VEHICLE LICENSE PLATE READING USING MATLAB

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ABSTRACT

We propose a camera-based assistive text reading framework to read characters and numbers from number plates of vehicles in daily use. To isolate the object from cluttered backgrounds or other surrounding objects in the camera view, we first propose an efficient and effective motion- based method to define a region of interest (ROI) in the video. This method extracts moving object region by a mixture-of-Gaussians-based background sub- traction method. In the extracted ROI, number plate localization and recognition are conducted to acquire information. To automatically localize the number plate regions from the object ROI, we propose a novel number plate localization algorithm by learning gradient features of stroke orientations and distributions of edge pixels in an Adaboost model. Text characters in the localized number plate regions are then binarized and recognized by off-the-shelf optical character recognition software. The recognized text codes are output to users. Performance of the proposed text localization algorithm is quantitatively evaluated on ICDAR-2003 and ICDAR-2011 Robust Reading Datasets. Experimental results demonstrate that our algorithm achieves the state of the arts. The proof-of-concept prototype is also evaluated on a dataset collected to evaluate the effectiveness of the system's hardware. We explore user inter-face issues and assess robustness of the algorithm in extracting and reading text from different objects with complex backgrounds.

Keywords : *- License plates, characters, recognition, localization, optical.*

1. INTRODUCTION

Reading is obviously essential in today's society. Printed text is everywhere in the form of reports, receipts, bank statements, restaurant menus, classroom handouts, product packages, instructions on medicine bottles, etc. There are few devices that can provide good access to common objects such as number plates, and objects printed with text such as alphanumeric number plates of vehicles. To eliminate the problems defined in problem definitions and also to help to read text from such kinds of challenging patterns and backgrounds found on many vehicle number plates, then have to form a camera-based assistive text reading framework to capture the object of interest within the camera view and obtain print text information from the object. The proposed algorithm used in this system can effectively handle complex background and multiple patterns, and obtain text information from both vehicle number plates and nearby signs and symbols. To eliminate the problem in assistive reading systems, in existing system very challenging for users to position the object within the center of the camera's view. As of now, there are still no acceptable solutions. This problem approached in stages.

2. LONG TERM EVOLUTION

A prototype system is developed to read printed text on number plates for assisting persons. In order to solve the common aiming problem for users, we have proposed a motion-based method to detect the object of interest, while the user simply shakes the object for a couple of seconds. This method can effectively distinguish the object of interest from background or other objects in the camera view. To extract text regions from complex backgrounds, we have proposed a novel text localization algorithm based on models of stroke orientation and edge distributions. The corresponding feature maps estimate the global structural feature of text at every pixel. Block patterns project the proposed feature maps of an image patch into a feature vector. Adjacent character grouping is performed to calculate candidates of text patches prepared for text classification. An Ad boost learning model is employed to localize text in camera-based images. Off-the-shelf OCR is used to perform word recognition on the localized text regions.

Our future work will extend our localization algorithm to process text strings with characters fewer than three and to design more robust block patterns for text feature extraction. We will also extend our algorithm to handle non horizontal text strings.

We define the notion of a stroke and derive an efficient algorithm to compute it, producing a new image feature. Once recovered, it provides a feature that has proven to be reliable and flexible for text detection. Unlike previous features used for text detection, the proposed SWT combines dense estimation (computed at every pixel) with non-local scope (stroke width depends on information contained sometimes in very far apart pixels). Compared to the most recent available tests, our algorithm reached first place and was about 15 times faster than the speed reported there. The feature was dominant enough to be used by itself, without the need for actual character recognition step as used in some previous works. This allows us to apply the method to many languages and fonts.

A number of portable reading assistants have been designed specifically for the visually impaired. KReader Mobile runs on a cell phone and allows the user to read mail, receipts, fliers, and many other documents. However, the document to be read must be nearly flat, placed on a clear, dark surface (i.e., a non cluttered background), and contain mostly text.

It is a challenging problem to automatically localize objects and text ROIs from captured images with complex backgrounds, because text in captured images is most likely surrounded by various background outlier "noise," and text characters usually appear in multiple scales, fonts, and colors. For the text orientations, this paper assumes that text strings in scene images keep approximately horizontal alignment. Many algorithms have been developed for localization of text regions in scene images. We divide them into two categories: rule-based and learning-based.

Rule-based algorithms apply pixel-level image processing to extract text information from predefined text layouts such as character size, aspect ratio, edge density, character structure, color uniformity of text string, analyzed edge pixel density with the Laplacian operator and employed maximum gradient differences to identify text regions. The used gradient difference maps and performed global binarization to obtain text regions. The designed stroke width transforms to localize text characters. The applied color reduction to extract text in uniform colors. In [5], colo r-based text segmentation is performed through a Gaussian mixture model for calculating a confidence value for text regions. This type of algorithm tries to define a universal feature descriptor of text.

