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Efficiently Recognition and Tracking of Traffic Signs Using SVM

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ABSTRACT: The number of cars is speedily growing. In parallel, the quantity of approaches and site visitor's indicators have multiplied. As a result of accelerated site visitor's indicators, the drivers are anticipated to gain knowledge of all the visitor's indicators and to pay concentration to them while driving. A process that can routinely recognize the site visitors signs has been need to decrease traffic accidents and to pressure extra freely.We introduce a new system for traffic sign recognition and tracking. Such a system presents a vital support for driver assistance in an intelligent automotive. First, to generate traffic sign applicant regions a colour based segmentation method is applied. Secondly, the extracted HoG feature's are used to encode the detected traffic signs and then generate the feature vector. To identify the traffic sign class this vector is used as an input to an SVM classifier. Finally, In tracking method perform a monocular tracking step in order to have a continuous capture of the traffic sign while accelerating the execution time. Our method affords under different challenging conditions with high precision rates**.**

KEYWORDS: Traffic signs recognition; Traffic signs detection; Traffic signs classification; Traffic signs tracking; SVM; HOG

I. INTRODUCTION

The car riding has been a routine of number of people. Traffic indicators are used to indicate traffic warnings, law, routing and administration as one of the most important expertise for autonomous automobile. Traffic sign recognition (TSR) approach performs a most important role for autonomous navigation method. TSR method extracts valuable meaning from the pictures taken through the camera installed on the top of automobiles. Traffic sign (TSs) recognition is a main issue for a driver assistance system as it has a dual role to control the road traffic and guide the driver. Serious accidents happen when drivers miss signs due to distractions or psychological state of drivers. Therefore, automated recognition of traffic signs is an important aspect for autonomous navigation systems. Such system has to be fast and efficient to detect traffic signs in real-time. Also they have to handle complex problems which can affect detection and recognition effectiveness. These problems include variations in illumination such as light levels, twilight, fog, rain, and shadow, motion blur and signs occlusion. Effectiveness is a key factor, as one misclassified or undetected sign could affect the navigation system completely. Actually, the existing systems do not provide a guarantee 100% of accuracy. Hence, we introduced a new effective method for fast detection, tracking and classification of traffic signs from a moving vehicle in various complex conditions. In the detection step, we apply a colour based segmentation method to extract the important and useful regions of traffic signs. For the classification step, HoG features are applied to encode the detected traffic signs and compute the feature vector. This feature vector is used as an input to the SVM classifier to detect the traffic sign class. At last, we track the recognized traffic signs.

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II. RELATED WORK

A. TRAFFIC SIGN DETECTION:

1] Title: On circular traffic sign detection and recognition
Authors: S. K. Berkaya , H. Gunduz, O. Ozsen, C. Akinlar and S. Gunal

Typically, RGB image is an output of a mounted camera. Whereas, the RGB color space is not suitable for the detection of signs colors because of to sensitiveness to the illumination variations. Therefore they used a color ratio between the intensity components of RGB.

2] Title: Road traffic sign detection and classification
Authors: A. de la Escalera, L. E. Moreno, M. A. Salichs, and J. M. Armingol,
They used only one RGB component as a reference to detect the sign colors in the image.

3] Title: Traffic sign detection in dual-focal active camera system
Authors: Y. Gu, T. Yendo, M. Tehrani, T. Fujii, and M. Tanimoto

There are methods based on the TS shape, which totally ignore color information and it focuses on shape information from gray scale images. For instance, to detect the points of interest in the TS image the technique of local radial symmetry was implemented. They applied this technique on the gradient of a gray scale image and used a center point votes for circular signs and a line votes for regular polygons.

4] Title: Detection and Recognition of Traffic Signs from Road Scene Images
Authors: Z. Malik and I. Siddiqi

They used the Hough transforms techniques to detect the rectangles, circles and triangle shapes of traffic signs.

B. TRAFFIC SIGN CLASSIFICATION:

1] Title: Malaysia traffic sign recognition with convolutional neural network
Authors: M. M. Lau, K. Ha. Lim and A. A. Gopalai

To ensure a prominent classification, there are training-based methods and model-based methods. The training-based methods rely on a training phase wherein different artificial techniques, for example Neural Network. The training-based methods using the neural networks with their different topologies have been widely exploited. Authors used a convolutional neural network and the radial-based neural networks.

2] Title: High performance traffic sign recognition based on sparse representation and SVM classification.
Authors: C. Liu, F. Chang and Z. Chen

They used training-based methods which rely on a training phase with Support Vector Machine as artificial technique. The SVM classifier has also been widely employed to identify the corresponding TS class. For classification step, they used a SVM classifier because of its good performance in statistical learning theory and robustness already proved in TRS topic.

3] Title: Fusion of map matching and traffic sign recognition.
Authors: A.U. Peker, O. Tosun, H. L. Akin and T. Acarman

The TS region is compared to a set of TS's Template exemplars (models) labelled with discrete class to find out the most similar TS class. To perform TSs matching, they used some comparison metrics like the normalized correlation

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between the templates stored in the database and the potential TS regions.

C. TRAFFIC SIGN TRACKING:

Title: Color-Based Road Sign Detection and Tracking
Authors: L. D. Lopez and O. Fuentes

Different methods were proposed to carry out the tracking step. They used points-based methods to represent the traffic sign in consecutive frames through a specific point or a set of points. They execute the tracking through the matching of a set of interest points which extracted from the detected traffic sign. They are generally robust to illumination changes and allow transformations.

