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## REVIEW ARTICLE

# CLASSIFICATION OF VEHICLE IMAGES

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**ABSTRACT**

In Full- occluded vehicle only detection can perform, to detect the full-occluded vehicle evaluate the width of vehicle and evaluate the ratio of length and width of vehicle. Un-occluded vehicle is classified on predefined attribute. Partial occlude vehicle first detection is perform by using convexity, second resolving is performed by intersecting line which separate the occluded object into individual part, at last classified the resolved object according to the predefined attributes.



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## INTRODUCTION

In Full- occluded vehicle only detection can perform, to detect the full-occluded vehicle evaluate the width of vehicle and evaluate the ratio of length and width of vehicle. Un-occluded vehicle is classified on predefined attribute (small vehicle, large vehicle, motorcycle). Partial occlude vehicle first detection is perform by using convexity ,second resolving is performed by intersecting which separate the occluded object into individual part ,at last classified the resolved object according to the predefined attributes. 1. Object is detected after performing background extraction. 2. Partially occluded vehicle is detected by using intersecting line. This proposed method detect partially occluded object. This method also detect full occluded object. It does not resolve full occluded object. The algorithm is used for partially occluded is not complete (Kastrinaki *et al*., 2003).

In this paper classification of the moving vehicle is performed based on binary coding method, in this method binary hash function is used for the detection. At the end classification is done by using SVM method. It uses well known methods Boosting Binary Feature and Spatial Pyramid Matching. This method extract dance features. It is difficult for low storage memory. It perform experiment on real images of the vehicle (Kastrinaki *et al*., 2003).

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In this paper, perform the classification of the vehicle by using three steps object extraction, tracking. After the tracking of the vehicle perform classification. It removes the background of the vehicle, its called extraction method. Accuracy is increased. At every time detection of vehicle varied. Image of real vehicle images, Intel Pentium 4 core, memory of 2 GB (Caballero *et al*., 2008).

In this paper classification of vehicle is performed based on shape and texture. First detect the object then perform classification depend on predefined attribute. Accuracy is good. It has capability to detect error and debugging it. This method is expensive. It uses Image of real vehicle images (Ha *et al*., 2004).

In this paper First extract the background of the vehicle, calculate the length, height, bottom of the vehicle. Apply evaluate eigenvector and eigenvector face then compare both. Extraction of vehicle object. Vehicle image occupy minimum area of region. It required minimum parameter for the classification. There is a need of work to improve the accuracy (Hsieh *et al*., 2006).

In this paper classification of vehicle is performed, first by using spatial pyramid model extract the sparse feature. At last perform classification task by using SVM method. Sparse Coding, Dictionary Learning and Spatial Pyramid Matching. Sparse coding is simple for extraction. Fast iteration is used in

extraction process. Perform classification experiment on real vehicle image (Chiu *et al*., 2010).

## Method Proposed

### Vehicle Classification Based on Highcon

The method we are proposing is based on two things, first to identify and remove occlusion and second image transformation techniques. First we have to identify if there exists any occlusion by using the convex hull of the vehicles formed. If there is an occlusion then the area of the vehicle and convex will not be same. After that we have to remove the occlusion and divide the convex hull that was formed by the vehicles. In second step, we will scale down the convex hull of various features that are already stored in database and transform it. Transformed convex hull image will be matched with the convex hull of the vehicle to identify if it's a bike, car or truck etc. Figure 1 shows the flowchart of proposed method. Full occlusion is detected by a method, in which we calculate the width of the vehicle and ratio of length and width of vehicle. We cannot resolve full occlusion only can detect it.

step1) Evaluate $W$.
- a) If $W>T_W^1$
  the object includes a large vehicle or a full occlusion between large vehicles or a horizontal full occlusion, so go to step 2).
  else,
- b) If $T_W^2<W<T_W^1$
  the object includes a small vehicle or a vertical full occlusion between small vehicles, so go to step 3).
  else
- c) If $W<T_W^2$
  classify the object as a motorcycle and go to step4).

step2) Evaluate $R$.
- a) If $R>T_R^1$
  classify the object as a vertical full occlusion between large vehicles and go to step 4).
  else,
- b) If $T_R^2<R<T_R^1$
  classify the object as a large vehicle and go to step 4).
  else,
- c) If $R<T_R^2$
  classify the object as a horizontal full occlusion and go to step4).

step3) Evaluate $R$.
- a) If $R>T_R^3$
  classify the object as a vertical full occlusion between small vehicles and go to step 4).
  else,
- b) If $R<T_R^3$
  classify the object as a small vehicle and go to step 4).

step4) Stop and quit.

