Vikas Dhiman

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Research Interest

3D Computer Vision, Robotics, Localization, Mapping, SLAM

Education

PhD student in Electrical Engineering: Systems — 2014 - present
University of Michigan, Ann Arbor, USA — *GPA: 3.55 / 4.0*

Masters in Computer Science and Engineering — 2012 - 2014
State University of New York at Buffalo, USA — *GPA: 3.83 / 4.0*

Bachelors in Electrical Engineering — 2004 - 2008
Indian Institute of Technology Roorkee, India — *CGPA: 8.21 / 10.0*

Projects

Continuous occlusion modeling for Road Scene Understanding — May 2014 – Nov 2015
with Dr. Quoc-Huy Tran, Dr. Manmohan Chandrakar and Dr. Jason Corso — *NEC Labs/University of Michigan*

Proposes a probabilistic graphical model based framework to estimate 3D localization of traffic participants in road scenes. Also introduces a novel perspective to the soft occlusion models where a region in space is viewed in terms of reflection and transmission probability.[3]

Occupancy grid mapping using forward sensor modeling — May 2013 – Sept 2013
with Dr. A. Kundu, Dr. Jason Corso and Dr. F. Dellaert — *SUNY Buffalo*

Shows that we can use more accurate forward sensor modeling for occupancy grid mapping as opposed to commonly used inverse sensor modeling. For such models we used modern MAP inference methods like Belief Propagation and Dual Decomposition which performed better than MCMC based inference methods. In the process, we propose a class of higher order factors that can be efficiently optimized using Belief Propagation and Dual decomposition. [1]

Voxel Planes — Feb 2013 – May 2013
with Dr. Julian Ryde and Dr. Robert Platt — *SUNY Buffalo*

Contributed to a mapping, localization and surface reconstruction algorithm based on fitting planar surfaces to voxels. Worked on the visualization module using VTK, add Plane-to-point ICP for mapping, added ROS wrapper and conducted the comparative experiments for the paper [4].

Mutual Localization — Jun - Sep 2012
with Dr. Julian Ryde and Dr. Jason Corso — *SUNY Buffalo*

Developed an algorithm for determining 6-DOF relative pose between two robots using bearing only sensors and fiducial markers[2]. I was responsible for developing algorithm, its implementation and testing against other algorithms.

Publications

[1] V. Dhiman, A. Kundu, F. Dellaert, and J. J. Corso. Modern MAP inference methods for accurate and faster occupancy grid mapping on higher order factor graphs. In *Proceedings of International Conference on Robotics and Automation*, 2014.

[2] V. Dhiman, J. Ryde, and J. J. Corso. Mutual localization: Two camera relative 6-dof pose estimation from reciprocal fiducial observation. In *Proceedings of International Conference on Intelligent Robots and Systems*, 2013.

[3] V. Dhiman, Q. Tran, J. Corso, and M. Chandraker. A continuous occlusion model for road scene understanding. In *Proceedings of IEEE Conference on Computer Vision and Pattern Recognition*, 2016.

[4] J. Ryde, V. Dhiman, and R. Platt. Voxel planes: Rapid visualization and meshification of point cloud ensembles. In *Proceedings of IEEE/RSJ Intelligent Robots and Systems*, 2013.

Skills

Languages: C++, Python, Matlab, Perl, Java
APIs: ROS, OpenCV, VTK, PCL, numpy