



VISTA – Stereoscopic Structure and Motion Estimation

Ivan Krešo, Siniša Šegvić

University of Zagreb, Faculty of Electrical Engineering and Computing



Problem definition

Use calibrated stereo camera to obtain the structure and motion estimation.

Motion:

- feature detection and feature tracking
- outlier rejection and optimization of the camera motion cost function

Structure:

- estimate 3D structure with dense stereo matching methods on rectified stereo images

Utilize the estimated structure and motion for outdoor applications and use it to advance the solutions for interesting problems.

Potential applications

- road detection and ground plane estimation
- obstacle detection and free-space estimation:
 - collision detection and warning system
- estimate the top-view image of the road
 - lane detection: lane departure warning system
- RGB-D object detection
- automated road safety inspection
- autonomous navigation of the mobile platform

Techniques

Raw data processing:

- stereo camera calibration
- image rectification

Camera motion estimation:

- real-time feature detection, descriptor extraction and tracking
- robust stochastic optimization with outlier rejection using: RANSAC sampling

Dense stereo reconstruction:

- Semi-Global Matching (SGM) method convenient for real-time implementation

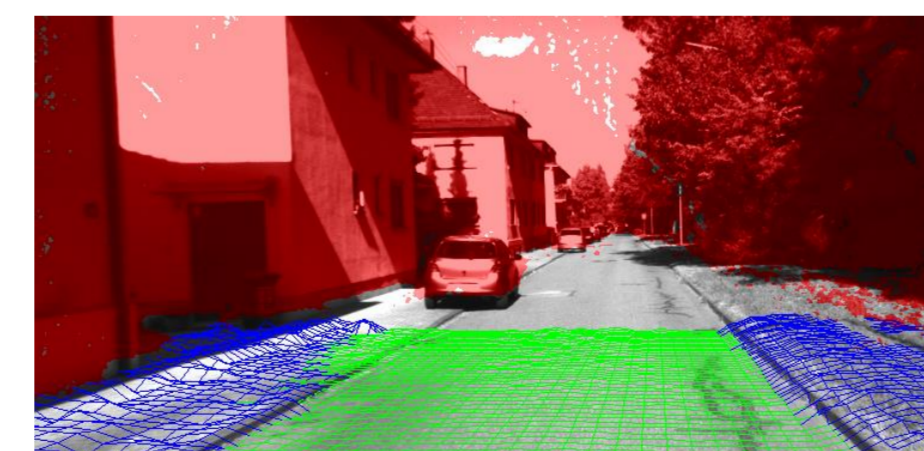
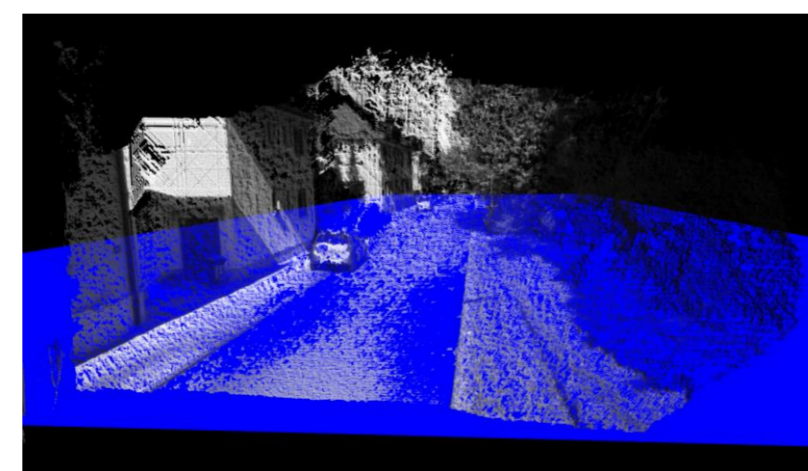
Results

Dense stereo reconstruction



- example of depth images obtained with dense stereo
- our implementation of SGM method (lowest image) compared to OpenCV implementation (central image) is more robust to difficult low-texture outdoor scenes

Obstacle detection



- example of ground plane estimation in 3D point cloud obtained with SGM dense stereo method
- prototype implementation of obstacle detection obtained using the estimated ground plane and digital elevation map

Contact

VISTA

Computer Vision Innovations for Safe Traffic

Prof. Sven Lončarić
sven.loncaric@fer.hr
<http://vista.fer.hr>

University of Zagreb
Faculty of Electrical Engineering and Computing
Unska 3, 10000 Zagreb, Croatia



Investing in future!



Ministry of science, education and sports



This action is co-financed by the European Union from the European Regional Development Fund

The contents of this poster are the sole responsibility of the University of Zagreb, Faculty of Electrical Engineering and Computing and do not necessarily reflect the views of the European Union.