IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 6, June 2016

Text Recognition and Detection of Traffic Sign -A Survey

R. Siva Prasath[1], Mr. S. Giri Prasad[2]

PG Student, Department of ECE, Coimbatore Institute of Engineering and Technology, Narasipuram, Coimbatore[1]

Assistant Professor, Dept of ECE, Coimbatore Institute of Engineering and Technology, Narasipuram, Coimbatore[2]

Abstract: In this survey recognition and detection of text in traffic signs Scene structure from Canny edge detector with Hough transform and HOG descriptors is used to outline search regions inside the image, within which traffic sign candidates or samples are then found. Maximally stable extremal regions (MSERs) with HSV or HSI color thresholding are used to find a high variety of candidates, and then they're reduced by applying constraints supported by temporal and structural information. The recognition stage interprets the text contained within detected candidate regions. Individual text characters are detected as MSERs and are arranged into lines, before being taken using optical character recognition (OCR) and Support vector machine (SVM). Recognition accuracy is immensely improved through the temporal fusion of text results across consecutive frames.

Index Terms: Maximally stable extremal region (MSER), Hue Saturation Value or Intensity (HSV or HSI) color, Optical Character Recognition (OCR) and support vector machine (SVM).

INTRODUCTION

The automatic recognition and detection of traffic signs is a difficult problem in now a days, with a variety of important application areas, together with autonomous vehicles and advanced driver assistance systems, road surveying. This system includes two main stages: recognition and detection [1-4].The detection stage exploits information from shaped based detection i.e., the size location and color based detection of the road in the frame, to see the regions within the scene it should search for traffic text signs. These regions are defined once the vanishing point (VP) of the scene is known and hence, the ground plane are determined by canny edge detector with Hough transform and HOG descriptor after that scene search regions are introduced and then color based detection is implemented by using a combination of MSERs, hue, saturation, and value or intensity (HSV or HSI) color thresholding.

By matching these regions through consecutive frames, temporal data is used to additionally eliminating the FP detected regions, based on the motion of regions with respect to the camera and also the structure of the scene.

Once a potential traffic sign has been located, consecutive stage of the algorithm makes an attempt to acknowledge text among the region before approximate perspective transform is applied to the region, in order to get shaped from unshaped region. Candidate components for text characters are then located among the region and sorted into potential text lines, before being taken using a support vector machine (SVM) or off-the-shelf optical character recognition (OCR) package.

To boost the accuracy of recognition, OCR results from many frames are combined together by matching individual words through frames using a weighted histogram and then detection and recognition process are described below

1. Detection

In the detection stage, two approaches exist. Detection based on color and shape criteria of traffic signs. The combination of the two process is additionally feasible. Basic color detection and shape detection are shown in figure1

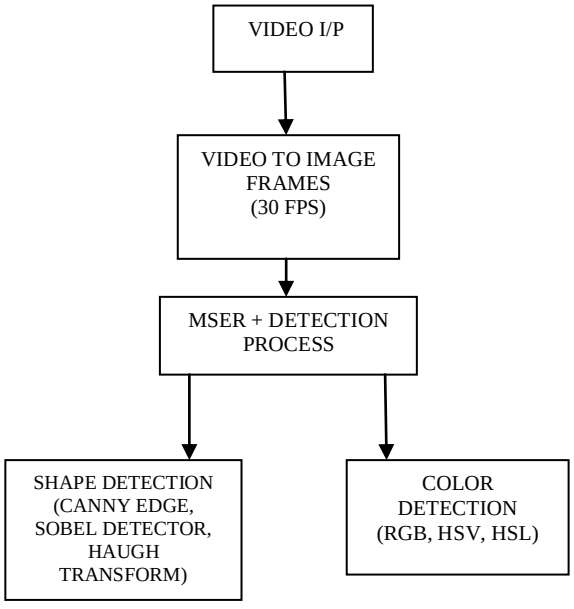

Fig.1. Basic color detection and shape detection

COLOR AND SHAPE BASED DETECTION

A).MSER AND HSV THRESHOLDING:

The algorithm involves observing the candidates for text-based traffic signs among the outlined scene search regions it taken from our past or previous work in the

DOI 10.17148/IJARCCE.2016.5613

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 6, June 2016

detection of symbol and text based traffic signs candidates using each MSER and HSV color thresholding.

