Vehicles Detection From Aerial Sequences

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Our work is based on aerial sequences taken from an UAV-Camera system that we use to localize one or several targets (in our case : vehicles). The dynamic behavior of the UAV-Camera system make having fixed background impossible. So, scene processing becomes more complicated. Also, this behavior generates noise due to vibrations.

1 Vehicles detection using perceptual criteria

This approach [3] is divided on three parts 1(a): the segmentation of the acquired images, the modelization of a graph in which primitives provided by the segmentation are connecting according to perceptual organization [1] (Proximity and Parallelism) , and the bi-partition of the graph by normalized cuts technique [4]. The final aim consists on extracting vehicles from the background. Parameters of the proposed algorithm are chosen after a learning stage in which we maximize the similarity between manual cut and normalized cut results. Genetic Algorithm are used in this step of optimization.

2 Vehicles detection using motion criterion

1(b) shows the different steps used to extract vehicles from sequences. In general, vehicles motions are different from background motion (caused by the UAV-Camera system move). We use corners [2] data to recognize primitives into successive images and normalized cuts techniques to extract homogenous edges (edges having the same move).

Fig. 2 and Fig. 3 show some results with the two approach. We note that cars detection is better using motion criterion. However, this method requires more images per second to have a "correct" matching.

References

1. K.L. Boyer and S. Sarkar. *Perceptual Organization for Artificial Vision Systems.* Kluwer, March 2000.
2. Schmid Cordelia. Appariement d'images par invariants locaux de niveaux de gris. *PhD thesis, Institut National Polytechnique de Grenoble*, July 1996.
3. K. Kaaniche and P. Vasseur. Segmentation and partition of aerial scenes for road traffic diagnosis. *Asian Conference on Computer Vision*, pages Vol II : 967–972, January 2004.
4. J. Shi and J. Malik. Normalized cuts and image segmentation. *PAMI*, 22(8):888–905, August 2000.
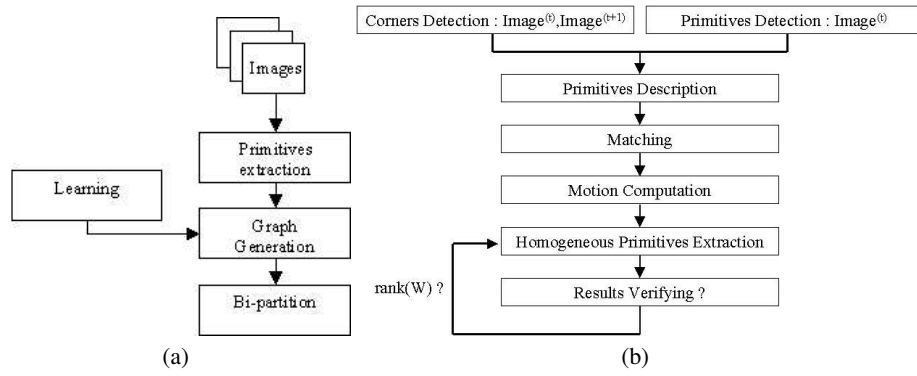
Fig. 1. (a) Vehicles Detection based on Perceptual Criteria. (b) Vehicles Detection based on motion Criterion.
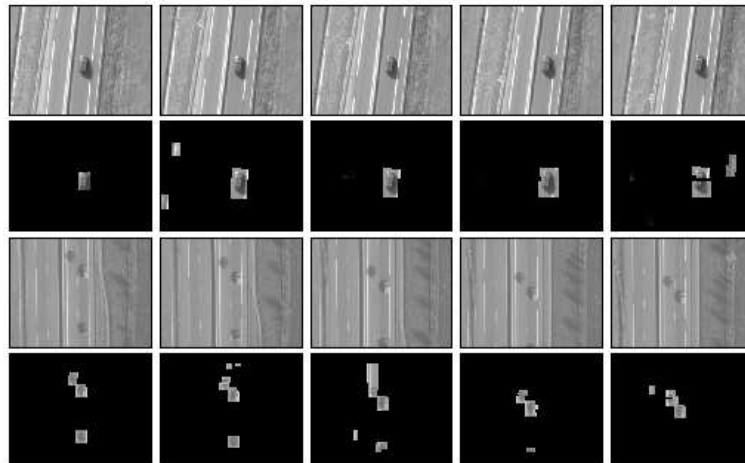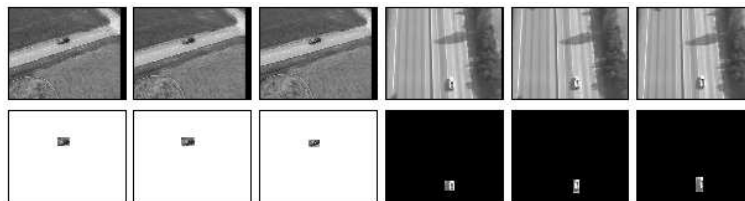

Fig. 2. Results with the first approach.

Fig. 3. Results with the second approach.