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A Review: Road Traffic Sign Detection and Recognition Systems

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Abstract: Traffic sign detection and recognition is an essential component of advanced driver assistance systems. It is mainly designed to increase driver safety through the fast acquisition and interpretation of traffic signs. However, still such systems are not able to recognize traffic signs accurately. In this article, firstly challenges and undesirable factors facing road traffic sign detection and recognition systems are addressed. The contributions of recent works to the various stages inherent in traffic sign detection: segmentation, feature extraction, and final sign detection are described in this paper.

Keywords: Active safety, object detection, recognition.

I. INTRODUCTION

The goal of standardizing traffic regulations in participating countries is in order to facilitate international road traffic and to increase road safety. Traffic sign detection and recognition is an essential component of advanced driver assistance systems. It is mainly designed to enhance driver safety through the fast acquisition and interpretation of traffic signs. However, still such systems are unable to recognize signs accurately.

Traffic sign detection and recognition is a active research field of applied computer vision that deals with the automatic detection and recognition of traffic signs in natural scene images captured from a moving car. Driving is a task depends on visual information processing. The road traffic signs define a visual language interpreted by drivers. Traffic signs carry much information required for successful driving; current traffic situation are described by traffic signs, define right way, prohibit or permit directions, warn about risky factors etcetera. Traffic signs guides drivers with navigation. They occur in standard positions in traffic scenes, their shapes, colors are known because of international standards. To see the problem in its whole complexness some features that influence the recognition system design and performance can be added. Road traffic signs are acquired from car moving on the road surface by considerable speed. The traffic scene images then suffer from vibrations; colour information is affected by different illumination.
Traffic signs are frequently obstructed partially by other vehicles. Many objects are present in road traffic scenes which make the traffic sign detection hard. Further, the algorithms must be applicable for the real-time implementation. The hardware platform must be able to process large amount of information in video data stream. To design a successful road traffic sign recognition system, one must execute different kind of image processing operations to detect, classify or recognize the road traffic signs.

II. CHALLENGES

Several undesirable factors may influence the design of an ideal TSDR. They are classified into five different categories such as: a low-acquisition vision system, an unsatisfactory road condition, a changeable surrounding condition, a moving vibrating car, and an imperfect sign state.

- Acquisition Vision System

When a traffic sign is far away from a camera, it appears small in the image. The recognition of such signs with a low-resolution camera is a challenging problem for moving vehicles. This is due to the fact that signs not only appear small, but noisy and blurry in the image. One way to handle this problem is to use a high resolution camera.

- Road Conditions

Camera vibrations and oscillations are an issue for moving cars. In fact, the mounted TSDR system suffers from car movements caused by road roughness. The performance of TSDR systems can be improved if the vibrations introduced by a camera are corrected by an image stabilization system. One way to decrease camera vibrations is to exploit the movement of lenses to achieve an adequate level of stabilization, or through the use of an electromechanical stabilization platform. Another possibility is through image stabilization algorithms.

- Surrounding Conditions

Surrounding conditions concern mainly the following factors: lighting, occlusions, and objects similar to signs. The degree of light intensity influences detection quality. This quality depends mainly on weather conditions and those found through the day where lighting conditions differ from night to day. Surrounding objects, such as buildings or trees, may directly affect (by occlusion) or indirectly (by their shadow) the quality of detection. Moreover, occlusion could be partial or total. In the case of total occlusion, all detection algorithms fail.

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• Moving Car
As images of signs are acquired from moving vehicles, sign detection suffers from car vibrations and motion blur. Motion blur is defined as the visible streaking of rapidly moving signs in frames. It results from a change in the recorded image during the recording process of a single frame due to fast movement. Moreover, car vibrations are mainly due to unsatisfactory road conditions.

• Traffic Sign State
The physical degradation of signs can be classified into two categories such as nature-made and manmade. Nature-made degradation is due to ultra-violet radiation and retro-reflective materials, which mainly influence the color sign. Manmade degradation can affect shapes, colors, and parts of the sign or the entire sign.

III. SYSTEM DESIGN

The identification of road traffic signs is usually accomplished in two main phases, detection and recognition. Figure 1 shows the different processes included in road traffic sign detection and recognition system.

