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Automated LED Text Recognition with Neural Network and PCA –A Review

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ABSTRACT: Light-emitting diodes text dot-matrix text (LED text) is being widely used for displaying information and announcements. LED display for modernization of society and catch on for its versatile application with many benefits. Existing paper used k-nearest neighbor(k-NN) approach, low computation complexity method for pattern recognition, is used to recognition character component as any class of character and canny edge was used to detect character pixels when appear in led display area from scene images. The drawback of existing system is that it cannot handle text line with non-uniform color and containing less than 3 characters. It also cannot detect continuous LED text. Our proposed system will utilize the probabilistic neural network (PNN) classification to add the robust classification for the higher level of the adaptiveness. Principal component analysis (PCA) is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. Our proposed system will achieve better detection and recognition rate than existing system.

Keywords: Neural network, pca, images, grey scale, images.

1. Introduction

Automatic text recognition includes text detection as a preliminary step. It has to be fast, efficient and robust so to feed an OCR classifier with the right input or we can say segmented regions must match to the actual text. Due to its huge applicative potential - from enquiring text in visual content to signboard conversion using PDA – text detection in natural scenes has been giving attention over the last decade. As counter to the classic documents with black ink on a white paper, images of natural scenes have difficulties that are away from being entirely solved, such as, complex symbols, compound backgrounds, uneven illumination that can be easily misclassified as text, perspective projections and complicated text styles.

Now days, with the improvement of digital technology, more databases are multimedia. The database mostly consists of images videos and textual information. The textual information is effective semantic information because it depicts the image or video and can be appropriate to fully understand images and videos. Text localization can be performed in three types of images that are:

1. Document image
2. Scene text image
3. Caption text image

Document images can be in the type of scanned book covers, CD covers or video image. Graphics text is also called scene text. Natural images that consist text are called scene text. The caption text is called artificial text, which text is inserted or superimposed in the image. There are two different techniques have been used for text localization from compound images that are region based approach and texture based approach.

Many text detection approaches have been proposed on the basis of edge detection, binarization, spatial-frequency image analysis and mathematical morphology. Text detection approaches can be classified can be edge-based, connected-component based or texture-based methods .Best results were achieved using edge based text detection. It obtains top performance among 4 methods that also includes mathematical morphology and color-based character extraction.

Detecting text in video data edge profiles have been used. The edge profile has been incorporated with additional edge features that eliminate false positives selection. To eradicate some of the non-text candidate regions, edge profiles are combined with a set of heuristic rules. The proposed method is calculated on CVL OCR DB, an annotated image database of text in scenes. It is supposed in this article that multiple text regions of different text styles and sizes can appear in the image.

The VMSs are playing improving roles in attempts to improve highway safety, operations. This device is used for routing and management, traffic warning, regulation, and is designed to affect the behavior of drivers by bringing real-time traffic-related information. In urban areas, the VMSs are used within parking guidance and information systems that guide drivers to available car parking areas. They may also demand vehicles to limit travel speed, take different routes, prompt of duration and location of the incidents or just inform of the traffic conditions. Each character of the LED text contains of a matrix of LEDs or matrix of segments with circle or rectangular shape. In recent years, text recognition plays an important part in intelligent transportation systems (ITS) such as information retrieval from traffic sign,, road navigation, and vehicle plate recognition. Many researchers have studied text detection and/or recognition with valid result. Unlike general text, LED text is crucial to recognized because of discontinuous character. Text recognition system as component of the ITS should be able to handle this type of text.

1.1 Text Recognition

OCR is the optical character recognition is the recognition of printed and written document characters by the computer. This involves photo scanning of text character by character. Analysis of scanned image translates the character image into character codes, like ASCII.

1.2 Text Character Restoration

Image Restoration is the process of taking a corrupt image or data and estimating the clear and real image. image restoration is performed by retrogression process that blur the image & such performed by imaging a point source & use point source image ,which is called the point spread function to restore the image information lost to blurring process.

