

Automatic Vehicle Detection Techniques in Image Processing Using Satellite Imaginary

Ekta Saxena
M. Tech. Scholar,
Computer Science & Engineering,
Marudhar Engineering College, Bikaner (Raj.)
ektasaxena3dec@gmail.com

Mrs. Neha Goswami
Asst. Prof. CSE Department,
Marudhar Engineering College,
Bikaner, (Raj.)
er.neha28@gmail.com

Abstract— Digital image processing is a fast growing field and many applications are developed in science and engineering. Image processing has the possibility of establish the latest machine that could perform the visual functions of all living beings. Object recognition is one of the most imperative features of image processing. Object detection from a satellite image or aerial image is a type of the object recognition system. This system is the most interesting and challenging research topic from past few years. It is known that the traffic is increasing day by day in the developing and developed countries. Satellites images are normally used for weather forecasting and geographical applications. So, Satellites images may be also good for the traffic detection system using Image processing. An automated system is developed using morphological recognition algorithm in MATLAB R2013a. In which image is captured from camera and converted into gray scale image for pre-processing. After conversion, image complemented, binary conversion is applied on image. After conversion canny edge detection method has done and passed this detection to the dilation process. After filtration and dilation, area is selected where number of vehicles is maximum and vehicles are recognized from the image in the form of bounding box. For detection number of vehicle each separately blob analysis is used.

Keywords- Digital Image, application, object detection, satellite image.

I. INTRODUCTION

Image processing is processes which transform an input image file into digital form and perform some operations on it, in order to get an increase image property or to extract some useful information from it. An image can be easily repaired using various image processing techniques and algorithms. Image processing a type of signal disbursement in which input is image, like video frame or photograph and output may be image or characteristics correlate with that image. Usually image processing system working like two dimensional signals and apply the set signal processing methods to them. Image processing is widely used and rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within computer science, telecommunication, information technology and engineering and disciplines too [1].

During the last three to four decades a number of techniques have been introduced and developed in image processing. Most of the techniques are developed for enhancing images achieve from unmanned, space probes, spacecrafts and military reconnaissance flights. Image Processing systems are becoming popular due to easy availability of powerful personnel computers, graphics software, large size memory devices etc [2].

II. EXPERIMENTAL RESULT AND ANALYSIS

Vehicle detection from a satellite image or aerial image is a type of the object recognition system. This system is the most interesting and challenging research topic from past few years. We know that the traffic is increasing day by day in the

developing and developed countries. Satellites images are normally used for weather forecasting and geographical applications. So, Satellites images may be also good for the traffic detection system using Image processing. I used simple morphological recognition method for vehicle detection using image processing technique in Matlab which is best method for detection of cars, trucks and buses. We can easily compute the total numbers of vehicles in the desired area in the satellite image and vehicles are shown under the bounding box as a tiny spots.

III. DATA INFORMATION

This paper work is used five images named D7, D12, D14, D15 and D10 as a reference. And step by step process is described on the image D7.

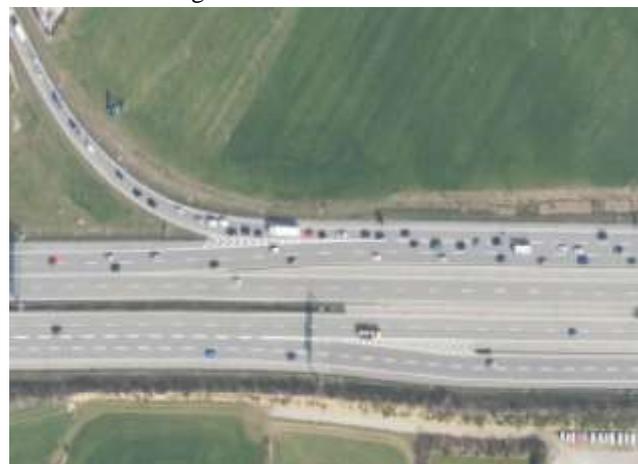


Figure 1: D7 Image

IV. METHODOLOGY

An automated system is developed using morphological recognition algorithm in MATLAB R2013a. In which image is captured from satellite and converted into gray scale image for pre-processing. After conversion, image complemented, binary conversion is applied on image. After conversion canny edge detection method has done and passed this detection to the dilation process. After filtration and dilation, area is selected where number of vehicles is maximum and vehicles are recognized from the image in the form of bounding box. For detection number of vehicle each separately blob analysis is used. Here we are using reference image D7.

