

International Journal of Advance Research in Computer Science and Management Studies

Research Article / Survey Paper / Case Study

Available online at: www.ijarcsms.com

Car Detection and Counting Method by using Data Mining / Warehousing

Vajid Khan¹

PG Student

Department of Computer Engg
JSPMs RSCOE Tathawade, 411033
Pune, Maharashtra – India

Abhijit Banubakode²

Professor

Department of Information Technology
JSPMs RSCOE Tathawade, 411033
Pune, Maharashtra – India

Abstract: The challenges of vehicle detection in aerial surveillance include camera motions, panning, tilting and rotation. Airborne platforms at different heights result in different sizes of target objects. We design a keypoint merging method for counting number of cars. This paper mainly consists of screening, feature extraction process, keypoint classification, grouping of number of key points, merging the key points. Set of consistent key points can be identified by using feature extraction process.

Keywords: Scale invariant feature transform, Feature extraction process, Keypoint, Object Recognition.

I. INTRODUCTION

In day to day fast growing technology, unmanned aerial vehicle has been the most proposed approach for solving object tracking problems. Unmanned aerial vehicle can flight without a pilot. But the proper trajectory path is essential in order to avoid the further damage and collisions. Object without a pilot can acquire information from low altitude and therefore they permit us to gather images in the spatial region. The most common requirement for today is the cars. Research environment is thinking closely towards implementation methods. Estimation of number of objects in parking slot has been the key aspect in urban scenario. [1]

There are so many advantages for analysing the aerial clips. It solves problems in traffic circumstances, military based operations, identifying a particular object in least time. During this process, it covers a much larger spatial area. It also provides strong proof for road detection. In this entire scenario, grey scale images are taken. The image format should be taken as JPEG format. The size of the image is 256 * 256. The required features of a particular object changes with its intensity and existence of shadow. [2]

Associated challenges:

The expected object counting and detection system must have covered all the lacunas mentioned in the previous methods. Previous methods were not covering the perfect validation process. Some methods were detecting object, some methods were counting number of objects and some methods were having some partial results. The main challenge is to overcome the existing results and derive some promising results. [3]

II. RELATED WORK

Lin et.al. Proposed a method in which they subtracted background colours of each frame and cleared vehicle candidate regions. However they assumed too many parameters such as the largest and smallest sizes of the vehicles and the height and focus of the airborne camera. [4]

R.Lin, X.Cao, Y.Xu, C.Wu proposed a moving vehicle detection method. The method was based on cascade classifiers. Positive and negative samples are used for the training purpose. Multiscale sliding windows are generated at

the detection stage. The major disadvantage of this method is that there are so many false alarms on the moving vehicles. The numbers of false alarms are more as compared to our method. [5]

Hinz and Baumgartner utilized a hierarchical model that describes different levels of details. There is no exact vehicle model which can make the method flexible. However their system would miss vehicles when the contrast is low.

Cheng and Butler considered multiple ideas and used a mixture of experts to merge the ideas for vehicle detection in aerial images. They performed segmentation of colours via mean shift algorithm and motion analysis via change detection. In addition they suggested a trainable sequential maximum a posteriori method for Multiscale analysis and enforcement of contextual information. However the motion analysis algorithm applied in their system cannot deal with previously mentioned camera motions and complex background changes. Their work highly depends on color segmentation results. [6]

Choi and Yang proposed a vehicle detection algorithm using the symmetric property of car shapes. However this idea is liable to suffer from false detections such as symmetrical details of buildings or road markings. Therefore they applied a log polar histogram shape detector to verify the shape of the candidates.

III. IMPLEMENTATION DETAIL

A. Proposed work

There are two phases of object recognition. Initial phase and Final phase. In the initial phase, we extract edge, corner and vehicle colours to train a dynamic Bayesian network. In the final phase, we perform background colour removal. Later same feature extraction procedure is repeated in the initial phase. The extracted features serve as the evidence of the trained dynamic Bayesian network. Due to this we can identify whether the keypoint belongs to a vehicle or not. We design a keypoint wise classification method for object recognition. For edge detection we are using canny edge detector. For corner detection we are using Harris corner detector. The features are extracted using a neighbourhood region of each key point. [7]