For example: when a player chooses to removes a character from his account, the character is invisible completely and is no longer accessible from the account. We preserve a clone of character in the database, just in case of player ever want to get it back, this is called character restoration.

1.3 LED TEXT

Now days LED display that is natural scene is being widely used for displaying announcements, sign boards, logo for displaying information. LED text is difficult to separate because of its discontinuous nature. A matrix of segments is used to display the character of LED, which is combined together to generate an LED text. The character of the LED text is displayed in matrix form which is coming in ovate or circle shape. The size of the matrix of the LED character 3× 5, 4×6, 5×7, 5×8 and 6×7 dots.

II. LITERATUTE SURVEY

Jo, Kanghyun et. al. [1] has proposed the text recognition method of LED dot matrix in natural scene. To accomplish identify character pixels in LED display. The calculated center point of edge segmented are merged on basis of their features which hence gives a character candidate. Then k nearest neighbor approach is used to classify character candidate. Secondly characters are merged into text line on basis of similarity of their properties. Such as color, height, aspect ratio and width. The proposed model by author achieves 68.8% detection and 47% recognition rate. Limitations of this paper is that is not able detect 3 or lold aess than 3 character. Recognition is also low. Also the accuracy of detection and recognition must be improved.

Yin, Xu-Cheng et. al. [2] as proposed the robust text detection for natural scene images. . In this paper Maximally Stable External Regions (MSERs) as character candidates using the strategy of minimizing regularized variations. Single link clustering algorithm is used for text recognition. Weights and clustering threshold are read automatically through a novel self-training distance metric learning algorithm. The proposed method is determine by the experiment on the multilingual, street view, multi-orientation born digital database. MSERs pruning algorithm that enables us to detect most character even when the image is in low quality. It does not perform character recognition. It does not work with multilingual texts.

Iqbal, Khalid et. al. [3] has proposed Bayesian network scores based text localization in scene images. Firstly To find the text regions all MSER – based extracted candidate characters are directly compared with text localization. Secondly, the candidate character regions extracted are combine into text regions by using selection rules. Thirdly, the complementary character are learned through K2 algorithm-based Bayesian network score. This paper achieve f1-measure 72.44%. Versatile model is used to select the various types of boards. This paper is not capable for perform the preprocessing step of automatic labeling of candidates.

Gupta, Neha et. al. [4] has worked on the localization of text in complex images using haar wavelet transform. This paper brings out new hybrid approach which locates text in distinct backgrounds. Haar (DWT) discrete wavelet transform decompose images in to four parts sub images coefficients, one part is average and remaining three are detail. This paper is success to detect for the text areas well in the top center and bottom-center regions of the images and also well detect the text in center region. This paper fails to detect text in the center left or center right direction.

Mishra, Anand et. al. [5] has worked on Top-down and bottom-up cues for scene text recognition algorithm. The problem of recognizing text extracted from street images have been focused in this paper .this paper present a framework that exploits both bottom-up and top-down signal. This paper proposed effective approach for recognition scene text. In this paper bottom up is signal from character detections and top-down cues from lexica. This paper achieve highly accuracy that is 82%. It does not work properly incorporate any text region localization method so not applicable to be real time applications.

Ikica, Andrej [6] has proposed on the improvement of edge profile based method for text detection in images of natural scenes. This paper is worked on the complex text of different styles, sizes and colors with complex backgrounds. It uses set of rules that eliminates non text areas. They have used CVL OCR DB that is a database for text in natural scene of images for evaluation. This model achieves 71% precision rate and 55% recall rate. But the model doesn't incorporate text recognition technique.

