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Traffic Image Detection and Recognition: A Review

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ABSTRACT: Text, as one of the most persuasive innovations of mankind, has assumed a significant part in human life, so distant from antiquated occasions. The rich and exact data epitomized in text is extremely valuable in a wide scope of vision-based applications; along these lines text identification and acknowledgment in characteristic scenes have become significant and dynamic examination themes in PC vision and archive investigation. Traffic sign discovery and acknowledgment is a field of applied PC vision research worried about the programmed location and characterization or acknowledgment of traffic signs in scene pictures gained from a moving vehicle. Driving is an undertaking dependent on visual data preparing. The traffic signs characterize a visual language deciphered by drivers. Traffic signs convey a lot of data fundamental for effective driving; they portray current traffic circumstance, characterize option to proceed, restrict or license certain bearings. This paper examined different identification and acknowledgment plans.

KEYWORDS: Image, Traffic, Text, Detection, Recognition, Image.

I. INTRODUCTION

In the last three decades there was an increase of road traffic, although the number of people killed or seriously injured in road accidents has reduced. This indicates that even if our roads are now more overcrowded than ever before, they are safer due the main advances in vehicle design, such as improved crumple zones and side impact bars. This can also be assigned by passive technology, like seat belts, airbags, and antilock braking systems. According to the department for transport. A. Difficulties in detecting and recognizing traffic signs

The positive aspects of TSDR is the uniqueness of the design of traffic signs, colours contrast usually very well against the environment, the signs are strictly positioned relative to the environment and are often set up in a clear sight to the driver.

On the other hand, there are still a number of negative aspects of TSDR. We can distinguish the following aspects:

- Lightning conditions are changeable and not controllable. Lightning is different according to the time of the day and season, weather conditions and local light variations such as direction of light.
- The presence of other objects like pedestrians, trees, other vehicles, billboards, and buildings. This can cause partial occlusion and shadows. The objects or surrounding could be similar to traffic signs by colour or shape.
- The sign installation and surface material can physically change over time, influenced by accidents and weather, thus resulting in disoriented and damaged signs and degenerated colors.
- The retrieved images from the camera of a moving car often suffer from motion blur and car vibration.
- It is not possible to generate an offline model of all the possible appearances of the sign, because there are so many degrees of freedom. The object size depends on the distance to the camera. Furthermore, the camera is not always perpendicular to the signs, which produces an aspect modification.
- The detection and recognition of traffic signs are caught up with the performance of a system in real-time. This requires a system with efficient algorithms and powerful hardware.
- Traffic signs exist in hundreds of variants often different from legally defined standards.

Thus, to construct a successful TSDR system one must provide a large number of traffic sign examples to make the system respond correctly to real traffic images. This requires large databases what is expensive and a time consuming task.