These two types of detector are used, to achieve a color detection make sure that all attainable traffic signs are detected in all conditions. MSERs are outlined to be regions that preserve their shape approximately through several image threshold levels. This region detector is robust to lighting and contrast variations and identify high-contrast regions, that build it appropriate for the detection of traffic signs [3]. Further traffic text sign candidates are detected using HSV thresholding some values of HSV thresholding are shown in table 1.

Each frame is first remodeled into the HSV color space, before a threshold is applied to each hue and saturation channels. The value channel is neglected to help the system remain invariant to changes in brightness.

The MSER region detection shown in figure2 Region detection should be repeatable and stable, and capable to discriminate between the regions

Table.1.value used for HSV thresholding

COLOR	HUE RANGE	MIN SAT	MAX SAT
BROWN	12°-52°	50%	100%
GREEN	136°-176°	20%	100%
BLUE	184°-224°	24%	100%

Fig.2. MSER region detection

The algorithm

i. Start from an area intensity extremum point
ii. go in each direction until the point of maxima of few function. The curve connecting points is the region boundary
iii. compute geometric moments of orders up to two for this region
iv. Replace the region with ellipse

Processing the MSER extraction implements the subsequent steps:

i. Sweep threshold of intensity from black to white, performing an easy light thresholding of the image
ii. Extract connected elements
iii. Notice a threshold when an extremal region is "Maximally Stable".
iv. Approximate an area with Associate in the form of ellipse (this step is optional) and Keep those regions descriptors as options

B).HSI THRESHOLDING

Candidate objects are choosen via thresholding. Thresholding refers to the procedure that makes a binary image; pixels with illumination values higher than a predefined threshold are assigned value 1, and all the others are set to zero. Thresholding are controlled in HSI (Hue – Saturation – Intensity) color space, as it is more strong to illumination changes than RGB. Only Hue Saturation channels are used, as these components encode color info. possible values for Hue element vary between 0°-360° and for the Saturation element between 0- 255. some values of HSI thresholding are give in table 2

Table.2. values used for HSI thresholding

COLOR	HUE RANGE	SATURATION
BLUE	180<H<290	S>102
RED	H<22(or)H>306	S>38
YELLOW	18<H<72	0.5<S<204

C). HOUGH TRANSFORM and CANNY EDGE DETECTOR

After color based detection, elimination of false positives and shape based detection is performed so as to separate overlapping traffic signs. shape based detection takes advantage of canny edge detector, Hough transform (line and circular).circular Hough transform that is the algorithm that identifies circular curves. The circular Hough transform is to be applied, an edge image, acquired via Canny detector, is crucial. Afterwards, the presence of circles is indicated through a voting procedure carried out in the parameter domain. the number of dimensions of the parameter space equals to the number of parameters needed to completely outline the curve. As a circle is mathematically expressed through the equation (1), voting procedure includes the position x_o, y_o of the center of the circle and its radius r.

$$(x - x_o)^2 + (y - y_o)^2 = r^2 \text{---------- (1)}$$

These three parameters from the accumulator array and combinations with the highest values of votes are more possible to represent circles. Circular Hough transform is applied to ROIs (Region of interests) with aspect ratio less than 0.7, as these ROIs are more anticipated to depict overlapping road signs. If a circle is detected, its bounding box is derived and the area between the new and the original bounding box forms a new region of interest. This new ROI is accepted only if the quantitative relation between the vertical sides of the two new bounding boxes (BB of the circle and remaining BB) is between 0.7 and 1.3.