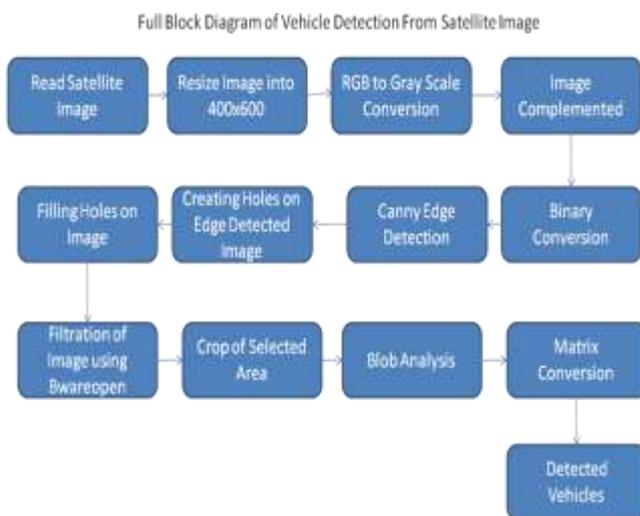


Figure 4.6: Block Diagram of vehicle detection from satellite image using canny edge

This block diagram include following steps:

- 1) **Image Acquisition System:**
 - a) Read Satellite image
 - b) Resize Image
- 2) **Preprocessing Operations**
 - a. RGB to Gray Scale conversion
 - b. Image complemented
- 3) **Image Segmentation Process**
 - c. Binary conversion
 - d. Edge Detection
- 4) **Image Enhancement**
 - e. Filling Holes on images
 - f. Creating Holes Edge Detected Images
 - g. Filtration of image using Bwareopen command using High pass filter
- 5) **Object recognition**
 - h. Crop of selected area
 - i. Blob Analysis

- j. Matrix Conversion
- k. Detected vehicles

V. PROCESS TO DETECT VEHICLES FROM SATELLITE IMAGES

Process to detect vehicle include many steps. Descriptions of these steps are as following:

1) Image Acquired

Image acquisition is the first stage of any vision system.

We can obtain the image and after that, various methods of processing can be practiced to the image to perform the many different vision tasks required today [3].

However, if the image has not been acquired properly then the expected tasks may not be achievable, even with the aid of some form of image enhancement. Here we will read the satellite image in Matlab to detect the vehicle.

2) Image Resize

Here image is resized in desired size to save the memory. Here we used 400x600 image resolution.

3) RGB to Gray Scale Conversion

In this paper the algorithm described is not depend on the type of colours in image and confide mainly on the gray level of an image for processing and extracting the required information. Colour components like Red, Green and Blue value are not used throughout this algorithm. So, if the input image is a colored image represented by 3-dimensional array in MATLAB, it is converted [4].

4) Image Complemented

As it is known that in the complement of a binary image, zeros become ones and ones become zeros; so in image complementation black and white are reversed. In the complement of an intensity or RGB image, each pixel value is subtracted from the maximum pixel value supported by the class (or 1.0 for double-precision images) and the difference is used as the pixel value in the output image. In the output image, dark areas become lighter and light areas become darker [5].

5) Binary Conversion

In a binary image, each pixel assumes only one of the two discrete values: 1 or 0. A binary image is stored as a logical array. An image consists of numeric values between 0 - 255. The numerical value of the picture is reduced to two values with binary level. Thus, an 8 - bit image is converted into 2 - bit format. The threshold value must be determined for this conversion. If the pixel value in the image is greater than

threshold value, then the pixel value is shown as "0"; and if the image pixel' value is less than threshold value, the pixel value is shown as "1". In this way the image is converted to the binary level [6].

Image is converted into binary image from gray scale. Intensity change value is calculated easily as compared to gray scale and color image.

