# Pixel Wise Classification Modeling to Detect and Track Moving Vehicles

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***Abstract***- *Today we can observe that security in the transportation has become a very important issue due to number of incidences related to moving vehicles and the use of some type of vehicle in number of terrorist attacks throughout the world. In this paper we have presented automatic vehicle detection system for aerial surveillance. Also, we avoid the existing frameworks and stereotype system of vehicle detection in aerial surveillance, which are either sliding window or region based. A pixel wise classification method is designed for the vehicle detection. The novelty lies in the fact that, in spite of performing pixel wise classification, relations among neighboring pixels in a region are preserved in the feature extraction process. The vehicle colours and local features are considered in this study. For vehicle colour extraction, we utilize a colour transform to separate vehicle colours and nonvehicle colours effectively. The regional local features are converted into quantitative observations when they are applying for pixel wise classification through DBN.*

***KEYWORDS- Aerial surveillance, dynamic Bayesian networks (DBNs), vehicle detection***

## 1. INTRODUCTION

Nowadays moving vehicle tracking is very important issue in the current global world. Because each time when nation is under attack then terrorist use a vehicle ,So government policies strictly works on model to find and track a moving vehicle so we can prevent attack on nation. In recent years, the analysis of aerial videos taken from aerial vehicles has become an important issue. Such technology is mostly used in military, police, and traffic management.

The region-based classification is not performed, which is mostly depending on results of color segmentation. Also it is not required to generate multi-scale sliding window. The advantageous feature of the proposed work (i.e. detection of task) is based on pixel wise classification. However, for each pixel the features are extracted in a neighborhood region. Therefore, the extracted features both pixel-level information and relationship among neighboring pixels in a region. This proposed design is more effective and efficient than multi scale sliding window or region-based detection methods. The system used to cover much larger spatial area and monitoring fast moving targets is the aerial surveillance system with compared to ground-plane surveillance systems. Hence, excellent supplement of ground-plane surveillance systems is aerial surveillance system. One of the main topics in aerial image analysis is scene registration and alignment. As well as vehicle detection and tracking is also a very important topic in aerial surveillance. The camera motions such as panning, tilting, and rotation like features are also included in aerial surveillance vehicle detection system.

In addition, the results are taken for target objects by using its different heights and its different sizes. This technology has a long history, such as in the military for observing enemy activities, for monitoring forests and crops resources. In this technology or aerial surveillance the high-resolution still images are collected under the area of surveillance which will be examined by human being or machine for the further analysis.

## 2. RELATED WORK

Hinz and Baumgartner [1] utilized a hierarchical model that describes different levels of details of vehicle features. There is no specific vehicle models assumed, making the method flexible. However, their system would miss vehicles when the contrast is weak or when the influences of neighbouring objects are present. Cheng and Butler [2] considered multiple clues and used a mixture of experts to merge the clues for vehicle detection in aerial images. They performed colour segmentation via mean-shift algorithm and motion analysis via change detection. In addition, they presented a trainable sequential maximum a posterior method for multiscale analysis and enforcement of contextual information. However, the motion analysis algorithm applied in their system cannot deal with aforementioned camera motions and complex background changes. Moreover, in the information fusion step, their algorithm highly depends on the colour segmentation results. Lin et al. [3] proposed a method by subtracting background colours of each frame and then refined vehicle candidate regions by enforcing size constraints of vehicles. However, they assumed too many parameters such as the largest and smallest sizes of vehicles, and the height and the focus of the airborne camera.

Assuming these parameters as known priors might not be realistic in real applications.

A moving-vehicle detection method has proposed based on cascade classifiers. Positive and negative training samples are collected in large quantity for the training purpose. In addition, at the detection stage the multiscale sliding windows are generated. But in this method there are a lot of miss detections on rotated vehicles are the major disadvantages of it. Using cascade classifiers results are not surprising from the experiences of face detection. The faces with poses are easily missed when only frontal faces are trained. But the number of false alarms would surge if faces with poses are added as positive samples.