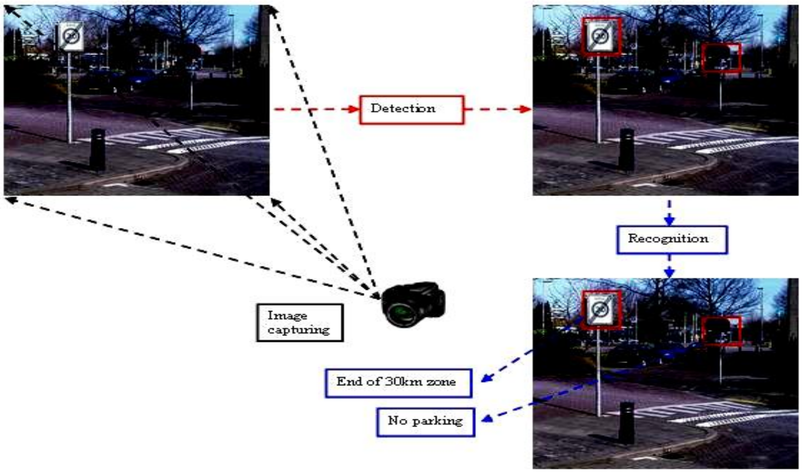

Figure 1: The traffic sign recognition system

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II. RELATED WORK

Y. Zhu et al.,[1] In this work, it is propose a novel text-based traffic sign detection framework with two deep learning components. More precisely, it is apply a fully convolution network to segment candidate traffic sign areas providing candidate regions of interest (RoI), followed by a fast neural network to detect texts on the extracted RoI. The proposed method makes full use of the characteristics of traffic signs to improve the efficiency and accuracy of text detection. On one hand, the proposed two-stage detection method reduces the search area of text detection and removes texts outside traffic signs. On the other hand, it solves the problem of multi-scales for the text detection part to a large extent. Extensive experimental results show that the proposed method achieves the state-of-the-art results on the publicly available traffic sign data set: Traffic Guide Panel data set. In addition, it is collect a data set of text-based traffic signs including Chinese and English traffic signs. Our method also performs well on this data set, which demonstrates that the proposed method is general in detecting traffic signs of different languages.

M. Javanmardi et al.,[[2] Detection of traffic signs and light poles using light detection and ranging (LiDAR) data has demonstrated a valid contribution to road safety improvements. In this study, the authors propose a fast and reliable method, which can identify various traffic signs and light poles in mobile LiDAR data. Specifically, they first use the surface reconstruction algorithm to extract the normal vectors of the points as one of the characteristic features and apply k -means on the characteristic features of the points to automatically segment the data into road or non-road points.

D. Wang et al.,[3] Automatic traffic sign detection is challenging due to the complexity of scene images, and fast detection is required in real applications such as driver assistance systems. In this work, it is propose a fast traffic sign detection method based on a cascade method with saliency test and neighboring scale awareness. In the cascade method, feature maps of several channels are extracted efficiently using approximation techniques. Sliding windows are pruned hierarchically using coarse-to-fine classifiers and the correlation between neighboring scales. The cascade system has only one free parameter, while the multiple thresholds are selected by a data-driven approach. To further increase speed, it is also use a novel saliency test based on mid-level features to pre-prune background windows.

T. Chen et al.,[4] Real-time traffic sign detection and recognition has been receiving increasingly more attention in recent years due to the popularity of driver-assistance systems and autonomous vehicles. This work proposes an accurate and efficient traffic sign detection technique by exploring AdaBoost and support vector regression (SVR) for discriminative detector learning. Different from the reported traffic sign detection techniques, a novel saliency estimation approach is first proposed, where a new saliency model is built based on the traffic sign-specific color, shape, and spatial information. By incorporating the saliency information, enhanced feature pyramids are built to learn an AdaBoost model that detects a set of traffic sign candidates from images.

Á. González et al.,[5] Traffic sign detection and recognition has been thoroughly studied for a long time. However, traffic panel detection and recognition still remains a challenge in computer vision due to its different types and the huge variability of the information depicted in them. This work presents a method to detect traffic panels in street-level images and to recognize the information contained on them, as an application to intelligent transportation systems (ITS). The main purpose can be to make an automatic inventory of the traffic panels located in a road to support road maintenance and to assist drivers.

III. TRAFFIC SIGN DETECTION AND RECOGNITION SYSTEM

The identification of traffic signs is usually accomplished in two main phases: detection and recognition. In the detection phase we can distinguish the following parts: pre-processing, feature extraction, and segmentation. As we can see a whole chain of image processing steps are required to finally identify the traffic signs. The first step in the detection phase is pre-processing, which may include several operations. These operations correct an image which is influenced by noise, motion blur, out-of-focus blur, distortion caused by low resolution, etcetera. Secondly, feature images are extracted from the original image. These feature images containing relevant information of the original image, but in a reduced representation. Thereafter, the traffic signs have to be separated from the background. Meaning that regions of constant features and discontinuities must be identified by segmentation. This can be done with simple segmentation techniques and with the more sophisticated segmentation techniques. After the segmentation phase follows another feature extraction part, but this time based on high level image analysis. In the last part of the detection phase are the potential traffic signs detected from the segmented images, by using the extracted features of the previous part. The efficiency and speed of the detection phase are important factors in the whole process, because it reduces search space and indicates only potential regions. After detection we can further analyze the image with several operations and modify it or extract further necessary information of it.
Detection and Recognition can be done by following steps and Approaches-

- Pre-processing.
- Feature extraction.
- Segmentation.
- Detection.
- Classification and recognition.