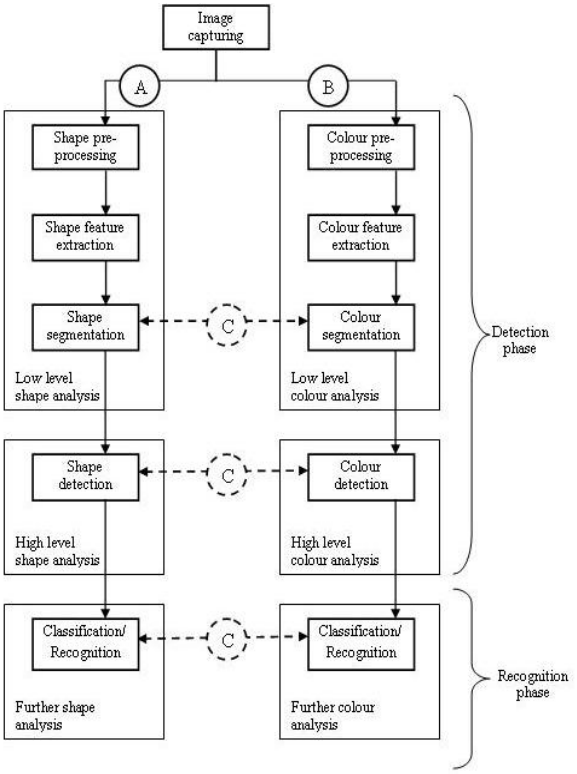

Fig 1Detection and recognition process of road traffic sign

A. Detection phase
The detection phase can be classified into the parts such as pre-processing, feature extraction, and segmentation.

1) Pre-processing
The aim of pre-processing is to adjust an image so that the resulting image is more suitable than the original image. Preprocessing consist of several operations. Preprocessing corrects an image which is influenced by noise, motion blur, distortion caused by low resolution, etcetera. The inputs of the pre-processing part consist of the original image and the output is reconstructed, restored and enhanced image.

2) Feature extraction
If the input to an algorithm is large to be processed or there is much data without much useful information, then the input will be transformed into a compact representation set of features, this transformation is called feature extraction. Its goal is to select the right set of features that describes the data in a sufficient way without loss of accuracy. A feature space is represented by the set of all possible features.

Feature extraction of an image can be classified such as spectral features, geometric features, and textual features. Since image data are by nature high dimensional, feature extraction is a necessary step for segmentation or traffic signs recognition to be successful. Moreover the lowered computational costs, it also helps to control the curse of dimensionality. Some feature extraction approaches are designed to manage explicitly changes in orientation and scale of objects. Principal component analysis is one of the most usually used feature extraction approach.

3) Segmentation
Segmentation refers to operations that partition an image into regions that are consistent with respect to some conditions. The aim of segmentation is to simplify or change the representation of an image into more meaningful or easier to analyze. The basic attribute for color segmentation is image luminance amplitude for a monochrome image. The basic attribute for color segmentation is color components for a color image. Useful attributes for segmentation are Image, shape and texture. The difficulties of these image segmentation problems are reduced with the help of pre-processing and feature extraction process. Segmentation approaches can be based on pixel data or on features.

Once region boundaries have been detected, it is useful to extract regions that are not separated by a boundary. Any set of pixels which is not differentiated by a boundary is call connected. A maximal region of connected pixels is known as connected component. The set of connected components partitions an image into segments. Image segmentation is a useful operation in different image processing applications.

4) Detection
The segmentation part provides the potential regions of traffic signs are provided by segmentation part. The goal of the detection part is the identification of potential regions with the use of rules of a traffic sign candidate that accept or reject a potential region. There are two different approaches in the road traffic sign detection part; color based and shape based. Shape analysis is in general applied to the segmentation results in order to perform the

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detection of the road traffic signs. Many authors share a common sequence of steps during the process but this sequence has a drawback as regions that have falsely been rejected by the color segmentation, and they are not recovered in the further process. A joint modeling of color and shape analysis can overcome this problem.

- Color based analysis

In TSDR systems colors can be an important source of information. A camera mounted on a car produces an RGB image. The detection process can be simplified by converting RGB image into a different form. There are so many colour spaces available in the literature, out of which are the HIS, HSB, L*a*b, YIQ and YUV colour systems.

- Shape based analysis

While moving from one country to another system that relies on colors have to change their configuration. Another point is the fact that colors vary as daylight and reflectance properties changes. Thus shape detection is a good alternative during sunset and night. Robust edge detection and matching algorithm is necessary while working with shapes. This is difficult when the traffic sign appears small in the image.

B. Recognition phase

Classification and recognition are interconnected tasks. At the end of the image processing chain these tasks occurs. Classification is concerned with criteria that can be used to identify or distinguish different populations of objects which appears in an image. The recognition is the process by which these tools are frequently used to find a particular feature within an image. Recognition includes different processes, such as searching a traffic sign in an image, or matching that traffic sign to a specific traffic sign.

IV. CONCLUSION

In this paper, a review of different techniques and methods used to implement road traffic sign detection and recognition system is briefly elaborated. As well as different challenges that influences system design are discussed.

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REFERENCES

[1] J. Greenhalgh and M. Mirmehdi, "Recognizing Text-Based Traffic Signs," IEEE Transactions On Intelligent Transportation Systems, Vol. 16, No. 3, pp. 1360-1369, June 2015.

[2] A. Mammeri And A. Boukerche and M. Almulla, "Design Of Traffic Sign Detection, Recognition, And Transmission Systems For Smart Vehicles," IEEE Wireless Communications, pp. no. 36-43, Dec. 2013.

[3] A. Mogelmose, M. Trivedi, and T. 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. no.1484-1497, Dec. 2012.

[4] P.Manwatkar, S. Yadav , " Text Recognition From Images," International conference on innovations in Information, Embedded and Communication System(ICIIECS), 2015.