B. System Proposed Architecture

In the proposed architecture phase, we are dividing the object recognition system using two phases. Initial phase and final phase. In the initial phase, we are taking set of images. Images can be of standard JPEG format. Size of image can be $256 * 256$. Image is represented in the form of key points. Feature extraction can be done by using scale invariant feature transform. We convert regional local features into quantitative observations. Dynamic Bayesian network is used for the classification of key points. In the final phase, background colour removal is performed. Extraction of data is done by using scale invariant feature transform. [10]

In the end, we use morphological operations to enhance the detection task and perform connected component labelling to get the recognition results. Dilation operations and erosion operations are the two morphological operations.[11]

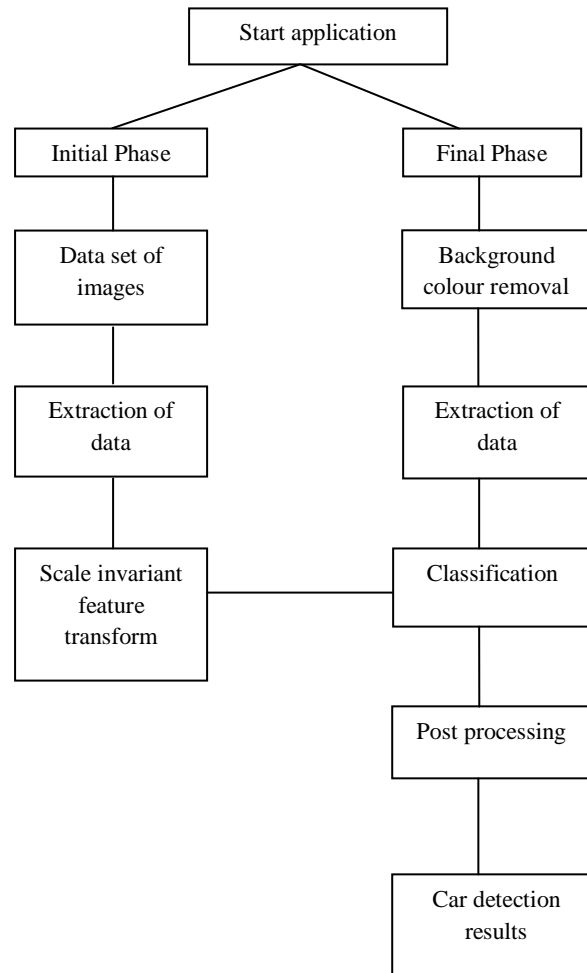


Fig.1 Proposed system framework

C. Algorithm

Step 1: Let input parameters $K_c = \{k_1, k_2, k_n\}$ be the set of n key points for the car class in the considered image $I(x, y)$.

Step 2: The goal is to find number of cars present in image $I(x, y)$.

Step 3: A new parameter m is added and initialized to 1 to keep track of merging operations done with that keypoint.

Step 4: Euclidean distance is the straight line distance between two pixels.

Euclidean distance can be computed as follows:

Euclidean distance = square root of $(x_2 - x_1)^2 + (y_2 - y_1)^2$

Step 4: A matrix $M * M$ containing the Euclidean distances in the spatial domain between all key points is computed.

Step 5: The two key points (k_1, k_2) with the smallest distance d_{min} are selected.

Step 6: If $d_{min} < T_t$ (merging threshold) Then include this result in keypoint k_1 and merge the keypoint k_2 .

Step 7: Update these values in the set K_c .

Step 8: The matrix containing the distances is then recomputed with the new point.

Step 9: Steps 4 to 7 are repeated until $d_{min} > T_t$.

Step 10: Assuming that the points with a value of m smaller than 2 are isolated points.

Step 11: Only the points with $m > 1$ kept.

Step 12: The number of resulting merged key points represents finally the estimation of the number of cars present in the scene. [8]

D. Mathematical model

Let S be the set of symbols.

$$S = \{I/P, O/P\}$$

$$I/P = \{\text{set of input symbols}\}$$

$$O/P = \{\text{Set of detected traffic, counted cars}\} [9]$$

IV. INPUT DATASET

A. Input datasets

Our input dataset is in images. Images are of standard JPEG format. Size of image should be 256 * 256 pixels.