III. PROPOSED METHOD

We are interested in recognizing and tracking the danger and prohibitory traffic signs as they are the important cause of accident-prone situations. Our proposed method is composed of two steps:

Traffic signs recognition and tracking.

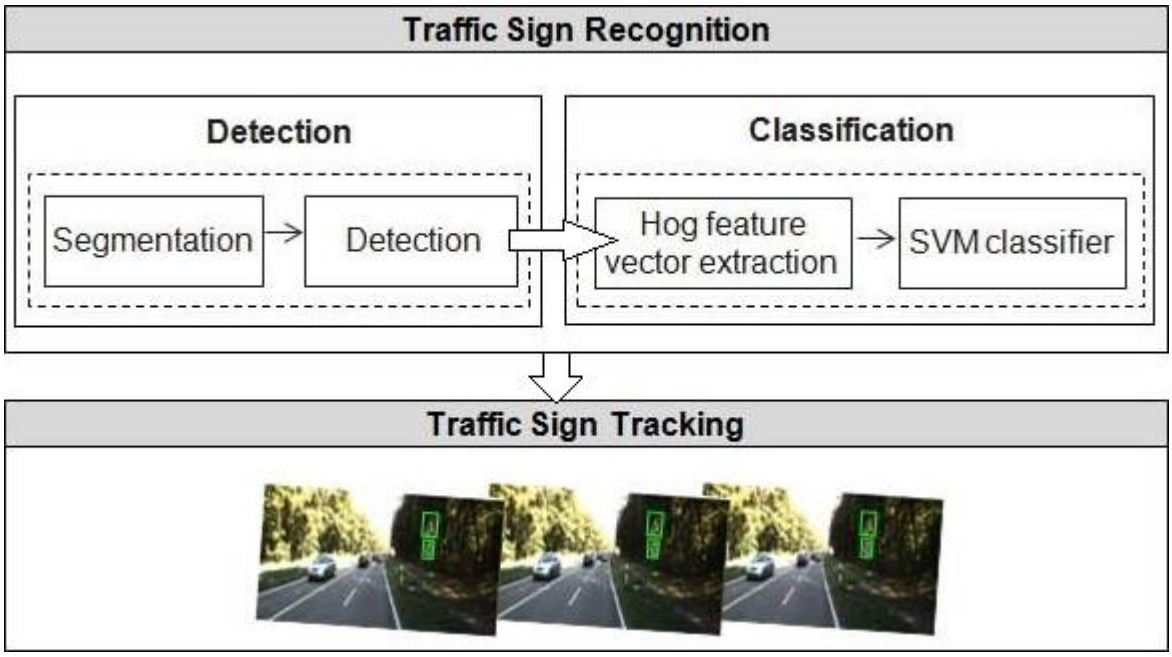

Fig.1. Traffic sign recognition and tracking process

Lane limits are detected in the closest regions of the images then, these lane limits are used to delimit the region of interest where potential TS may present.

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A. *TRAFFIC SIGN RECOGNITION*

The traffic sign recognition performs on two steps

a) Traffic Sign Detection

The traffic signs detection aims to find out the potential road signs regions

i. Delimitation of ROI_{TS} :

Through simple image processing techniques, we create a reduced search mask to perform the detection step and reduce the search effort for these signs. Therefore, we apply a eliminating process to reject TSs that belong to other roads. Relying on the detected lane limits in the near region (ROIr and ROIl), we use the right lane limit and the Horizon line (Hz) to draw a quadrilateral on the right side of the image. This quadrilateral is considered as our new Region of Interest (ROI).

ii. Segmentation:

In this step, we proceed with color segmentation within this ROI. The measured color of TS is a combination of the TS original color and the added outdoor lighting. Therefore, the color model for TS segmentation should be selected. As it is commonly known, the color used in TSs seeks to capture the human attention. Therefore, we selected the HSV color space as it is based on human color perception. Indeed, the hue value is invariant to light and shadows variation in daylight. Applying a thresholding on each of HSV component, we segmented the TSs appearing on the ROI. Then we apply a closed morphology operation to have more dense areas of interests and eliminate interruptions.

iii. Detection:

This step aims to detect the precise location of the TSs. In order to achieve this goal, an analysis of the segmented regions is carried out. Therefore, we labeled the connected regions so that all the connected candidate pixels are grouping as one potential region (using 8-neighbors). Next, a bounding box characteristic(height, width, area) is calculated for all potential regions.

b) **Traffic sign classification**:

The classification of potential traffic sign regions is a important step as it helps to make a decision to keep or reject a potential traffic sign. To ensure a useful classification, we used the Histogram of Oriented Gradients (HOG) operator to extract the HOG feature vector. Then, an SVM classifier is applied relying on the already extracted feature vector

B. *TRAFFIC SIGNS TRACKING :*

Once a traffic sign is recognized, we perform a monocular tracking step in order to have a continuous capture of the traffic sign while accelerating the execution time. Since we are in a moving camera context, it is more appropriate to use an optical flow -based method. The bounding box which involves the detected TS includes a set of interest points that we extract using Harris detector. For each interest point, the tracker searches for the matching point in the next frame within a padded region around the TS location in the previous frame.

V. CONCLUSION

In this paper, we introduced a new method for recognition and tracking of traffic signs for traffic assistance system. Probable traffic signs regions are detected, then classified using HOG features and a linear SVM classifier. Then, we keep tracking traffic sign so as to have a continuous capture of the traffic sign while accelerating the execution time. The proposed system shows good recognition rate under changing weather conditions and tricky lighting.

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