Vehicle Recognition from Satellite Images in Digital Image Processing

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Abstract

These days, another motivation of extricating little scope protests as vehicles from high goals satellite pictures have been assessed. Less research is performed utilizing high goals satellite symbolism as it is a difficult assignment. In spite of the fact that different investigations have been performed, still there is a need to build up a quick, strong, and appropriate methodology. The methodology portrayed in this paper gives out the precision pace of vehicles caught from satellite pictures It just exercise the full quantities of vehicles inside the ideal space in the satellite picture and vehicles are appeared underneath the jumping box as a little spots.

Keywords: Image Enhancement, Morphological Image Processing, Segmentation, Otsu Threshold, Edge Detection

INTRODUCTION

Traffic information is disappeared with higher changes in satellite goals and item arranged discovery technique in satellite pictures; it might be significantly speedier just as recently acquired inside the huge zone pictures from satellite rather than the conventional information getting strategy. Two thresholding procedures are utilized for this: underlying is pixel level and second is Otsu technique. With this methodology better thresholding procedure might be recognized. In light of trouble made by factors like mayhem, brightening, climate, and shadow unsettling influence vehicle location from the genuine satellite picture gets intense. In this way, to support the vehicle distinguishing proof rate and once the identification must be acceptable, there is a partner degree direness of improving the procurement of the satellite pictures before the vehicle extraction [1][9]. Basically this hypothesis utilizes the honing procedure just as the histogram leveling handling of picture upgrade strategy. Histogram has the key objective of building the unified hazy area of the underlying picture histogram into the uniform appropriation among the entirety of the dark scale [2]. As a response to the current extending the picture nonlinearly and reproduces the picture pixel esteems will be finished. According to this way, the measure of pixels inside a persuaded go regarding dark can be generally comparable.

RELATED WORK

As an essential advance Semantic examination of changes in satellite symbolism needs the recognition of changes [12]. Generally remarkable of those sort depend on foundation displaying. In this class, an assortment of pictures of the scene are utilized to realize what the typical foundation look of the scene should show up so given a shiny new

picture, the pixels with irregular look can be identified as changes. Generally less inquired about field in pc vision is 3-d change adjustment. Prior methodologies utilized physically made 3-d site models to frame correspondences between pictures so change recognition calculation rule is applied [3] [4]. For this kind of way to deal with be used in present day applications and along these lines the overhead of developing 3-d geometry is unworkable.

Heller et al. utilize sound system sets of satellite pictures to reproduce 3-d unadulterated geometry of the scene and afterward think about remade unadulterated geometry from entirely unexpected sets of pictures to discover 3-d changes to the scene [5]. This algorithmic standard is extra pertinent but at the same time is depended on having sound system sets and it can't discover appearance changes on the surfaces of the scene like moving vehicles and shadows. Much of the time, a fresh out of the box new methodology that joints the capacity of Stauffer-Grimson style appearance displaying with machine driven 3-d geometry revelation has been anticipated [5]. This volumetric appearance displaying (VAM) approach is better for alteration identification from satellite symbolism for fluctuated reasons.

PROPOSED APPROACH

1. *Image Enhancement*

A brief distribution of enhancement technique will be as under [7]:

1. Spatial domain strategies, that is direct affected to the pixels.
2. Frequency domain strategies, in image it works on the Fourier rework

2. Morphological Image Processing

In image process, Morphology could be a tool that is employed to extract the elements of image so that illustration and description of the region shape form a sort of a skeleton and boundaries are provided [8]**.** Thus, the morphological operations and their operators also can be used for filtering, dilution and pruning. With the assistance of erosion morphology technique boundaries or edges of an area and shape can be extracted by applying on A by B and then subtracting the eroded A from A.

