CAR DETECTION IN COLOR AERIAL IMAGE USING IMAGE OBJECT SEGMENTATION APPROACH

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ABSTRACT ... One of future remote sensing techniques for transportation application is vehicle detection from the space, which could be the basis of measuring traffic volume and recognizing traffic condition in the future. This paper introduces an approach to vehicle detection using image object segmentation approach. The object-oriented image processing is particularly beneficial to high-resolution image classification of urban area, which suffers from noisy components in general.

The project site was Dae-Jeon metropolitan area and a set of true color aerial images at 10cm resolution was used for the test. Authors investigated a variety of parameters such as scale, color, and shape and produced a customized solution for vehicle detection, which is based on a knowledge-based hierarchical model in the environment of eCognition. The highest tumbling block of the vehicle detection in the given data sets was to discriminate vehicles in dark color from new black asphalt pavement. Except for the cases, the overall accuracy was over 90%.

KEY WORDS: Car Detection, eCognition, Aerial Image, Object-Oriented classification

1. INTRODUCTION

In recently year, car detection in high-resolution aerial image applied to various fields, such as military uses, traffic surveillance and monitoring technologies. High-resolution aerial image is an attractive alternative for providing a spatially rich dataset to supplement the temporally rich dataset from ground based sensors.

Another research on car detection, adjust misdetection using Hierarchical Model and Structure Grouping (1996, Renard Ruskone), car detection in 9cm resolution panchromatic image (2001, Stefan Hinz), develop Simple model-based vehicle detection and Sophisticated Models (2002, H. Moon), car detection using Baysian network (2002, Tao Zhao), car detection using Intersecting Cortical Model(ICM) (2004, Ulf Ekblad), car detection in 1m resolution panchromatic image using Morphological Shared-weight neural network (2004, Xiaoying Jin), in comparison with Principal Component Analysis (PCA), Baysian Background Transformation (BBT) and Gradient based method (2004, G. Sharma), car detection in 1m resolution aerial infrared image (2006, Stefan Hinz)

This research on car detection in high-resolution aerial image based object-oriented classification using eCognition software. Car detection in aerial image is relative to image intensity. Car can be any intensity in the image, from very dark to very light. Also, some dark colored cars are close to the road intensity. In the case of dark colored cars, we need a different method of classification.

2. METHOD OF CLASSIFICATION

2.1 Adjustment each factor of segmentation

Generally, each factor of segmentation, scale, shape, compactness and smoothness, is important thing for image classification. Scale factor decide segmented object size. Also, shape, compactness and smoothness factor decide segmented object shape. Therefore, Classification result is decided adjustment each factor of segmentation.

2.2 Set up each class

The classification algorithm evaluates the value of an image object to a list of selected classes. Each class are composed of hierarchical class, for example, car (light and dark), building, grass, lane and road.

2.3 Classification

Except for the case of dark car, apply hierarchical model. In case of dark car, need a different method of classification.