## 3. PROPOSED SYSTEM

Proposed Technique

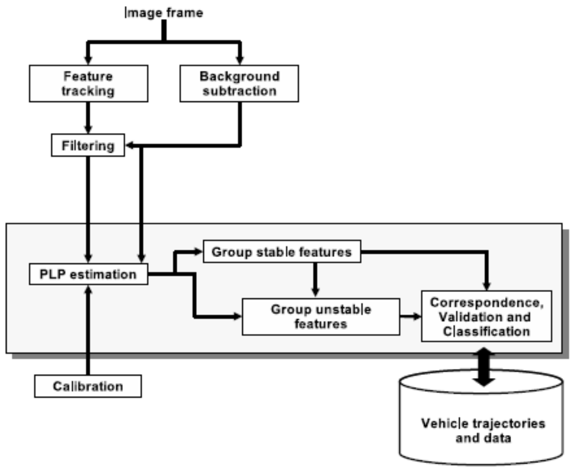


Figure 1: Overview of the system for detection and tracking of vehicles using stable features

## 3. a. Background Color Removal:

Since nonvehicle regions cover most parts of the entire scene in aerial images, we construct the color histogram of each frame and remove the colors that appear most frequently in the scene.

These removed pixels do not need to be considered in subsequent detection processes. Performing background Color removal cannot only reduce false alarms but also speed up the detection process.

## 3. b. Feature Extraction:

Feature extraction is performed in both the training phase and the detection phase.

- Local feature analysis
- Colour transform and colour analysis

**1) Local feature analysis:** Corners and edges are usually located in pixels with more information. We use the Harris corner detector to detect corners. To detect edges, we apply moment-preserving thresholding method on the classical canny edge detector to select thresholds adaptively according to different scenes, In the Canny edge detector, there are two important thresholds, i.e. the lower threshold $T_{km}$ and the higher threshold $T_{high}$ As the illumination in every aerial image differs, the desired thresholds vary and adaptive thresholds are required. The computation of Tsai's moment-preserving method is deterministic without iterations for L-level thresholding with $L < 5$. Its derivation of thresholds is described

**2) Colour Transform and Colour Classification:** In the authors proposed a new colour model to separate vehicle colours from nonvehicle colours effectively. This colour model transforms (R,G,B) colour components into the colour domain(u,v), where (Rp,Gp,Bp) is the R,G and B colour components of pixel p and Zp –(Rp+Gp+Bp)/3 It has been shown in that all the vehicle colours are concentrated in a much smaller area on the(u-v) plane than in other colour spaces and are therefore easier to be separated from nonvehicle colours, Although the colour transform proposed in did not aim for aerial images. We have found that the separability property still presents in aerial images

## Cranny's Edge Detection Algorithm:

The Canny edge detection algorithm is known to many as the optimal edge detector. Cranny's intentions were to enhance the many edge detectors already out at the time he started his work. He was very successful in achieving his goal and his ideas and methods can be found in his paper, *A Computational Approach to Edge Detection*".

The first and most obvious is low error rate. It is important that edges occurring in images should not be missed and that there be NO responses to non-edges. The second criterion is that the edge points be well localized. In other words, the distance between the edge pixels as found by the detector and the actual edge is to be at a minimum. A third criterion is to have only one response to a single edge. This was implemented because the first 2 were not substantial enough to completely eliminate the possibility of multiple responses to an edge.

## Steps:

**Step 1**:- first step is to filter out any noise in the original image before trying to locate and detect any edges.
**Step 2**:- After smoothing the image and eliminating the noise, the next step is to find the edge strength by taking the gradient of the image.
**Step 3**:- The direction of the edge is computed using the gradient in the x and y directions. However, an error will be generated when sum X is equal to zero. So in the code there has to be a restriction set whenever this takes place.
**Step 4:** Once the edge direction is known, the next step is to relate the edge direction to a direction that can be traced in an image.
**Step 5:** After the edge directions are known, non maximum suppression now has to be applied.
**Step 6:** Finally, hysteresis is used as a means of eliminating streaking. Streaking is the breaking up of an edge contour caused by the operator output fluctuating above and below the threshold.

## 4. CONCLISION

In this paper we have presented automatic vehicle detection system for aerial surveillance. Also, we avoid the existing frameworks and stereotype system of vehicle detection in aerial surveillance, which are either sliding window or region based. A pixel wise classification method is designed for the vehicle detection. From the above study we have drawn following conclusions:

- The pixel wise classification method is proposed for the vehicle detection by using DBNs.
- In this pixel-wise classification, relations of neighbouring pixels in a region are preserved in the feature extraction process.

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