Learning-based algorithms, on the other hand, model text structure and extract representative text features to build text classifiers. Chen and Yuille presented five types of Haar- based block patterns to train text classifiers in an Adaboost learning model. Kim et al. Considered text as a specific texture and analyzed the textural features of characters by a support vector machine (SVM) model used globally matched wavelet filter responses of text structure as features. The performed classification of text edges by using histograms of oriented gradients and local binary pat- terns as local features on the SVM model. Employed gradient and curvature features to model the grayscale curve for handwritten numeral recognition under a Bayesian discriminate function. In our research group, we have previously developed rule-based algorithms to extract text from scene images. A survey paper about computer-vision-based assistive technologies to help people with visual impairments can be found.

3. BLOCK DIAGRAM

A number of portable reading assistants have been designed specifically for the visually impaired "K-Reader Mobile" runs on a cell phone and allows the user to read mail, receipts, fliers, and many other documents. However, the document to be read must be a non-jumbled background (i.e. must be nearly flat, placed on a clear, dark surface or a non cluttered background), and contain mostly text. Even a number of reading assistants have been designed specifically for the visually impaired ,to our knowledge, no existing reading assistant can read text from the kinds of challenging patterns and backgrounds found on many everyday vehicle number plates. Such as text information can appear in various scales, fonts, colors, and orientations as in fig.2.

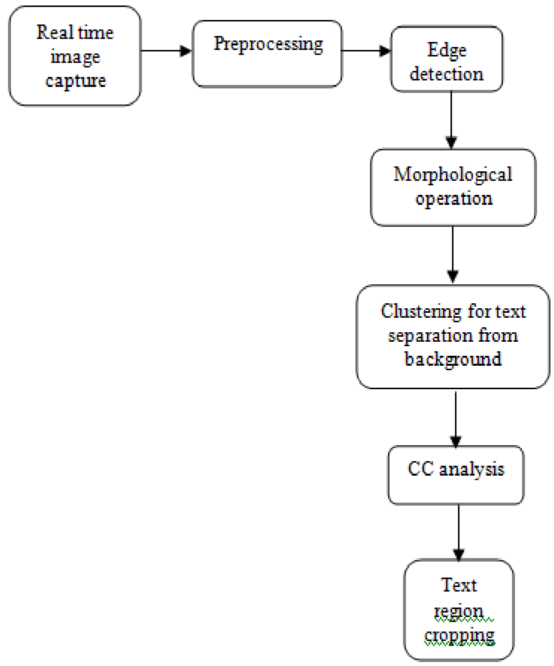

Fig -1: Block diagram of system

In addition, “K-Reader Mobile” accurately reads black print on a white background, but has problems recognizing colored text or text on a colored background. It cannot read text with complex backgrounds. Furthermore, these systems require a blind person user to manually localize areas of interest and text regions on the objects in most cases.

Fig -2: Examples of printed text from vehicle number plates with multiple colors, complex backgrounds, or nonflat surfaces.

Mobile accurately reads black print on a white background, but has problems recognizing colored text or text on a colored background. It cannot read text with complex backgrounds, text printed on cylinders with warped or incomplete images (such as soup cans or medicine bottles). Furthermore, these systems require a blind user to manually localize areas of interest and text regions on the objects in most cases.

The person should hold the object so it will be appears in the camera view, thus we have to use a camera with sufficiently large angle to accommodate users with only approximate aim. This may often result in other text objects appearing in the camera’s view (for example, while shopping at a mall). To extract the vehicle number plate from the camera image, this system going to develop a motion-based method to obtain a region of interest (ROI) of the object.

It is a challenging problem to automatically localize objects and text region of interests (ROI) from captured images with complex backgrounds, because text in captured images is most likely surrounded by various background “noise,” and text characters usually appear in multiple scales, fonts, and colors. For the text orientations, we assume that text strings alignment in scene images keep approximately horizontal. Many algorithms have been developed for localization of text regions in scene images. We can divide them into two categories: Rule- Based and Learning-Based classifier training, which define unique feature maps based on stroke orientations and edge distributions. These, in turn, generate representative and fine text features to distinguish text characters from background outliers.

Although a number of reading assistants have been designed specifically for the visually impaired, to our knowledge, no existing reading assistant can read text from the kinds of challenging patterns and backgrounds found on many everyday vehicle number plates. As shown in Fig. 3.3, such text information can appear in multiple scales, fonts, colors, and orientations. To assist blind persons to read text from these kinds of vehicle number plates, we have conceived of a camera-based assistive text reading frame- work to track the object of interest within the camera view and extract print text information from the object.