Approaches-

- Neural Network
- Optical Character Recognition
- Maximally Stable External Regions

A. STEPS

i. Pre-Processing

The goal of pre-processing is to adjust an image so that the resulting image is more suitable than the original. An image pre-processing method that works for one application may not work very well for another application.
The input of the pre-processing part consists of the original (sensor) image and the output is a reconstructed, restored, and enhanced image. The input can be influenced by noise, motion blur, out-of-focus blur, distortion caused by low resolution, etcetera. We can split the image pre-processing methods in two different domains:

- Spatial domain operates directly on the pixels.
- Frequency domain operates on the Fourier transform of an image.

ii. Feature extraction

If the input to an algorithm is too large to be processed or there is much data without much useful information, then the input will be transformed into a reduced representation set of features. This transformation is called feature extraction. Its objective is to select the right set of features which describes the data in a sufficient way without loss of accuracy. The set of all possible features represents a feature space

iii. Segmentation

Segmentation refers to operations that partition an image into regions that are consistent with respect to some conditions. The goal of segmentation is to simplify or change the representation of an image into something that is more meaningful or easier to analyse. The basic attribute for colour segmentation is image luminance amplitude for a monochrome image and colour components for a colour image. Image shape and texture are also useful attributes for segmentation.

iv. Detection

The segmentation part provide us with potential regions of traffic signs. The goal of the detection part is the identification of these potential regions with the use of rules that accept or reject a potential region as a traffic sign candidate. There also exist two different approaches in the traffic sign detection part: colour based and shape based.

Based on the segmentation results, shape analysis is in general applied to these results in order to perform the detection of the traffic signs.

v. Recognition phase

The output of the detection phase is a list of detected traffic sign. This list is forwarded to the recognition phase for further evaluation. To design a good recognizer, many features should be taken into account. Firstly, the recognizer should present a good discriminative power and low computational cost. Secondly, it should be robust to the geometrical status of the sign, such as the vertical or horizontal orientation, the size, and the position of the sign in the image. Thirdly, it should be robust 5to noise. Fourthly, the recognition should be carried out quickly if it is designed for real time applications. Furthermore, the recognizer must be able to learn a large number of classes and as much as possible a priori knowledge about traffic signs should be employed into the classifier design.

B. APPROACHES

i. Neural Network

Transform the original image into the gray scale image by using support vector machines, then use convolutional neural networks with fixed and learnable layers for detection and recognition. The fixed layer can reduce the amount of interest areas to detect, and crop the boundaries very close to the borders of traffic signs. The learnable layers can increase the accuracy of detection significantly. Besides, we use bootstrap methods to improve the accuracy and avoid overfitting problem

ii. Optical Character Recognition

Optical character recognition or optical character reader (OCR) is the mechanical or electronic conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo.

iii. Maximally Stable External Regions

After detecting the shape of the traffic signs, optical character recognition (OCR) method is used to recognize the character present in it. A technique based on Maximally Stable External Regions (MSER) region and canny edge detector was also supervised for character recognition in traffic sign detection process.

IV. CONCLUSION

This paper gives an overview of three, widely used, techniques on the topic of traffic sign detection and recognition. Statistical methods seem limited in this field and therefore much research has been done to find methods that are more accurate. As a final word, the choice of a method and the use of a technique depend on the complexity of the problem specific task. It can be a time consuming job to find the right settings of the different techniques. The study of the three emphasized methods in traffic sign detection and recognition can be easily extended with more research. Therefore we can combine techniques and achieve significant better results.

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