6) Canny Edge Detection

Edge detection, especially step edge detection has been mostly applied in various different computer vision systems, which is an important technique to extract useful structural information from various vision objects and fiercely reduce the amount of data to be processed. It has found that, the requirements for the application of edge detection on diverse vision systems are relatively the same. Thus, a development of edge detection solution to address these requirements can be implemented in a wide range of situations [7].

7) Filling Holes

Here we will fill the holes which were created on the canny edge detection to detect the vehicles. This is the major step of vehicle detection. This is the main part of the Morphological operations.

8) Filtration using HighPass Filter

A high pass filter is the basis for most sharpening methods. An image is sharpened when contrast is enhanced between adjoining areas with little variation in brightness or darkness. Here we got those pixels which are greater than the value of 20. Those pixels whose values are lesser than the 20 pixels are suppressed [8].

9) Cropping the area:

Here we will crop that area where numbers of vehicles are maximum using imcrop command.

10) Blob Analysis

Blob Analysis is a common technique of machine vision which is based on analysis of logical image regions. As such it is a tool of choice for applications in which the objects being checked are clearly appreciable from the background. Diverse set of Blob Analysis methods allows creating tailored solutions for a wide range of visual inspection problems [9].

VI. OVERALL RESULT OF VEHICLE DETECTION FROM SATELLITE IMAGE

Reference Images	Vehicle Detection		Result in %
	Manual Detection	Automatic Detection	
D7 image	16 Vehicles	16 Vehicles	100%
D14 Image	15 Vehicles	20 Vehicles	75%
D15 Image	19 Vehicles	24 Vehicles	79.16 %
D10 image	8 Vehicles	8 Vehicles	100%
D12 image	6 Vehicles	7 Vehicles	85.71 %

Overall Average among 5 Images would be 87.974%

VII. CONCLUSION

In last couple of decades, the numbers of vehicles or object have been increasing day by day. With this increase, it is becoming difficult to keep track of each vehicle for the purpose of law application and traffic management. Thus, it is needed that type of system, which is capable of providing appropriate solutions to the traffic issues and hence this object detection from satellite image is need to be developed [6].

In this proposed approach an automated system is developed in MATLAB R2013a. For using the different technique from previous work this paper used canny edge detection method for detecting the vehicles and vehicles recognized using blob analysis. The approach is work on five different images. And a table is created which shows the accuracy of different images in percentage. The overall result shows the accuracy of system is 87.9%.

VIII. FUTURE SCOPE

- This method is best suitable for stationary vehicle, but for moving cars or vehicles this method will not be applicable, therefore this problem can also be overcome in near future in order to get more appropriate consequences.
- The effect of light on vehicles reduces our accuracy when we apply our method, so there is some scope to improvement here.

IX. REFERENCES:

- [1] <http://www.engineersgarage.com/articles/image-processing-tutorial-applications>.
- [2] K.M.M. Rao, Deputy Director, NRSA, Overview of Image Processing
- [3] Sangeeta Lalwani, Piyush Saxena, Amarpal Singh, "Threshold Approach to Handwriting Extraction in Degraded Historical Document Images", International Journal of Computer Applications (0975 – 8887) Volume 71– No.13, May 2013.
- [4] G.P.S.Manideep, Prof.G. K. Rajini, A.Sharmila, "Analysis of Spatial domain and Frequency domain Techniques for Car plate detection", ijraset, Volume 2 Issue IX, September 2014.
- [5] <http://in.mathworks.com/help/images/ref/imcomplement.html>.
- [6] Divyang Goswami, Mrs. Rama Gaur, "Automatic License Plate Recognition System using Histogram Graph Algorithm", ijritcc, Vol. 2, Issue 11, page no. 3521-3527.
- [7] http://en.wikipedia.org/wiki/Canny_edge_detector.
- [8] Jr-Jen Huang, Tsung-Yu , and Yen-Jen Chen , "The Front Vehicle Distance and Time to Collision Warning System", International Journal of Conceptions on Management and Social Sciences, Vol. 2, Issue. 3, Sep' 2014; ISSN: 2357 – 2787.
- [9] http://docs.adaptive-vision.com/current/studio/machine_vision_guide/BlobAnalysis.html.