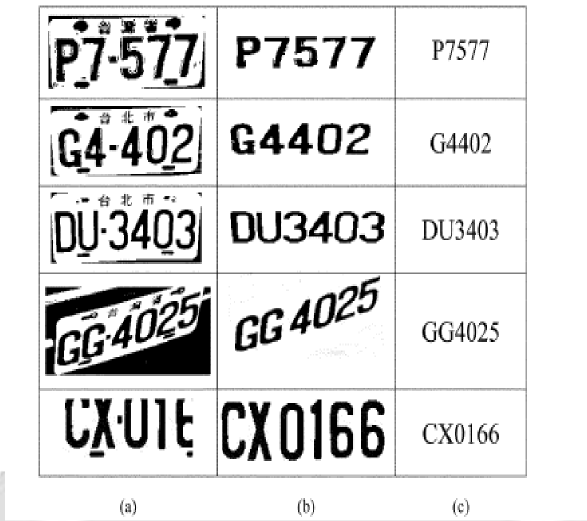

Fig -3: Example of license number identification (a) Locating license plate (b) Region Segmentation (c) Licence number identification.

In assistive reading systems for blind persons, it is very challenging for users to position the object of interest within the center of the camera's view. As of now, there are still no acceptable solutions. We approach the problem in stages. To make sure the vehicle number plate appears in the camera view, we use a camera with sufficiently wide angle to accommodate users with only approximate aim. This may often result in other text objects appearing in the camera's view (for example, while shopping at a supermarket). To extract the vehicle number plate from the camera image, we develop a motion-based method to obtain a region of interest (ROI) of the object. Then, we perform text recognition only in this ROI.

In solving the task at hand, to extract text information from complex backgrounds with multiple and variable text patterns, we here propose a text localization algorithm that combines rule- based layout analysis and learning-based text classifier training, which define novel feature maps based on stroke orientations and edge distributions. These, in turn, generate representative and discriminative text features to distinguish text characters from background outliers.

4. CONNECTED COMPONENTS GROUPING

The image partition creates a set of connected components S from an input image, including both text characters and unwanted noises. Observing that text information appears as one or more text strings in most natural scene images, we perform heuristic grouping and structural analysis of text strings to distinguish connected components representing text characters from those representing noises. Assuming that a text string has at least three characters in alignment, we develop two methods to locate regions containing text strings: adjacent character grouping and text line grouping respectively. In both algorithms, a connected component C is described by four metrics: height(.),width(.), centroid(.), and area(.). In addition, we use D(.) to represent the distance between the centroids of two neighboring characters.

5. OPTICAL CHARACTER RECOGNITION

OCR is a complex technology that converts images with text into editable formats. OCR allows you to process scanned books, screenshots and photos with text and get editable documents like TXT, DOC or PDF files. This technology is widely used in many areas and the most advanced OCR systems can handle almost all types of images, even such complex as scanned magazine pages with images and columns or photos from a mobile phone.
The process of converting an image to editable document is separated to several steps; every step is a set of related algorithms which do a piece of OCR job. General steps in OCR process are:

5.1 Loading image as bitmap from given source

Source can be a file or a pointer to a memory block, also good OCR system must understand a lot of image formats: BMP, TIFF (both one-page and multi-pages images), JPEG, PNG and so on. PDF files must be supported as well, many documents are stored as images in PDF format and the only way to extract text from such files is to perform OCR. Detecting the most important image features like resolution and inversion. Many OCR algorithms expect some predefined range of font sizes and foreground/background colors so the image must be rescaled and inverted before processing when necessary.

Image can be skewed or it can have a lot of noise, so disked and denoising algorithms are applied to improve the image quality.

Fig -4: (a) the original image after skew; (b) after applying the de-skew (shear) operation using Hough transform, It is clear that the plate became axes

Many OCR algorithms require bi-tonal image, therefore color or gray image must be converted to black-white image. This process is called "binarization" and it is very important step because incorrect binarization will cause a lot of problems.

Fig -5: OCR Detection of text and Binarization.

5.2 Lines detection and removing

This step is required to improve page layout analysis, to achieve better recognition quality for underlined text, to detect tables, etc.

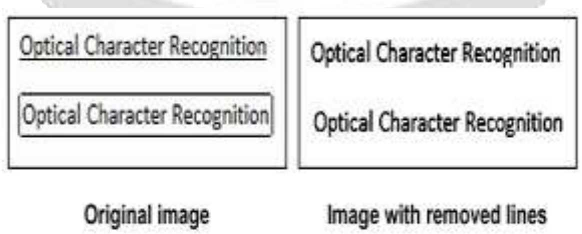

Fig -6: OCR Detection of lines and Removing.

Page layout analysis; this steps is also called "zoning". At this stage OCR system must detect positions and types of all important areas on the image. Detection of text lines and words, sometimes, is not an easy task because of different font sizes and small spaces between words.

Combined-broken characters analysis. It is very common situation when some characters are broken to several parts, or when a few characters touch each one; it is necessary to detect such cases and find correct position of every character.