D).HOG DESCRIPTORS

For the recognition stage, regions of interest are described using histogram of oriented Gradients (HOG) proposed by Triggs and Dalal (2005). HOG descriptors have firstly been applied for pedestrian detection but till then, they have been widely used for object recognition, as they're sturdy to scale and illumination changes. in order to

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 6, June 2016

extract HOG descriptors, an image is divided into blocks, which are formed by overlapping cells. every cell consists of non-overlapping pixels and for every cell a local 1-D histogram of edges orientation is derived. each pixel contributes to the formulation of the histogram by the magnitude and also the orientation of its gradient. Orientation angles are measure into bins and for each pixel a vote is assigned to the suitable bin to which the orientation value belongs and this vote is assigned by the magnitude. the number of bins is changeable and also the range of orientation is between 0°-180° for unsigned gradient and 0°-360° for signed gradient. The local histograms are accumulated over blocks in order to attain illumination invariance and are then concatenated to create the descriptor(Figure 3).

2. RECOGNITION

The recognition procedure is to assign every region of interest to the category that it belongs. Also, fps (false positive) that have been detected as candidates depicting a road sign and that are eliminated. Recognition shall be performed using traditional template matching from the field of machine learning, like Optical character recognition (OCR) and Support Vector Machines (SVMs).

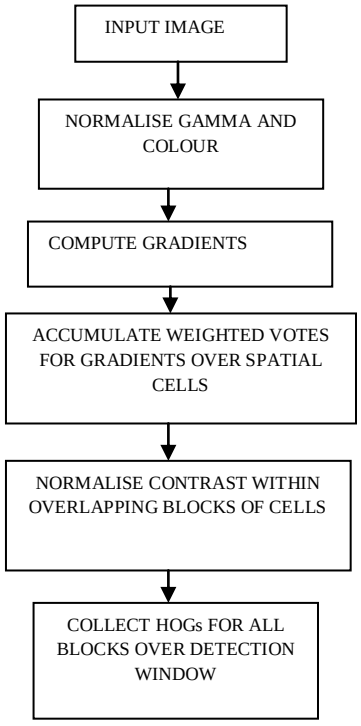

Fig.3.Function of HOGs descriptor

A)OCR

Optical Character Recognition (OCR) is the electronic or mechanical translation of images of written or typewritten text into machine-editable text. The main aim of this project is to design an expert system which can be best to, OCR that can effectively recognize a specific character of sort format exploitation the Feed Forward approach. OCR could be a field of research in artificial intelligence [5-6], in pattern recognition and additionally in machine vision. Although tutorial analysis within the field that continues, the main focus on OCR has been shifted to implementation of well-tried techniques.

OCR (uses optical techniques like lenses and mirrors) and digital character recognition (using computer algorithms and scanners) were originally thought as separate fields. as a result a very few applications survive that use actuality optical techniques, the OCR term has been broadened currently to incorporate digital image processing as well. this technique will be applicable to recognize any variety of characters together with uppercase, lowercase alphabets and numerals. Basic process of OCR is given in figure4

OCR engine process

i. The system acquires an image of the scanned paper.
ii. The scanned paper is given as input to the OCR engine.
iii. The portions of the image are matched to shapes by engine that is instructed to recognize.
iv. The OCR engine can create the given logical parameter's best guess as to which letter that a shape represents the final OCR results are shown as text.

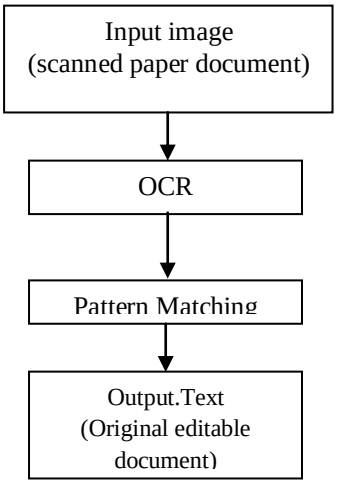

Fig.4.Basic OCR process

B).SVM

SVMs (support vector machine) are a bit difficult. in this case, it tend to show a linear SVM and illustrate its behavior on some 2d data. this should be great for aiming to grips with maximizing geometric margins, support vectors, and the optimization perform an maximum separating hyper plane[1]. Data can be generated randomly (uniformly or from separate Gaussians) over the 2d space, and an SVM can be trained to find a separate line. data points can be dragged around with the mouse, and the model (SVM) will retrain in real-time as the point is dragged (observe that dragging non-support vector points will not affect the SVM decision boundary) are shown in figure5