B. Results:



Image Test	N cars present	True positive s	False Positives	True Positives	False Positives
1	51	51	0	24	27
2	31	31	0	25	6
3	19	19	0	13	6
4	15	15	0	10	5
5	3	3	0	2	1
Total	119	119	0	74	45

Fig.2 Comparisons of different vehicle detection methods

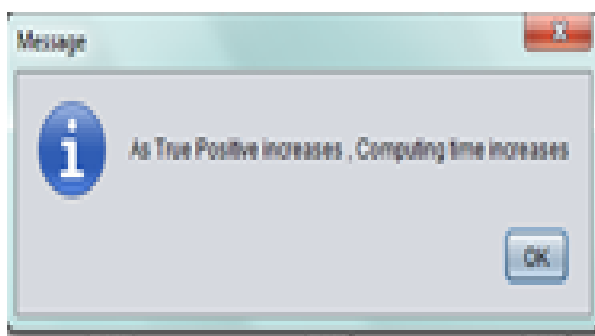
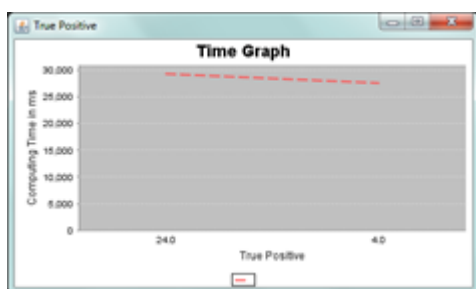


Fig. 3 Comparison of True positives and Execution time



Graph 1. True positives versus Computing time in ms



Fig. 4 Feature Extraction

True positives: Number of samples correctly identified by the total number of cars. [10]

False positives: Number of samples incorrectly identified by the total number of cars. [11]

V. CONCLUSION

In this way, we have concluded automatic object counting system using car keypoint merging algorithm. We have performed pixel based computation. Our results exhibit promising accuracy than other existing systems. We came to conclusion that as size of true positives increases, computing time increases.

Acknowledgement

We take the opportunity to thank Dr. A.B.Bagwan, our Head of Computer Engineering Department, Dr.P.K.Deshmukh, and our PG Coordinator, all the teaching and non teaching staff of Computer engineering department for their encouragement, support and untiring cooperation.

References

1. Choi and Yang, "Vehicle detection from aerial images using local shape information," Adv. Image Video Technol, Vol.5414, Lecture Notes in Computer Science, pp.227-236, Jan.2009.
2. Fergus, Perona, and Zisserman, "Object class recognition by unsupervised scale invariant learning" in Proc. Conf.Comput.Vis.Pattern Recognit.,2003,pp. 264.
3. Harris and Stephens, "A combined corner and edge detector" in Proc.4th Vis.Conf., 1988, pp.147-151.
4. H. Cheng and D. Butler, "Segmentation of aerial surveillance video Comput. Tech.Appl.,2005, p.66
5. Hinz and Baumgartner, "Vehicle detection in aerial images using generic features, grouping and context" in Proc.DAGM-Symp, Sep.2001, Vol.2191, Lecture Notes in Computer Science, pp 45-52.
6. J. Gleason, A. V. Nefian, X. Bouysounousse, T. Fong, and G. Bebis, "Vehicle detection from aerial imagery," in Proc. IEEE Int. Conf. Robot. Autom., May 2011, pp. 2065–2070.
7. Jongwoo Kim, Daniel X. Le, George R. Thoma, "Identification of Investigator Name Zones using SVM Classifiers and Heuristic Rules", 12th International Conference on Document Analysis and Recognition,2013.
8. Lin, Cao, Xu, Wu, and Qiao, "Airborne moving vehicle detection for video surveillance of urban traffic", in Proc. IEEE Intell Veh.Symp., 2009, pp.203-208.
9. L. D. Chou, J. Y. Yang, Y. C. Hsieh, D. C. Chang, and C. F. Tung, "Intersection-based routing protocol for VANETs," Wirel. Pers. Commun., vol. 60, no. 1, pp. 105–124, Sep. 2011.
10. Moon, Rosenfeld, and Chellappa, "Performance analysis of a simple vehicle detection algorithm" Image Vis.Comput.vol.20, no.1, pp.1-13, 2002.
11. Moranduzzo, Melgani, "Automatic car counting method for unmanned aerial vehicle images", February 22, 2013.