Chapter 35
Semantic Based Annotation for Surveillance Big Data Using Domain Knowledge

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ABSTRACT

Video surveillance technology is playing a more and more important role in traffic detection. Vehicle's static properties are crucial information in examining criminal and traffic violations. Image and video resources play an important role in traffic events analysis. With the rapid growth of the video surveillance devices, large number of image and video resources is increasing being created. It is crucial to explore, share, reuse, and link these multimedia resources for better organizing traffic events. With the development of Video Surveillance technology, it has been wildly used in the traffic monitoring. Therefore, there is a trend to use Video Surveillance to do intelligent analysis on vehicles. Now, using software and tools to analyze vehicles in videos has already been used in smart cards and electronic eye, which helps polices to extract useful information like plate, speed, etc. And the key technology is to obtain various properties of the vehicle. This paper provides an overview of the algorithms and technologies used in extracting static properties of vehicle in the video.

1. INTRODUCTION

With the development of Video Surveillance technology, it has been wildly used in the traffic monitoring. Therefore, there is a trend to use Video Surveillance to do intelligent analysis on vehicles. Now, using software and tools to analyze vehicles in videos has already been used in smart cards and electronic eye, which helps polices to extract useful information like plate, speed, etc. And the key technology is to obtain various properties of the vehicle.

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With the help of cloud computing [Xu, 2015(a); Luo, 2011, Hu, 2014; X. Wei, 2015], internet of things [Xu, 2015(b); Xu, 2014(a); L. Wang, 2014], and Big Data [Xu, 2014(b); Xu, 2014(c)], the Ministry of Public Security is the management department of traffic events in China. Different provinces or cities of the Ministry of Public Security manage their own resources separately because the resources, especially video resources, are provided by different cameras under different spatial and times. However, some resources are related to one another and can serve multiple traffic events. Therefore, it is crucial to annotate these video resources with useful content. The appropriate annotations can create the semantic connections among video resources and allow their metadata to be understood globally. To this end, this paper has identified the following primary challenges. Recently, Wang [Y. Wang, 2011(a); Y. Wang, 2011(b); Y. Wang, 2013; Y. Wang, 2014(a); Y. Wang, 2014(b);] proposed the framework of cognitive learning, which can be used for semantic annotation:

1. Video resources should be annotated precisely. It is important to use the appropriate concepts to annotate the video resources. Especially in the traffic events case, the standard concepts should provide to the users to annotate video resources. Moreover, it is difficult to use only one general description to tell the whole story of a video resource because one section of the video stream may have plenty of information but some may not related to the main points of the video when it was created. Therefore, besides the standard concepts, a more accurate annotation mechanism, based on the timeline of the video stream should be required. For example, given a car in an image, different users may give different annotation of this car such as “car”, “vehicle”, and “SUV”;
2. The annotations of the video resources should be accurate and machine-understandable, to support related organizing and searching functionality. Though the standard and supervised terminology can provide accurate and machine-understandable vocabularies, it is impossible to build such a unified terminology to satisfied different description requirement for different traffic events. For example, the annotation of a red traffic light in an image may be helpful for detecting cross red lights;
3. Linking video resources using the annotations. Of course, the web resources are not separately. It is crucial to explore, share, reuse, and link these multimedia resources for better organizing traffic events. For example, a video resource about a crash event can be linked to a video resource about a traffic jam at the close timestamp.

As for the Knowledge model of the vehicle, the vehicle body model to is the vehicle’s own description of the video feature, it contains two parts, the static characteristics and dynamic characteristics. This paper is to introduce the static feature extraction.

For a vehicle, the static properties of the vehicle includes models of the vehicle, license plate, logo are static properties of vehicle. There are many ways to extract static properties from video, and the common used methods are image syntax.

In the process of extracting static property, according to the relationship between multi-level image description syntax, it will analyze the composition and then use machine learning methods determine the content of the static properties, such as concrete plate number or type of vehicle.

The remainder of the paper covers background and related work discussions (Section 2), the overall platform architecture (Section 3), the detailed illustration about the annotation process (Section 4), and the conclusions and future work (Section 5).