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Text Extraction of Vehicle Number Plate and Document Images using Discrete Wavelet Transform in MATLAB

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Abstract - *Text Extraction from color images is a challenging task in computer vision. The concept of text extraction is derived from the vehicle plate recognition and their characters extractions individually. Some examples of the applications are automatic image indexing, visual impaired people assistance or optical character reading, keyword searching in a document image. The continuous research has been done majorly that focuses on the text detection and localization in images. Digital image processing is an ever expanding and dynamic area with applications reaching out into our daily life such as digital signature, authentication, surveillance, medicine, space exploration, automated industry inspection and many others areas. These applications are involved in different processes like image enhancement, object detection, features extraction, color imaging etc. Implementation of such applications on a general-purpose computer can be easier, but every time it is not efficient due to additional constraints on memory and other peripheral devices. Out of the five senses – sight, hearing, touch, smell and taste, humans use to perceive their environment. Among all, sight of images is the most powerful. More than 99% of the activity of the human brain is involved in processing images from the visual cortex. The research focuses on the color images text extraction using Two-Dimensional Discrete Wavelet Transform (2D-DWT). The transform used for DWT is HAAR DWT with mathematical morphological concept. The speed of HAAR DWT operates the fastest among all wavelets because its coefficients are either 1 or -1. It is one of the reasons that HAAR DWT is used to detect edges of candidate text regions. Image sub bands contain both text edges and non-text edges. The work will be carried out in MATLAB image processing tool.*

Key Words: **Aligning and Merging Analysis (AMA), Brightness Value (BV), Digital Number (DN), Discrete Cosine Transform (DCT), Discrete wavelet Transform (DWT), Fast Fourier Transform (FFT), Matrix laboratory (MATLAB), Joint Picture Expert Group (JPEG)**

1. INTRODUCTION

The plate number is used to produce a violation fine on speeding vehicles, illegal use of bus lanes, and detection of stolen or wanted vehicles. License plate recognition technology has gained popularity in security and traffic applications as it is based on the fact that all vehicles have a license plate and there is no need to install any additional tracking apparatus. The main advantage is that the system can store the image record for future references. The rear part of the vehicle is extracted off the filmed image and is given to the system for processing. The processed result is fed into the database as input. The violators can pay the fine online and can be presented with the image of the car as a proof along with the speeding information. When the vehicle approaches the secured area, the LPR unit senses the car and activates the illumination (invisible infra-red in most cases) as shown in Figure 1.1 below. The LPR unit takes the pictures from either the front or rear plates from the LPR camera. The image of the vehicle contains the license plate. The LPR unit feeds the input image to the system. The system then enhances the image, detects the plate position, extracts the plate, segments the characters on the plate and recognizes the segmented characters, checks if the vehicle appears on a predefined list of authorized vehicles, If found, it signals to open the gate by activating its relay. The unit can also switch on a green "go-ahead" light or red "stop" light. The unit can also display a welcome message or a message with personalized data. The authorized vehicle enters into the secured area. After passing the gate its detector closes the gate. Now the system waits for the next vehicle to approach the secured area. In LPR, we need to deal with a large variety of license plates, especially in United States. Each state in US has its own license plate color, pattern and formats of numbers and characters.

Fig. 1.1 License plate samples in 50 states of USA

2. OBJECTIVES

- Research objective is to extract the vehicle plate number and text form any colored images using MATLAB image processing tool. The extraction of text is carried out from any image using Haar Transform.
- Use a method to extract texts in images or video sequences using Haar discrete wavelet transform (Haar DWT). The edges detection is accomplished by using 2-D Haar DWT and some of the non-text edges are removed using thresholding.
- After it, apply different morphological dilation operators to connect the isolated candidate text edges in each detail component sub-band of the binary image. Morphological dilation operators also extract the characters from the images using mathematical morphological and templates.
- Character reorganization from the image and character extraction form the colored image is also the objective of image extraction.

3. NEED & RESEARCH MOTIVATION

Recent advancement and research areas of image processing have much interest in content retrieval and derived in the perceptual and semantic content. Human perceptual includes color, shape pixel intensity and texture and semantic includes objects, events, interrupts and their relations. Contents of an image are described using texts, which are also easily and clearly describe the feature of an image. Since the text and characters data can be embedded in an image. Up to now it has been extracted by two basic techniques. These techniques are edge and connected component-based technique. A text extraction system receives an input in the form of an image or a sequence of images. Text reorganization and extraction problem can be divided into the following parts. (i) Detection of text (ii) localization of text, (iii) tracking on text (iv)Extraction and enhancement of text, and (v) recognition of text.