5.3 Recognition of characters

This is the main algorithm of OCR; an image of every character must be converted to appropriate character code. Sometimes this algorithm produces several character codes for uncertain images. For instance, recognition of the image of "I" character can produce "I", "|" "1", "l" codes and the final character code will be selected later.

Dictionary support: This step can improve recognition quality, some characters like "1" and "I", "C" and "G" can look very similar and the dictionary can help to make the decision. Saving results to selected output format, for instance, searchable PDF, DOC, RTF, TXT. It is important to save original page layout: columns, fonts, colors, pictures, background and so on. It is not a complete list, a lot of other minor algorithms also must be implemented to achieve good recognition on various image types, but they are not principal in most cases and can vary in different OCR systems.

Every OCR step is very important; the whole OCR process will fail if only one its step cannot handle given image correctly. Every algorithm must work correctly on the highest range of images, that is why there are only few good universal OCR systems are available. On the other hand, if some features of given images are know the task becomes much easier, it is possible to get better recognition quality if only one kind of images must be processed. To achieve the best results if some features of images are known, good OCR system must have ability to adjust the most important parameters of every algorithm; sometimes this is the only way to improve recognition quality. Unfortunately, nowadays there are not OCR systems that can be comparable with human eyes and it seems they will not be created in the near future.

Omni Page is an optical character recognition (OCR) application available from Nuance Communications. Omni Page was one of the first OCR programs to run on personal computers. It was developed in the late 1980s and sold by Caere Corporation, a company headed by Robert Noyce. The original developers were Philip Bernzott, John Dilworth, David George, Bryan Higgins, and Jeremy Knight. Caere was acquired by ScanSoft in 2000. ScanSoft acquired Nuance Communications in 2005, and took over its name.

6. AUTOMATIC TEXT EXTRACTION

As shown in Fig. 5.1, we design a learning-based algorithm for automatic localization of text regions in image. In order to handle complex backgrounds, we propose two novel feature maps to extracts text features based on stroke orientations and edge distributions, respectively. Here, stroke is defined as a uniform region with bounded width and significant extent. These feature maps are combined to build an Adaboost based text classifier.

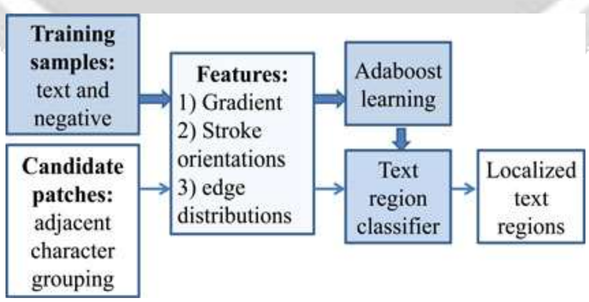

Fig -7: Diagram of the proposed Adaboost-learning-based text region localization algorithm by using stroke orientations and edge distributions.

7. CONCLUSION

In this paper, I have described a prototype system to read printed text on vehicle number plates. This method can effectively distinguish the object of interest from background or other objects in the camera view. To extract text regions from complex backgrounds, I have proposed a novel text localization algorithm based on models of stroke orientation and edge distributions. The corresponding feature maps estimate the global structural feature of text at every pixel.

Block patterns project the proposed feature maps of an image patch into a feature vector. Adjacent character grouping is performed to calculate candidates of text patches prepared for text classification. An Adaboost learning model is employed to localize text in camera-based images.

8. REFERENCES

[1]. Dhiraj Y. Gaikwad and Pramod B. Borole, "A Review Paper on Automatic Number Plate Recognition (ANPR) System" International Journal of Innovative Research in Advanced Engineering (IJIRAE), Volume 1, Issue 1, pp 1-5, (April 2014).
[2]. Amr Badr, Mohamed M. Abdelwahab, Ahmed M. Thabet, and Ahmed M. Abdelsadek, "Automatic Number Plate Recognition System" Annals of the University of Craiova, Mathematics and Computer Science Series, Volume 38(1), 2011, Pages 62-71 ISSN: 1223-6934
[3]. Yoh-Han Pao, "Adaptive Pattern Recognition and Neural Network." Pearson Education Asia, 2009
[4]. H. Sarukhanyan, S. Alaverdyan, and G. Petrosyan, Automatic Number Plate Recognition System, Proceedings of the 7th International Conference on Computer Science and Information Technologies, Yerevan, Armenia, September 28-2 October, 2009, Electronic Copy of the CSIT 2009 Proceedings, 347-350
[5]. L. Dlagnekov. License plate detection using adaboost. International Conference on Pattern Recognition
[6]. N. Nikolaou and N. Papamarkos, "Color reduction for complex document images" Int. J. Imaging Syst. Technol., vol.19,pp.14–26,2009