3. Segmentation

To remove noise and artifacts if a picture has been preprocessed, than in deciphering the image typically segmentation is the main step. The features or region with the Image segmentation, are having similar characteristics, they are than known and later classified together [2]. Statistical classification could also be utilized in it, edge detection, thresholding, region detection or any of the mix of those techniques. A collection of classified elements is segmentation step output, segmentation techniques are relied on region or edge [14]. Edge-based techniques admit the discontinuities in a picture values between the distinct regions, and therefore the objective of the segmentation algorithmic program is to precisely demarcate the boundary separating of those regions. Region-based techniques admit the common patterns within the intensity values in a cluster of the neighboring pixels. The cluster of the neighboring pixels is known as the region, and therefore target of the segmentation algorithm is to cluster the regions according to the functional or anatomical roles.

4. Edge Detection

With the robust intensity distinct edges are placed within the image. As edges mainly take place at the image locations that replicate object boundaries, in image segmentation edge detection is generally used when there is a demand to separate the image into the areas with reference to the various objects [11].

For the steps that are corrupted by white noise it is optimal for them. With reference to these areas optimality to the three criteria they are [13]:

- Detection criterion ... vital edges should be there, fake responses should be avoided.
- Localization criterion ... minimum distance should be prevailing between the particular and the located position of the edge.
- One response criterion ... multiple responses into a one edge are reduced (moreover it is somewhat coated by initial criterion as when there in single edge there are two responses one in every of them should be treated as wrong).

5. Otsu Threshold

To find a best threshold value k* the Otsu threshold employ the class reparability and magnifies the middle-class variance [10]. With this threshold use of objects from their background is extracted. In Otsu threshold k* technique MATLAB includes built-in function that access it. By directly relating to the Otsu threshold to the testing image it will observe the bright vehicles, however there is chance of lane markers and road dividers to be available on the highways. To cut back the issue of road dividers and lane markers a pre-process step is applied. During this pre-process step the sliding neighborhood operation is registered to the testing image. The sliding neighbor operation could be assigned to every pixel of testing image with the highest level of intensity to its neighborhood (it is a final rectangular space of 3-by-3 pixels, because it is center pixel it is allotted by operation).

METHODOLOGY

Morphological recognition algorithms are used to develop an automated system in MATLAB R2013a. In which satellite images are taken as input and converted into gray scale image for pre-processing. After conversion these images are converted into binary images after image complement. After conversion canny edge detection method has done and passed this detection to the dilation process. The area is selected after filtration and dilation where number of vehicles is maximum and vehicles are recognized from the image in the form of bounding box. The number of vehicles is counted by blob analysis. Here we are using reference image New 5.

The steps are elaborated below:

1) Satellite Image Acquisition

2) Necessary Operations

3) Image segmentation process

4) Image Enhancement

1. Process to detect vehicles from satellite images

Process to detect vehicle include many steps.

i. Image Acquired

Initially stage of any vision system is the image acquisition stage. Once the input image has been obtained, a number of methods of processing can be applied to the image to perform the different vision tasks required today. Figure 1 shows the image that we acquired as a reference.

Figure 1: Acquired image

However, if the image has not been acquired satisfactorily then the intended 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. .

ii. RGB to Gray Scale Conversion

The algorithm described here is relies mainly on the gray level of an image for processing and fetching the required information. Color components like RGB value are not used throughout this algorithm. So, if the input document image is a multicolor image represented by 3D array in MATLAB, it is converted to a 2D gray image before further processing. All these process are shown on the image GUI.

Figure 2: RGB to gray scale

iii. Binary Conversion

A binary image is stored as a logical array where each pixel of the image assumes only one of the two discrete values: either 1 or 0. An image consists of numeric values between 0 - 255. Thus the numerical value of the picture is reduced from 0 – 255 to only to two values with binary level. Thus, an image is converted into 2 - bit format from 8 – 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". Thus in this way the image is converted into binary image. Image is converted into binary image from gray scale. Intensity change value is calculated easily as compared to gray scale and color image.