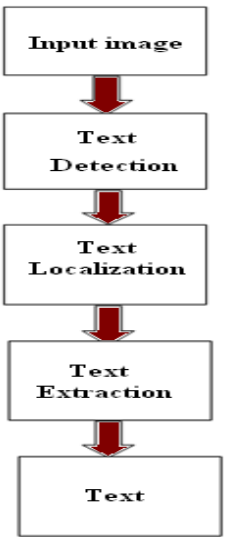

Fig. 1.2 Steps in text extraction

The meaning of text detection is to detect the text which is presences in image. In this, threshold values are needed for scene-based change detection because the portion occupied by a text region relative to the entire image is usually small. It is based on the difference between two consecutive frames and then used this scene change information for text detection. The methods of text localization are divided into two types: region and texture based. Regions defined methods use the properties of the color or gray scale in a text region or their differences with the corresponding properties of the background. Text extraction is done using two basic methods. First is region based while the other is based on texture?

4. RESULTS & DISCUSSIONS

The MATLAB Text Extraction Simulation function is conducted on different colored jpg and bmp files, and text and characters are successfully extracted. The results are displayed sequentially in Figure for different test conditions. Hair transformation is a great way to construct color photos document. For text extraction from pictures, the Hair Discrete Wavelet Transformation, the Sobel boundary detector, the weighted OR operator, thresholding and the morphological dilation operator are proposed. Statistical morphological methods are used for the recognition of text and characters. Models for all characters were also developed and quantitative morphological operators were used to measure the boundaries. In the text regions of complicated photos these mathematical methods are defined. The recommended solution is consistent against the language and font size of the text. The solution suggested also helps to break down blocks into one-line, sometimes multi-line messages. Based on the experimental tests, the suggested method was seen to be successful in extracting text regions from photographs.

Fig .1.3 (a) Image 1 before text extraction

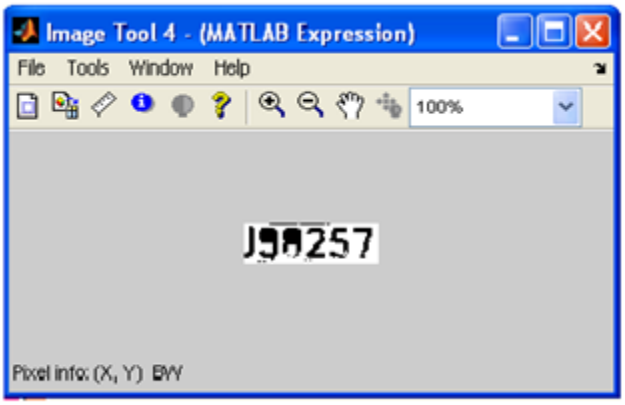

Fig. 1.3 (b) text extracted image

5. CONCLUSIONS

HAAR DWT has introduced a new text extraction method, which involves many picture cases with their textual content. It also uses a rotating window technique for interpreting high frequency sub bands. Dilation, oxidation, opening and closing morphological operations have been carried out to better refine the text and the non-text area. The MATLAB simulation is conducted on the different pictures with single / multiple text, multiple text of various sizes, uniform and non-uniform data.

It can be used to retrieve textual details from camera images, satellite imagery and tollbooth because it is used for the retrieval of textual knowledge from a video scene through a hybrid method. In addition, work will be performed on a broad variety of document images so the particular text and the selection of unique characters from a document image is calculated.

The text abstraction on the color images is done effectively utilizing mathematical morphology and Haar DWT. Document retrieval methods are immense, like the rendering of digital versions of ancient scriptures in daily life, etc. It may be required in digital form. It can be used to retrieve textual details from camera images, satellite imagery and tollbooth because it is used for the retrieval of textual knowledge from a video scene through a hybrid method. This is most significant because it should be used in the identification of the automobile license plate because it is in the process of calculating the license plate number. We will pursue strategies in future research to understand the unique characters in color images.

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