

An Efficient and Robust Method for Text Detection in Low and High Resolution Natural Scene Images

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Abstract:- In this paper, we propose efficient and sturdy technique for investigating texts in natural scene footage. A fast and effective pruning formula is designed to extract Maximally Stable External Regions (MSERs) as character candidate's victimization the strategy of minimizing regularized variations. Character candidates form into text candidates by the single-link clump formula, wherever distance weights and clump threshold unit of measurement learned by a completely distinctive self-training distance metric learning formula. The probabilities of text candidates like non-text unit of measurement estimable with a temperament classifier. Text candidates with high non-text probabilities unit of density eliminated and texts unit of measurement acknowledged with a document classifier. Text find in natural scene footage is also an important for several content-based image resolve. Experiments on polyglot, street browse; multi-direction and even born-digital databases conjointly demonstrate the effectiveness of the reposed technique.

1. INTRODUCTION

Existing strategies for scene text detection will roughly be categorized into 3 groups: window based [6] [7], connected element based [9] [10] and hybrid strategies [12]. Text in pictures contains valuable data and is exploited in several content-based image and video applications, like content-based net image search, video data retrieval, and mobile based mostly text analysis and recognition attributable to complicated background, and variations of font, size, color and direction, text in natural scene pictures needs to be robustly detected before being recognized and retrieved. Window based mostly strategies, also referred to as region-based strategies, use a window to search for doable texts within the image and so use machine learning techniques to spot text. These methods square measure slow because the image needs to be processed in multiple scales. Connected element based mostly strategies extract character candidates from pictures by connected element resolve followed by grouping character candidates into text; extra checks is also performed to get rid of false positives. The hybrid technique discovered by Pan et al. [12] exploits a locality detector to detect text candidates and extracts connected elements as character candidates by local finalization; non-characters square part eliminated with a Conditional Random Fields model [13] and characters will finally be classified into text. Additional, Stable External Regions (MSERs) [14] primarily based ways, which can be categorized as connected part primarily based ways but mistreatment MSERs as character candidates, became the focus of many recent works.

MSER-based ways have according promising conduct on the wide used ICDAR 2011 Strong Reading Competition info [15]. However, many issues remain to be self-addressed. First, the

MSERs algorithmic program detects a large range of continuance elements and this continuance components square measure ambiguous for the latter character grouping algorithmic

program. Most of the continuance elements, apart from the elements that almost all doubtless correspond to characters, ought to be removed before any process. The existing ways for MSERs pruning [19] still have space for enhancements in terms of accuracy and speed. Second, current approaches [14], [19], [20] for document candidates construction, which may be categorized as rule based and clustering-based ways, work well however square measure still not sufficient: rule-based ways typically need calibration parameters by hand, that is long and error prone; the clustering-based technique [14] shows smart performance but is sophisticated by incorporating post-processing stage once minimum spanning tree clump.

In this paper, we have a tendency to propose a sturdy and correct MSER based scene text detection technique. First, by exploring the data structure of MSERs and adopting easy features, we have a bias to style a quick and correct MSERs pruning algorithm; the amount of character candidates to be processed is considerably reduced with a high accuracy. Second, we have a tendency to propose a unique self-training distance metric learning formula that may learn distance weights and clustering threshold naturally; character candidates are gather into text candidates by the single-link cluster algorithm victimization the learned parameters. Third, we propose to use a personality classifier to estimate the back probabilities of text candidate's equivalent to non-text and remove text candidates with high non-text possibilities. Such elimination helps to coach a lot of powerful text classifier for distinguishing text. Finally, by integration the above concepts,

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we have a tendency to build correct and strong scene text find system. The system is evaluated on the benchmark ICDAR 2011 strong Reading Competition information (Challenge 2) Associate in Nursing has achieved an f -measure of seventy six, which is far above the present best performance of 71%. Moreover, experiments on trilingual, street read, multi-orientation and even born-digital (web and email) databases conjointly demonstrate that our methodology achieves hefty improvements over existing ways. An online demo of our planned scene text detection system.