LITERATURE TABLE

Author and Publishing House	**Paper Title**	**Problem Addressed**	**Merits**	**Demerits**
Jo, Kanghyun, Science Direct (Elsevier), 2015.	LED Dot matrix text recognition method in natural scene.	Canny edge detection algorithm with Spatial Feature based Point of Interest evaluation for LED text recognition.	The spatial feature detection and extraction has been utilized for adequate accuracy for LED text detection.	Not able to detect 3 or less than 3 characters. Recognition is very low. Also the accuracy of detection and recognition must be improved.
Yin, Xu-Cheng et. al., IEEE Transactions 2014.	Robust text detection in natural scene images.	Fast and effective pruning algorithm is designed to extract Maximally Stable External Regions (MSERs) as	Adequate accuracy in the form of f1-measure nearly at 76%. Significantly	Does not perform character recognition. Does not work well with

		character candidates using the strategy of minimizing regularized variations	improved precision rate at 86.29.	multi-orientation text.
Iqbal, Khalid et. al., IJCNN, IEEE 2014.	Bayesian network scores based text localization in scene images.	Bayesian network scores using K2 algorithm in conjunction with the geometric features based effective text localization method with the help of maximally stable extremal regions (MSERs).	The performance in measures of f1-measure at 72.44% can scored adequate. Versatile model to select the various types of text boards.	Not capable of performing the preprocessing step for automatic labeling of candidates.
Gupta, Neha et. al. IJITEE 2012.	Localization of Text in Complex Images Using Haar Wavelet Transform.	**Haar Discrete** **Wavelet Transform (DWT) with Sobel edge detection and morphological dilation for text region localization.**	Detect the text areas well in the top-center and bottom-center regions of the images. Also well detect the text in center-center region.	But does to work well with the text in the center left or center right directions.
Mishra, Anand et. al. CVPR, IEEE 2012.	Top-down and bottom-up cues for scene text recognition.	Conditional Random Field model on these detections to jointly model the strength of the detections and The interactions.	Text recognition accuracy has been recorded nearly at 82% and 74% respectively over SVD-WORD and ICDAR(50).	Does not work incorporate any text region localization method so not applicable to the real-time applications.
Ikica, Andrej et. al. EUROCON, IEEE 2011.	An improved edge profile based method for text detection in images of natural scenes.	Connected components (CCs) based candidate text region detection.	This model has been recorded with high precision rate of 71% and recall rate of 55%.	Does not incorporate the text recognition techniques.

III. FINDINGS OF LITERATURE REVIEW

The existing system is based upon the extraction of the text on the LED boards placed on the highways to provide the various kinds of information to the drivers. The proposed model works in two primary steps. In the first step, the existing model uses the canny edge detection to detect the character pixels in the LED board after the image acquisition. [1] The points on the character lines are recalculated for each character segment in this step and merged to reconstruct the character clearly. [1, 7-8] Then the existing approach performs the k-nearest neighbor approach to obtain and classify the character features and character candidate. The existing model has resulted only 68.8% and 47% accuracy for detection and recognition respectively, which is very low. [1]

In this research, we are proposing the new approach to detect the LED text with higher accuracy than the existing approach. [1] The proposed model will be using the neural network classifier along with principle component analysis (PCA) [1, 7-8] along with balanced feature precision and compression methods along with neural network for the LED text recognition in order to recognize the LED text with

higher accuracy. For the character positioning in the beginning phase before using the neural network classifier with PCA, a set of preprocessing methods would be applied to extract the characters individually from the LED board signs. The preprocessing methods will include the canny edge detection with contour selection to accurately extract the characters from the LED board. [1] Blurring based morphological methods would be utilized to reconstruct the broken character shapes which are faded due to faulty LED boards.

IV. CONCLUSION

The LED text extraction and recognition models add the intelligence to the vehicles, cameras and many other optical character recognition (OCR) applications. The proposed model has been designed to achieve the higher accuracy in the localization and recognition of the LED text regions in the natural scenes. The LED region localization requires the number computations for the visual pattern recognition, for which we have proposed the use of color illumination along with the text lookup for the localization of the text regions. The morphological factors have also been utilized to improvise the localized regions. The proposed model design aims at the use of neural network classification for the purpose of accurate region localization for the LED text recognition. The proposed model is expected to resolve the issues related to the accuracy and precision in the existing models.

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