

Chapter 8

Efficient Feature Extraction Method for Traffic Surveillance in Intelligent Transportation Systems

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ABSTRACT

As the use of automobiles increases, traffic control surveillance becomes a significant problem in the real world. For effective urban traffic management, real-time, accurate, and reliable traffic flow information must be gathered. This chapter's primary goal is to create an adaptive model that can evaluate real-time vehicle tracking on urban roadways using computer vision techniques. This study proposes the implementation of the improved particle swarm optimization (IPSO) algorithm to extract features that can be used for detailed object analysis. The traffic flow data is pre-processed for enhancement as it is recorded using a fixed camera in various lighting situations. After that, the bit plane approach is used to segment the enhanced image. Finally, the proposed method is used to extract the feature values from the segmented area of the image, which are then employed for tracking.

INTRODUCTION

The amount of traffic on the roads around the world has significantly increased recently. Road network administrators are forced by this to maximize the usage of already-existing infrastructures and to offer dependable and comfortable conditions to users. Traffic conditions must be controlled in real-time, and effective traffic management strategies must be put into place quickly in order to address severe traffic interruptions like accidents and congestion (Asha, & Narasimhadhan, 2018). Traffic flow video surveil-

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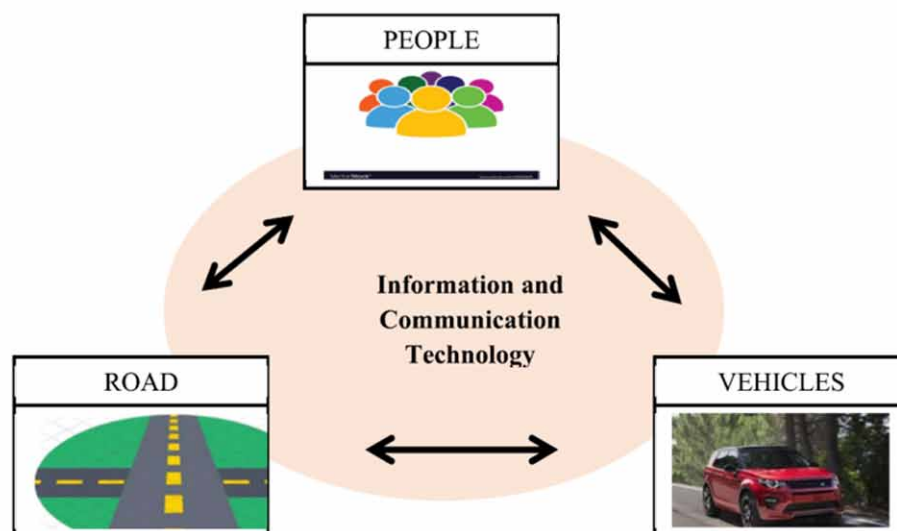
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lance systems seem to be a crucial instrument in achieving this critical goal (Le et al., 2020). In order to set policies for open and closed access or the duration of red and green signals in order to alleviate traffic congestion, survey data on the degree of traffic density is needed by counting the number of vehicles that pass the road (Norhafana et al., 2019). This observation was made manually at first, but as technology has advanced, some techniques can now be used to make observations automatically (Mohana et al., 2009). In general, infrared sensors, radars, and cameras constitute the foundation of traffic surveillance systems (Guerrero-Ibáñez et al., 2018). However, camera-based systems work well since they are inexpensive to install and maintain and provide real-time traffic monitoring and management (Fabela et al., 2017). To meet the growing issues of traffic congestion, local governments are creating their respective intelligent transportation systems (ITSs) (Patil et al., 2021).

Information technology (IT) has been altering human existence in a variety of ways, starting with communication and continuing through education, health care, government, and banking (Bansal et al., 2023). Currently, IT is in the early stages of altering Intelligent Transportation Systems (ITS) (Filjar et al., 2009). The relationship between ITS and communication technology is depicted in Figure 1. Every method of transport is covered under the term “ITS,” which generally refers to contemporary applications of communication and information technology used to creatively address transportation problems (Patil et al., 2015). ITS Solutions provides innovative services for various modes of transportation and traffic management (Bhardwaj et al., 2023a). Its services are created with the goal of minimizing fuel consumption and transportation costs providing security, dependability, efficiency, and quality (Bhardwaj et al., 2023b).

One of the most crucial applications of video-based surveillance systems is traffic surveillance (Chaturvedi et al., 2022). Researchers have, therefore, been investigating vision-based ITS for many years in an effort to get accurate and usable traffic data (Uthiramoorthy et al., 2023). These technologies make it possible to gauge a vehicle’s speed, count the number of them, classify them, and identify traffic accidents (Sharma, & Kumar, 2015; Shashank & Sharma, 2023). A wide range of approaches

Figure 1. Relationship between information technology and ITS



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