2. LITERATURE SURVEY

In the literature survey we are going to discuss Robust Text Detection in Natural Scene Images: Below in literature we are discussing some of them.

A. Using framework to find text strings [1].

This paper proposed framework of text string detection consists of two steps: 1) Image partition to detect text character candidates depend on local gradient characteristics and color uniformity of character components. 2) Character candidate classification to find text strings based on joint structural characteristics of text characters in each text string such as character size differences, distances between adjacent characters, and character alignment. By assuming that a text string has at least three characters, proposed two algorithms of text string detection: 1) adjacent character grouping method, and 2) text line grouping method. The adjacent character grouping method finding the connection groups of each character candidate as string partitions and then blends the intersecting sibling groups into text string. The text line grouping method executes Hough transform to fit text line between the centroids of text candidates. Each fitted text line interprets the location of a potential text string. The identified text string is presented by a rectangle region covering all characters whose centroids are cascaded in its text line. Text information in natural incident images serves as significant hint for many image-based applications such as scene understanding, content-based image retrieval, assistive navigation, and automatic geocoding. However, locating text from complicated background with various colors is a competitive task. In this paper, I examine a new framework to find text strings with arbitrary orientations in composite natural scene images. To enhance efficiency and correctness, our algorithms are bringing out in multi-scales. The proposed methods outperform the state-of-the-art output on the public power full Reading Dataset which present text only in horizontal orientation. Furthermore, the effectiveness of our methods to detect text strings with arbitrary orientations is evaluated on the Oriented Scene Text Dataset collected by ourselves containing text strings in non-horizontal orientations.

B. Using a novel hybrid method [26].

This paper proposed a novel hybrid method to actively localize

texts in natural scene images. A text region finder is designed to create a text confidence map, based on which text components can be partitions by local linearization approach. A Conditional Random Field (CRF) model, considering the unary component property as well as binary neighboring component relationship, is then presented to label components as "text" or "non-text". Last, text components are arranged into text lines with a power minimization approach. Experimental results show that the proposed method gives hopeful performance balancing with the existing methods on ICDAR 2003 competition dataset.

C. A text line segmentation algorithm [27].

In this paper, they proposed a text line segmentation algorithm based on minimal spanning tree clustering with distance metric learning for differentiating text lines in handwritten documents. Mentioned a distance metric, the connected components (CCs) of document image are grouped into a tree format, from which text lines are obtained. By understanding the distance metric in supervised learning on a dataset of pairs of CCs, the proposed algorithm is made robust to handle various documents with un-uniformly skewed and curved text lines.

D. Pattern clustering methods [29].

This paper introduced an overview of pattern clustering methods from a statistical pattern identification perspective, with an aim of providing useful advice and references to basic concepts accessible to the broad community of clustering practitioners. The present classification of clustering techniques, and distinguish cross-cutting themes and recent advances, and also illustrate some essential applications of clustering algorithms such as image segmentation, object recognition, and information retrieval. Clustering is the unsupervised arrangement of patterns (observations, data items, or feature vectors) into groups (clusters). The clustering problem has been addressed in many contexts and by researchers in many disciplines; this reflects its broad appeal and usefulness as one of the steps in exploratory data analysis. However, clustering is a hard problem combinatorial, and distinguishes in assumptions and contexts in different communities have made the transfer of useful generic concepts and methodologies slow to occur.

3. PROPOSED APPROACH AND FRAMEWORK AND DESIGN

The robust method is introduced for scene text detection using the Maximally Stable Extremely Regions (MSERs) on ICDAR 2011 dataset. But this method is having many limitations to address. In this project, the important limitation of this method is how to detect highly blurred texts in low resolution natural scene images, is considered as our research problem. To address this research problem, we are presenting new modified system which can able to handle both low as well as high

resolution images for robust scene text detection. For low resolution images, the recent efficient algorithm introduced to enhance the quality of low resolution image to high resolution.