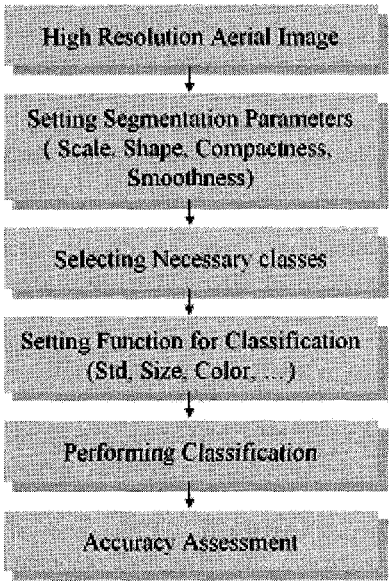

Figure 1. The diagram of classification

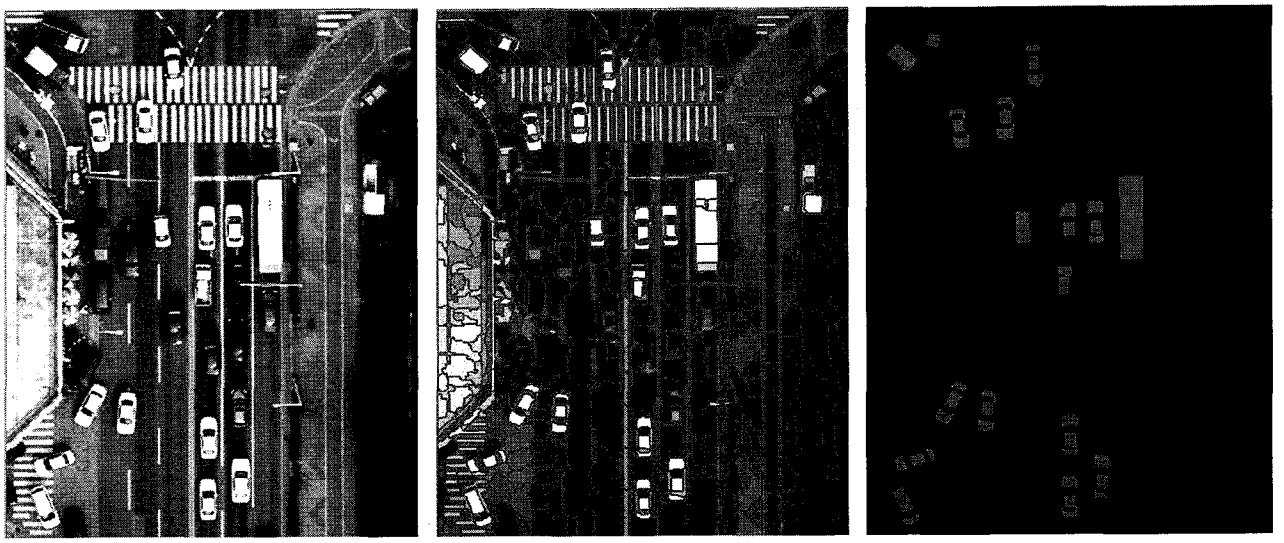

Figure 2. Result of classification in small area

3. IMAGE PROCESSING AND ANALSIS

3.1 Light colored Car detection

The project site was small area in Dae-jeon and a set of true color aerial images at 10cm resolution was used for the test.

In case of small area, most of light colored cars are detecting. Large area applied same method to light colored cars detection.

In case of large area, overall accuracy was little decreasing. Because of the light colored lane and buildings. Eliminate misdetection through increase of sample point and adjustment object size.

