

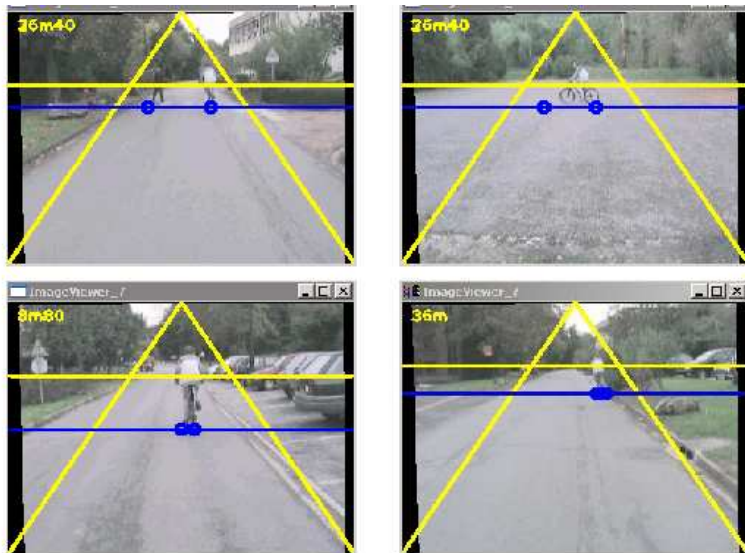
Motion and stereovision cooperation for obstacle detection

Introduction

Our work deals with obstacle detection from two moving cameras. In this application, most of real-time implemented approaches are based only on stereovision. We propose here to exploit also the egomotion of the cameras. Indeed, we can solve some inherent problems of stereovision or motion considering a cooperation between these two processes, where anyone could correct another in early processing steps.

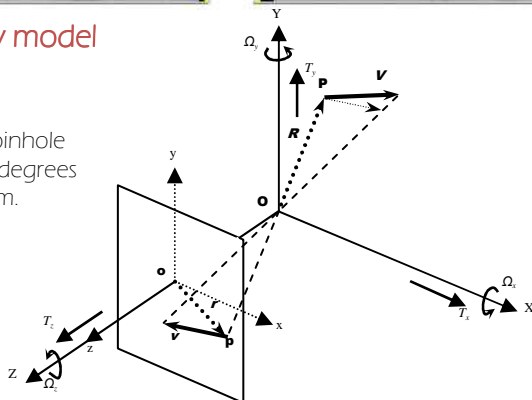
Previous work

IEF and LIVIC have developed an obstacle detection system in the framework of the ANR project LOVE. The system is based on the V-disparity approach. We propose a generalization of this method using motion.



Preliminary model

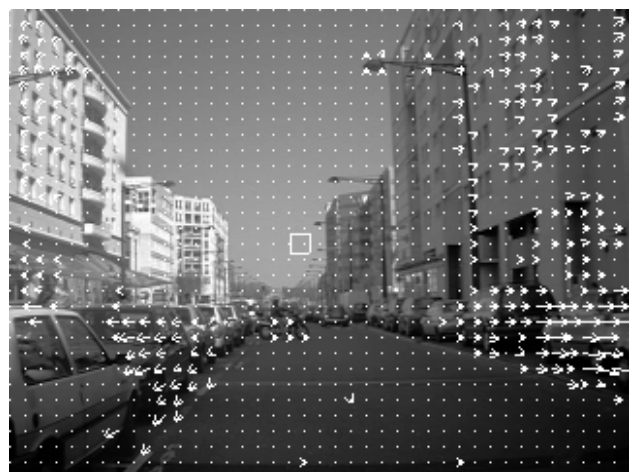
Classical pinhole model: 6 degrees of freedom.



Our approach

The cooperation between motion and stereo could be based on the physical following constraints:

- Discontinuity in optical flow could indicate potential discontinuities in the corresponding disparity map.
- Gaps in disparity maps could indicate potential discontinuities in the velocity vector fields.
- if a and b are corresponding points in the left and right images at t , and if a moves at a' and b at b' at $t+dt$ then a' and b' must be correspondent points at $t+dt$. Thus, the optical flow can help to reduce significantly stereo space research.
- Correspondent points from stereo mapping must have a consistent velocity and present similar visual characteristics (color, texture, geometric attributes).



Optical flow using the Lukas and Kanade approach and FOE estimation using a voting method.

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- R. Labayrade, D. Aubert, J. Tarel. Real time obstacle detection in stereovision on non flat road geometry through 'V-disparity' representation. Proc. IEEE Intelligent Vehicles Symposium, Versailles, France, pp. 646-651. IEEE ComputerSociety Press, Los Alamitos, 2002.

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