Connected Component Based Segmentation Technique for Vehicles Detection from High Resolution Satellite Images

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Abstract: *Satellite images are used for various applications like geographical, weather and geological applications. The forecasters used the low-resolution satellite images to predict the atmospheric changes. The high resolution satellite images are used in more applications especially for object segmentation and detection. The research on the high resolution satellite image is a challenging task. Less research is performed on high resolution satellite imagery as it is a challenging task. Traffic monitoring is a challenging task in developing countries. Automatic vehicle detection is very much useful for the traffic monitoring system. Vehicle images appear in miniature size in high resolution satellite images which is very difficult to extract from the images. Many researchers are working in these areas for the past few decades and most of the research is based on various types of sensor data. In sensor images, complete road network cannot be captured. In this paper, automatic detection of vehicles from high resolution satellite is proposed. Connected component based algorithm for automatic vehicle detection in high resolution satellite images is proposed in this paper.*

Index Terms: *Adaptive global thresholding, Connected component analysis, Morphological operator, Vehicle detection.*

I. INTRODUCTION

Vehicle detection and tracking are mainly used in many real time applications such as urban planning, traffic monitoring and control etc. Vehicle segmentation is used to find out the number of vehicles, the speed of the vehicle, and classification of the vehicles. In urban areas, traffic monitoring and controlling is the most needed task [1]. Vehicles details are necessary for traffic management, assessment of fuel requirement, traffic emissions control and control the air pollution [2]. Image processing approaches and investigation tools used for vehicle detection is given in this section. In this paper, a brief outline of image processing techniques and tools used to detect the vehicles which are used to develop the traffic surveillance systems is proposed. Automatic vehicle detection is most needed for traffic monitoring and surveillance system to control the traffic flow [3]. In the traffic monitor system, rather than the traditional method, high resolution satellite images are mainly used because of its compatibility, cost and accuracy [4]. The performance of vehicle segmentation is influenced in various areas such as urban planning, transport planning, evaluation of air and noise pollution levels in the atmosphere etc. Thus, an automatic approach of vehicle detection is essentially needed to solve the traffic-related issues and town planning.

The rest of the paper is arranged as follows. Section 2 gives the literature survey on vehicle detection. The proposed methodology of vehicle detection using connected component based approach is presented in section 3. Section 4 provides the results and discussion of the proposed algorithm and conclusion of the paper is present in section 5.

II. LITERATURE SURVEY

An important property of the vehicle image detection method is its ability to extract accurate vehicle images, and much literature on vehicle segmentation has been published in the past decades. Some of these works are stated here.

Noorpreet proposed vehicle detection method from high resolution satellite images [5]. This algorithm applied Otsu thresholding method to get a binary image, edges of the images are extracted with the help of canny operator after that blob analysis is applied to identify the vehicles objects in the image. Leitloff has presented a vehicle segmentation approach in very high resolution satellite images of urban zone [6]. This approach consists of four main processes. The region of interest (ROI) is determined by preprocessing steps, and then adaptive boosting classifier is applied. Then, the grouped vehicles and single vehicles are categorized. The location of vehicles is identified and reliability is measured in this paper.

Qu has introduced an automatic vehicle detection approach, which is based on Binary Normed Gradients (BING) and convolution Neural Network (CNN) [7]. This model consisted of two stages; Binary Normed Gradients (BING) is applied to extract region proposals. Convolution Neural Network (CNN), which combines feature extraction and classification, is used to enhance the robustness and improve the accuracy rate. Aaron presented an algorithm for 3D object centred change detection in satellite image [8]. This paper implanted the integrated cartographic modelling with image processing to utilize various government and commercial image data and geospatial data.

Kembhavi et al. [9] proposed a model based on multi-scale HOG features. Thus it can effectively detect vehicles in different sizes and scales. Grabner [10] proposed a car detection system using the robust boosting method. In [11], edges are detected then thresholding is applied to detect the changes in an image.

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