The program needs some implementation of A SVM algorithm. Therefore, you'll have to compel to have one of:

i. The bioinformatics toolbox and third-party library "libsvm", which includes an SVM train function
ii. The optimization toolbox, which includes a quad prog function

DOI 10.17148/IJARCCE.2016.5613

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 6, June 2016

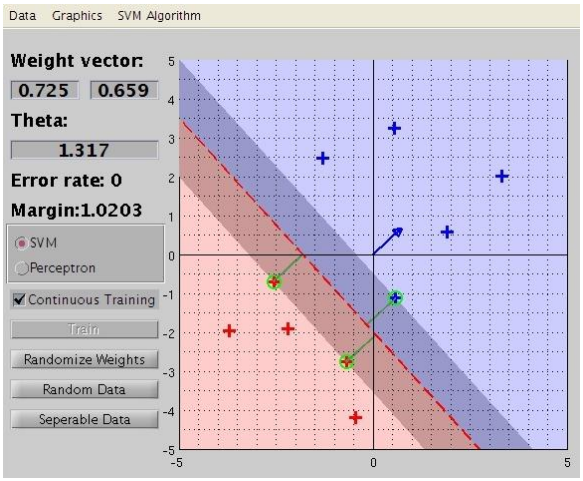

Fig.5.SVMs decision boundary output

CONCLUSION

The automatic recognition and detection of text in traffic signs supported by MSERs with HSV or HSL thresholding, HOG descriptor. The search space for traffic signs was reduced exploitation structural information from the scene that assisted in reducing the total number of fps. Perspective rectification and temporal fusion of candidate regions of text were used to improve OCR and SVM results.

REFERENCES

[1]. S. Maldonado-Bascon, S. Lafuente-Arroyo, P. Gil-Jimenez, H. Gomez- Moreno, and F. Lopez-Ferreras, "Road-sign detection and recognition based on support vector machines," IEEE Trans. Intell. Transp. Syst., vol. 8, no. 2, pp. 264–278, Jun. 2007

[2]. J.Greenhalgh and M. Mirmehdi, "Traffic sign recognition using MSER and random forests," in Proc. EUSIPCO, Aug. 2012, pp. 1935–1939.

[3]. J.Greenhalgh and M. Mirmehdi, "Real-time detection and recognition of road traffic signs," IEEE Trans. Intell. Transp. Syst., vol. 13, no. 4, pp. 1498–1506, Dec. 2012.

[4]. Mogelmose, M. M. Trivedi, and T. B. Moeslund, "Vision-based traffic sign detection and analysis for intelligent driver assistance systems: Perspectives and survey," IEEE Trans. Intell. Transp. Syst., vol. 13, no. 4,pp. 1484–1497, Dec. 2012.

[5]. Google, Tesseract-OCR 2013, [Online; accessed 8-October-2013]. [Online].\Available:http://code.google.com/p/tesseract-ocr/

[6]. The Department for Transport, "Working drawings for traffic signs,"London, U.K., Oct. 2013. [Online]. Available:https://www.gov.uk/working-drawings-for-traffic-signs

[7]. Reina, R. Sastre, S. Arroyo, and P. Jiménez, "Adaptive traffic road signpanels text extraction," in Proc. WSEAS ICSPRA, 2006, pp. 295–300.

[8]. Merino and M. Mirmehdi, "A framework towards real-time detectionand tracking of text," in Proc. CBDAR, 2007, pp. 10–17.

[9]. S. Houben, J. Stallkamp, J. Salmen,M. Schlipsing, and C. Igel, "Detectionof traffic signs in real-world images: The German traffic sign detection benchmark," in Proc. IJCNN, Aug. 2013, pp. 1–8, IEEE.

[10]. R. I. Hartley and A. Zisserman, Multiple View Geometry in Computer Vision, 2nd ed. Cambridge, U.K.: Cambridge Univ. Press, 2004.