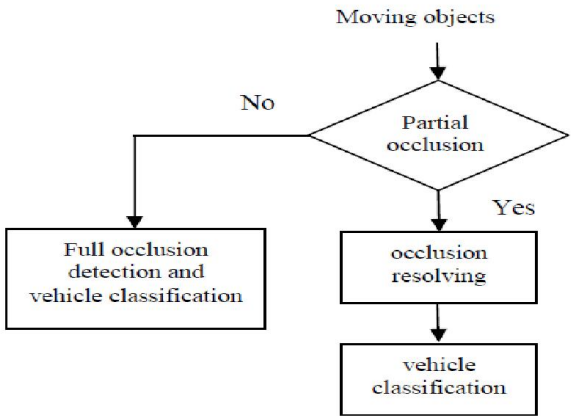



**Figure 1. The flowchart of the suggested method**

We classify vehicles which have partial occlusion, full occlusion or no occlusion. Then Partial occlusion is detected through convexity of object and separates them by a line. Calculate the normalized size of divided object. To detect the full occlusion used width of vehicle and ratio of length and width of the object. Finally, it classified the detected vehicle into three group small vehicle, large vehicle, and motorcycle (refer Figure 2).

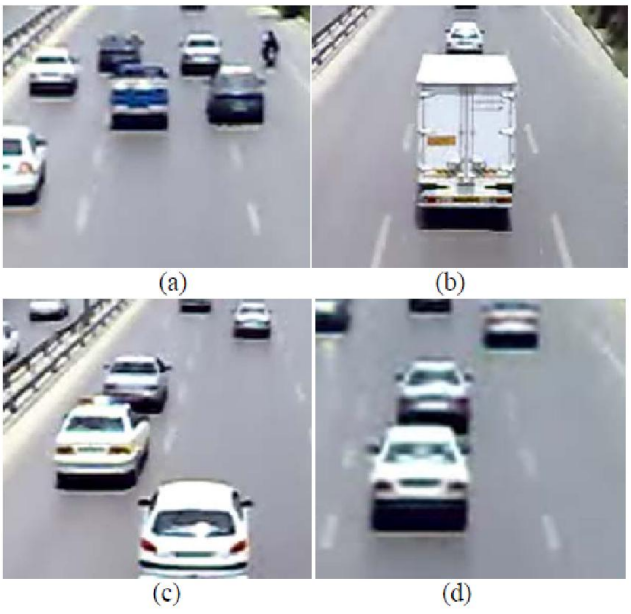



**Figure 2. (a) it show vehicle occlusion. (b) It shows partial occlusion. (c) And (d) it show full occlusion**

## Comparison

Previous method was not able to resolve occlusions and this is able to resolve partial occlusion and detect the full occlusion.

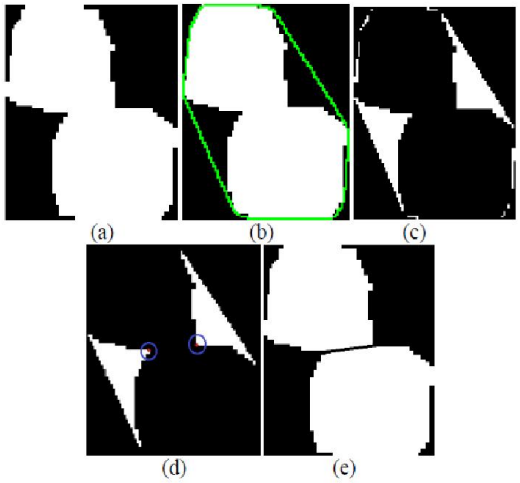
## Experiments and analysis on real vehicle data

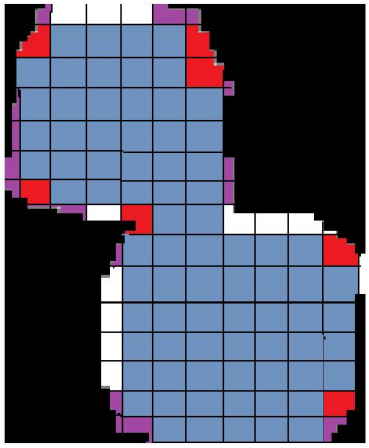
### Detection

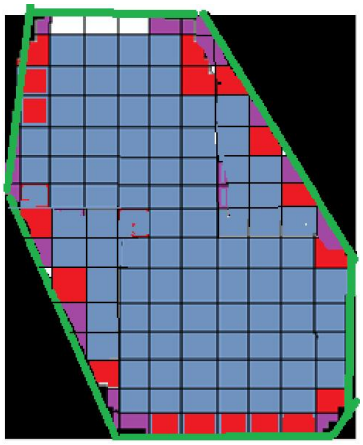
Partial occlusion is detected by computing the convex hull of the object.

