input images and their corresponding outputs using Prewitt edge detector as compared with the sobel edge detector and Robert edge detector.

Table1: Results images of different text detection methods

Original Images	Output of Prewitt Edge Detection Algorithm	Output of Sober Edge Detection Algorithm	Output of Robert Edge Detection Algorithm
			
			

From the above graph it is cleared that precision rate and recall rate using prewitt edge detection is high compared with sobel and Robert edge detection method.

IV. CONCLUSION

Recognition of content in Natural Scene Images is trying for complex foundation. There are numerous strategies accessible to perform the content identification and character extraction in regular scene pictures. Here the results obtained by Prewitt and Gaussian edge recognizable proof figuring on different game plan of pictures are been stood out from regard with precision rate and survey rate. The Edge based system perceives content regions with most huge Precision (100 %) and Recall (100 %) rate. Along these lines it is more viable diverged from that of the execution procured with other edge recognizable proof procedure. Remembering the final objective to incorporate with that Prewitt edge-pointer computation is healthier since it gives higher audit rate as contemplated Sobel, Robert and altered Prewitt edge-locator estimation.

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