Figure 3: Gray to binary image

iv. Canny Edge Detection

Edge detection is an important technique to fetch useful structural data from different vision objects and reduce the volume of data to be processed. Thus, a development of edge detection solution to address these requirements can be implemented in a wide range of situations. The figure 4 shows the demonstration of canny edge detection:

Figure 4: Canny edge detection

v. Filling Holes

Here we will fill the holes which were created on the canny edge detection to extract the text. This is the major step of text extraction. This is the main part of the Morphological operations. Figure of this step is given below:

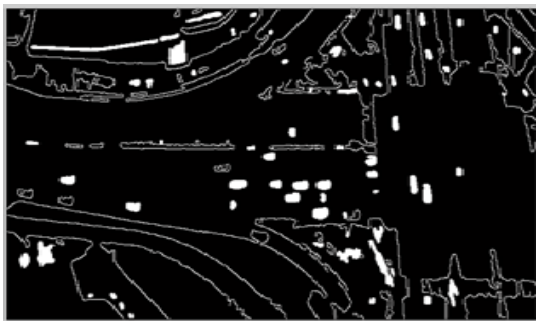

Figure 5: Filling holes

vi. Filtration using High Pass 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 25. Those pixels whose values are lesser than the 25 pixels are suppressed.

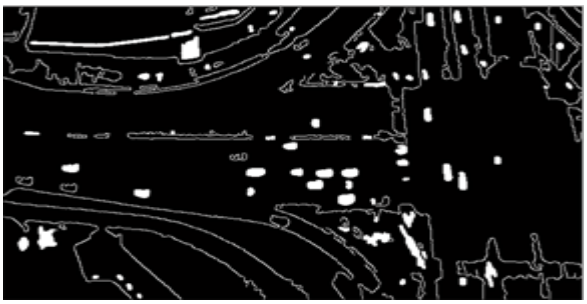

Figure 6:High pass filter

vii. Cropping the area

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

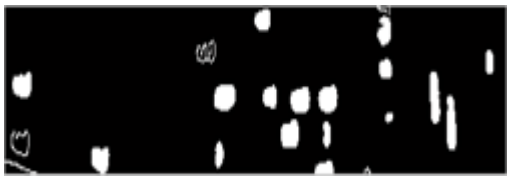

Figure 7: Cropped image

viii. Detected Vehicles using Blob Analysis

Blob Analysis is a fundamental technique of machine vision based on analysis of consistent image regions. As such it is a tool of choice for applications in which the objects being inspected are clearly discernible from the background. Diverse set of Blob Analysis methods allows creating tailored solutions for a wide range of visual inspection problems.

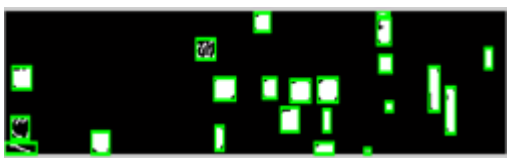

Figure 8: Detected vehicles

RESULTS

Vehicles are evaluated from the proposed algorithm as follows:

Table1: Accuracy rate of detected vehicle

Road	*No. of vehicles*	*Detected*	*Missed*	*Accuracy rate*
Road 1	176	165	11	93.75%
Road 2	89	77	12	86.51%
Road 3	145	132	13	91.03%
Road 4	115	101	14	87.82%
Road 5	93	81	12	87.09%
Road 6	132	120	12	90.90%

CONCLUSION

In the past 3 decades satellite imaging has been used with success for geographical, weather, and geological applications. With the advancement of technology, additional refined sensors offer higher resolutions, and with quicker computer systems, the employment of satellite imaging has opened the fields of application and exploration. Segmentation techniques supported thresholding are used to extract highways and vehicles from pictures containing roadways scenes. Color properties are accustomed to extract vegetation areas from cities and fields scenes. Results of this work might be used to assist transportation agencies within the study of traffic density and trends across huge geographic areas.

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