TNO | Kennis voor zaken

Exploiting time-coherences for autonomous vehicle vision tasks

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Keywords
Autonomous vehicles, stereo vision, Ostacle detection.

This project will be carried out using the RoboJeep: a platform for autonomous navigation research (see figure 1). The RoboJeep is a joint research effort by TNO Defense, Security and Safety and the Faculty of Science at the University of Amsterdam. An autonomous vehicle can be used for tasks that are hazardous to humans. Example applications can be found in disaster areas, humanitarian demining and personnel rescue. Apart from pure autonomous applications the methods involved can also be used to enhance automotive safety. To accomplish its goals an autonomous vehicle must sense its environment and construct an accurate world-model. For this, the RoboJeep is equipped with a stereo vision camera. Using the stereo images, the depth of image points can be estimated. Then, based on this 3D reconstruction a distinction can be made between obstacles and drivable terrain (see figure 2). During the proposed research, we will develop a novel obstacle detection algorithm that can exploit the inherent coherences between successive time-steps.

Figure 1, RoboJeep.

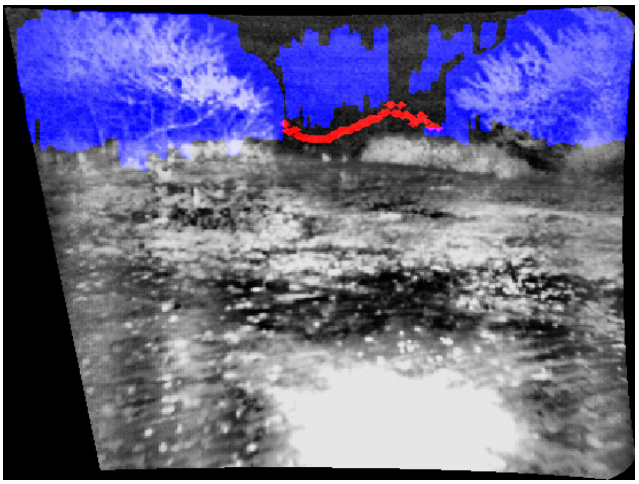

Figure 2, Automated obstacle detection.

Proposal

The topic of this study is to investigate and develop methods that can exploit time-coherences between successive stereo frames to improve obstacle detection results. Often, obstacle detection is performed all over again every time-step without exploiting previous classification results. This causes a high amount of false detections, especially during low visibility conditions. In this project, we will exploit the estimated motion (also using the stereo camera) of the vehicle to transform previous classification results into the current coordinate frame. Then, the current classification result can be fused with a limited amount of previously obtained classification results. The question that has to be answered is: what kind of filters to use for this purpose. The participants will be supplied with a benchmark environment consisting of ego-motion, disparity estimation and obstacle detection algorithms. The task is to develop time-coherence filters and thoroughly evaluate them over a wide range of parameter settings. The findings of this research will be published in a paper and presented during the final project session.