4. MATHEMATICAL MODEL

1) Calculate a variation -

$$V = \begin{cases} V + \theta 1(a - a_{max}) & \text{if } a > a_{max} \\ V + \theta 2(a_{min} - a) & \text{if } a > a_{min} \\ V & \text{otherwise} \end{cases}$$

Where,

$\theta 1$ and $\theta 2$ are penalty parameters.

X_u be the feature vector characterizing.

The similarity between u and v , and the distance between u and v is defined as

$$D(u, v) = w^T x_{u, v}$$

Where

W , the feature weight vector together with the threshold, can be learned.

2) Feature Space-

The feature vector xu is used to describe the similarities between data point's u and v . Let xu, xv be the coordinates of the top left corner of u, v 's bounding rectangle, hu, wu the height and width of the bounding rectangle of u , su the stroke width of u (stroke width computation is described in [28]), and $c1u, c2u, c3u$ the average three channel color values of u , the feature vector xu includes the following features:

• Interval

$$\begin{cases} abs(x_u - x_v - w_u) / \max(w_u, w_v) & \text{if } x_u < x_v, \\ abs(x_u - x_v - w_v) / \max(w_u, w_v) & \text{else.} \end{cases}$$

• Width and height differences

$$abs(w_u - w_v) / \max(w_u, w_v), abs(h_u - h_v) / \max(h_u, h_v).$$

• Top and bottom alignments

$$\text{Arc tan} \left(\frac{abs(y_u - y_v)}{abs(x_u + w_u / 2 - x_v - w_u / 2)} \right),$$

$$\text{arctan} \left(\frac{abs(y_u + h_u - y_v - h_v)}{abs(x_u + w_u / 2 - x_v - w_u / 2)} \right).$$

• Color difference

$$\sqrt{\frac{(c1_u - c1_v)^2 + (c2_u - c2_v)^2 + (c3_u - c3_v)^2}{255}}$$

Stroke width difference

$$abs(s_u - s_v) / \max(s_u, s_v).$$

Given the top level cluster set $\{C_k\}_{k=1}^m$, we randomly initialize feature weights and set C and

$$C = \{(\hat{\mu}_k, \hat{v}_k) = \arg \min_{\mu \in C_k, v \in C_{-k}} d(\mu, v, \omega)\}_{k=1}^m,$$

$$\mathcal{M} = \{(u_k^*, v_k^*) = \arg \min_{u \in C_k^2, v \in C_k^2} d(u, v, \omega)\}_{k=1}^m$$

Where,

C_{-k} Is the set of points excluding points in C_k , C_k^2 are direct sub clusters of C_k .

ϵ Is specified is the single-link clustering termination threshold.

By the definition of single-link clustering, we must have

$$d(u, v; \omega) > \epsilon \text{ for all } (u, v) \in C,$$

$$d(u, v; \omega) \leq \epsilon \text{ for all } (u, v) \in \mathcal{M}$$

We use logistic regression our model and by adopting the function of logistic regression as define the following objective function,

$$J(\theta; C, \mathcal{M}) = \frac{-1}{2m} \left(\sum_{(u,v) \in C} \log(h_\theta(X'_{u,v})) \right)$$

$$+ \sum_{(u,v) \in \mathcal{M}} \log(1 - h_\theta(X'_{u,v}))$$

Where

$$h_\theta(X'_{u,v}) = 1 / (1 + \exp(1 - h_\theta(X'_{u,v})))$$

$$\theta = \begin{pmatrix} -\epsilon \\ w \end{pmatrix}, \quad X'_{u,v} = \begin{pmatrix} 1 \\ x_{u,v} \end{pmatrix}$$

5. CONCLUSION

Proposed new modified system can able to handle both low as well as high resolution images for scene text detection. For low resolution images, the recent efficient algorithm introduced to enhance the quality of low resolution image to high resolution. Finally, by above new techniques we build a robust scene text find system that exhibits superior act over state-of-the-art methods on a variety of public databases.

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