$C=S_v/S_{ch}$

Where C is convexity, $s_y$ and $s_{ch}$ are area of the object and area of region of object enclosed by a convex hull. Convexity of un -occluded and fully occluded vehicle is more than partial occluded vehicle.





### B. Resolving

Separating the partially occluded object into two individual part through a intersecting line. We used end point of the region to obtain intersecting line. Form a convex hull of the object, separate the region of the object from the convex hull obtain object. Select two nearest point . join that two point.

$d=\min((x_j-x_i)^2+(Y_j-Y_i)^2)$

### C. Vehicle Classification

After the occlusion is removed, each separated object is classified on predefined attribute according to their size. The size of the vehicle is depend on the relative position and range of the camera.

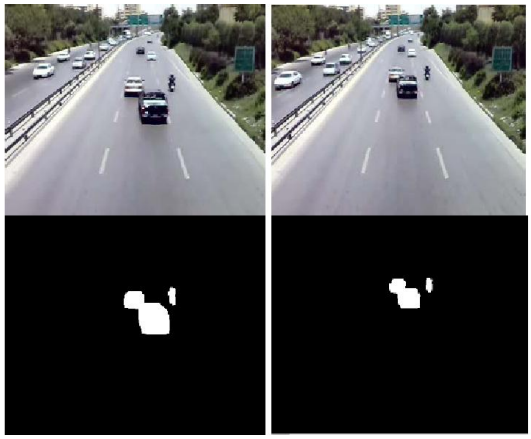


**Fig. 5. This figure show partial occlusion**

The vertical field of view allows us to zoom in and out on the world. Consider the following example. At left picture, the angle is wider which makes objects smaller while at right hand picture, the angle is smaller which makes the same object appear larger. On the left (where we zoom in with a smaller field of view) position of the camera should be further way and on the right it is closer to the projection plane.

**Full occlusion detection**

TABLE I. ACCURACY OF THE PROPOSED OCCLUSION DETECTION AND RESOLVING METHOD

| Occlusion type | Actual number | Detected | Divided (correctly) |
|---|---|---|---|
| Partial occlusion | _ | 29 | 29 |
| Full occlusion | _ | 8 | _ |
| Entire | 38 | 37 | 29 |

TABLE II. ACCURACY OF THE PROPOSED VEHICLE CLASSIFICATION METHOD

| Vehicle type | Accuracy of classification |
|---|---|
| Large | 96% |
| Small | 98% |
| Motorcycle | 98% |

**Conclusion**

In this paper, we classify vehicles which have partial occlusion, full occlusion or no occlusion. Partial occlusion is detected through convexity of object and separates them into two individual parts by the using of intersecting line. Calculate the normalized size of divided object. To detect the full occlusion used width of vehicle and ratio of length and width of the object. Finally classified the detected vehicle into three group small vehicle, large vehicle, and motorcycle.

## REFERENCES

Caballero A. F., F. J. Gomez, and J. L. Lopez, "Road-traffic monitoring by knowledge-driven static and dynamic image analysis," *Expert Systems with Applications*, vol. 3, no. 5, pp. 701–719, 2008.

Chiu C. C., M. Y. Ku, and L. W. Liang, "A Robust Object Segmentation System Using a Probability-Based Background Extraction Algorithm," *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 20, No. 4, 2010.

Ha D.M., J. M. Lee, Y. D. Kim, "Neural-edge-based vehicle detection and traffic parameter extraction," *Image and Vision Computing*, vol. 2, no. 2, pp. 899–907, 2004.

Hsieh J. W., S. H. Yu, Y. S. Chen, and W. F. Hu, "Automatic Traffic Surveillance System for Vehicle Tracking and Classification," *IEEE Transactions on Intelligent Transportation Systems*, vol. 7, no. 2, pp. 175-187, JUNE 2006.

Kastrinaki V., M. Zervakis, and K. Kalaitzakis, "A survey of video processing techniques for traffic applications," *Image and Vision Computing*, vol. 21, no. 4, pp. 359 – 381, 2003.

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