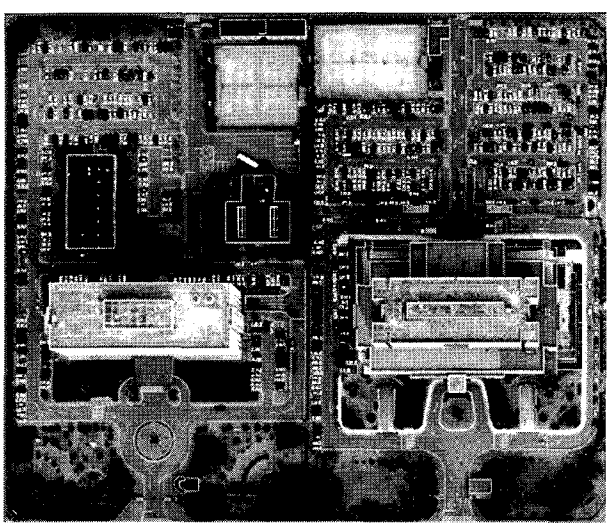

Figure 3. Extended Area

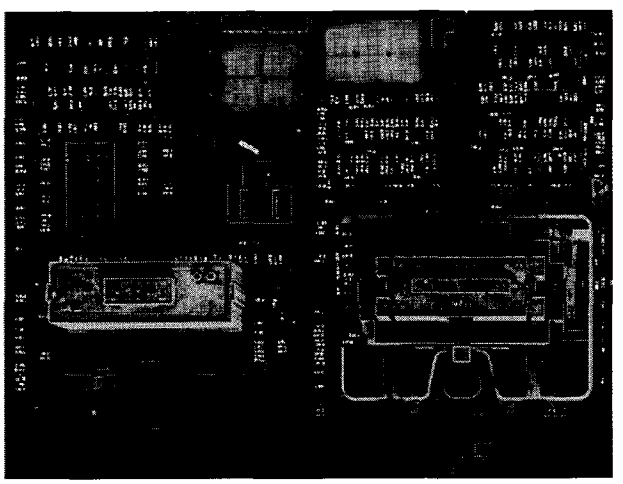

Figure 4. Classification in Extended Area

3.2 Dark colored Car detection

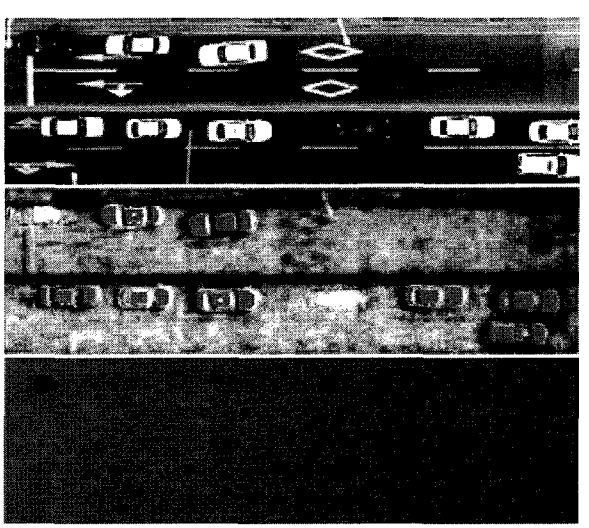

Figure 5. Small area in aerial image,Angle ratio image, result of classification

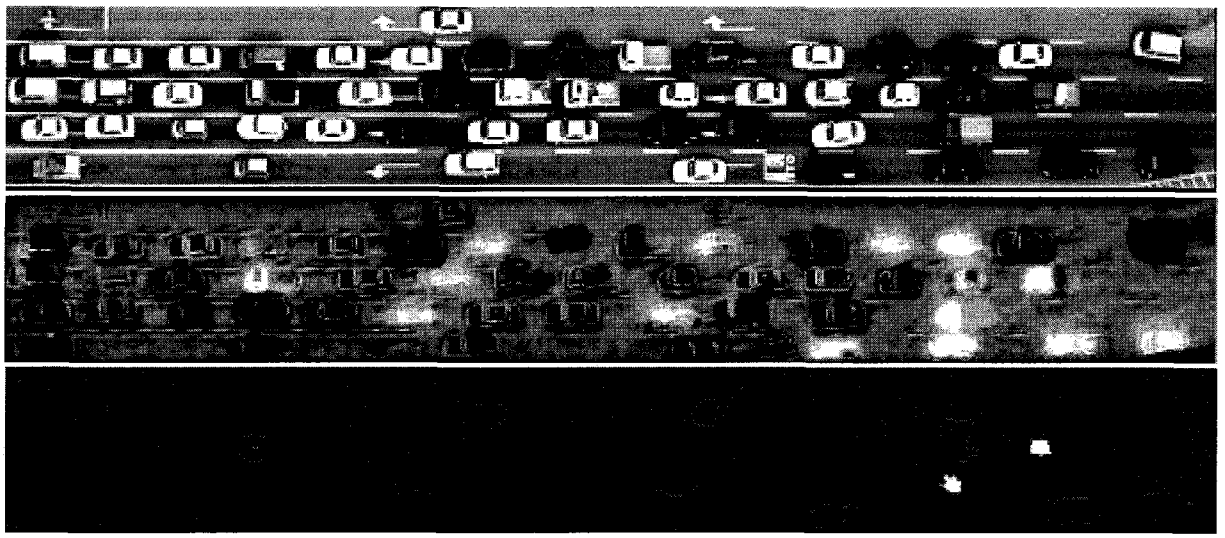

Figure 6. Extended area in aerial image, Angle ratio image, Result of classification

Dark colored car detection was difficult to light colored car detection. Same method of classification when light colored car detection, dark colored car was classified asphalt pavement or the other things. In this case, for increase of accuracy, apply to angle ratio image. Make an angle ratio image using between red band and green band relationship. Angle ratio image presents light color instead of dark color.

Apply to angle ratio image in small area, accuracy was over 90%. Apply to extended area, accuracy was over 80%. Lane and short distance of between each car caused the misdetection.

4. CONCLUSION

One of future remote sensing techniques for transportation application is vehicle detection from the space, which could be the basis of measuring traffic volume and recognizing traffic condition in the future.

This research is car detection in 10m resolution aerial image using object-oriented classification approach. It is based on the use of a basic model and angle ratio image processing.

As a result of research, in case of light colored car, easily detect using object-oriented classification. However, in case of dark colored car, needs angle ratio image processing.

Future work, for increase of overall accuracy, needs investigating dark colored car segmentation and classification methods.

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