

# PRATIK AGARWAL

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## Education

- Autonomous Systems Lab, University of Freiburg, Germany** August 2012-April 2015  
PhD in Computer Science  
Thesis: Robust graph based localization and mapping.
- University of Michigan, Ann Arbor, MI.** CGPA: 7.21/9.0 (3.74/4.0) August 2010-April 2012  
M.S.E in Computer Science Engineering
- Manipal University, India.** CGPA: 9.15/10 August 2006-July 2010  
Bachelor of Engineering (B.E.) in Computer Science Engineering

## Patents

- [1] Pratik Agarwal and Jiajun Zhu, “**Estimating multi-vehicle motion characteristics by finding stable reference points**”,  
US Patent number 8,886,387. Issued on November 11, 2014.
- [2] Pratik Agarwal, Jiajun Zhu, Dimitri Dolgov, “**Methods and Devices for Determining Movements of an Object in an Environment**”,  
US Patent number 8,989,944. Issued on March 24, 2015.
- [3] Jiajun Zhu and Pratik Agarwal, “**Methods and Systems for Object Detection using Multiple Sensors**”,  
US Patent number 9,098,753. Issued on August 4, 2015.

## Publications

### Journal Articles

- [1] Pratik Agarwal, Wolfram Burgard and Cyrill Stachniss, “**A Survey of Geodetic Approaches to Mapping and the Relationship to Graph-Based SLAM**”, Robotics and Automation Magazine, September 2014.
- [2] Edwin Olson and Pratik Agarwal, “**Inference on networks of mixtures for robust robot mapping**”, The International Journal of Robotics Research (IJRR), June 2013

### Peer-Reviewed Conference Articles

- [1] Andreas Lars Wachaja, Pratik Agarwal, Mathias Zink, Miguel Reyes Adame, Knut Moeller, Wolfram Burgard “**Navigating Blind People with a Smart Walker**”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2015
- [2] Pratik Agarwal, Wolfram Burgard and Luciano Spinello, “**Metric Localization using Street View**”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2015
- [3] Bahram Behzadian, Pratik Agarwal, Wolfram Burgard and Diego Tipaldi, “**Monte Carlo Localization in Hand-Drawn Maps**”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2015
- [4] Pratik Agarwal, Giorgio Grisetti, Gian Diego Tipaldi, Luciano Spinello, Wolfram Burgard and Cyrill Stachniss, “**Experimental Analysis of Dynamic Covariance Scaling for Robust Map Optimization Under Bad Initial Estimates**”, IEEE International Conference on Robotics and Automation (ICRA) 2014.

- [5] Pratik Agarwal, Wolfram Burgard and Cyrill Stachniss “**Helmert’s and Bowie’s Geodetic Mapping Methods and Their Relationship to Graph-Based SLAM**”, IEEE International Conference on Robotics and Automation (ICRA) 2014.
- [6] Pratik Agarwal, Gian Diego Tipaldi, Luciano Spinello, Cyrill Stachniss and Wolfram Burgard, “**Robust Map Optimization using Dynamic Covariance Scaling**”, IEEE International Conference on Robotics and Automation (ICRA) 2013.  
**Best student paper finalist.**
- [7] Pratik Agarwal and Edwin Olson, “**Variable reordering strategies for SLAM**”,IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2012
- [8] Edwin Olson and Pratik Agarwal, “**Inference on networks of mixtures for robust robot mapping**”, Robotics Science and System (RSS) 2012  
**Shortlisted for a special issue on the best papers from RSS.**
- [9] B. Sujith Kumar, Pratik Agarwal, P. Abhimanyu, Prem Bhargav and Dr. K. Madhava Krishna, “**RoboCup SSL Team Description, IRL RC**”, Emerging Research Trends in Artificial Intelligence (ERTAI-2010).

#### Workshops (Reviewed)

- [1] Andreas Wachaja, Pratik Agarwal, Miguel Reyes Adame, Knut Möller and Wolfram Burgard **A Navigation Aid for Blind People with Walking Disabilities**, Workshop on Rehabilitation & Assistive Robotics: Bridging the Gap Between Clinicians and Roboticians. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2014
- [2] Miguel Reyes Adame, Andreas Wachaja, Pratik Agarwal, Knut Möller and Wolfram Burgard **Development of a Smart Walker with a Vibrating Belt for Assisting Visually Impaired**. BMT - Biomedical Technology/ Biomedical Engineering 2014
- [3] Pratik Agarwal, Gian Diego Tipaldi, Luciano Spinello, Cyrill Stachniss and Wolfram Burgard “**Dynamic Covariance Scaling for Robust Robotic Mapping**”, Workshop on robust and Multimodal Inference in Factor Graphs, IEEE International Conference on Robotics and Automation (ICRA) 2013.

#### Internships

<b>Google Inc, Mountain View.</b> Intern at Google[x] with the self driving car team.	October 2014-January 2015
<b>Google Inc, Mountain View.</b> Intern at Google[x] with the self driving car team.	July-November 2013
<b>Microsoft Corporation, Seattle.</b> Intern with the Bing Mobile team.	May-July 2011
<b>IIIT Robotics Research Lab, Hyderabad.</b> Multiple Robot coordination for RoboCup Small Sized League.	Jan-June 2010
<b>Material Research and Testing, Berlin.</b> Telepresence using Networked Data Turbine.	June-July 2009
<b>Stesalit Ltd, Kolkata</b> Simulating modules using Aardvark I2C/SPI interface.	Dec 2008-Jan 2009

#### Public Talks

- [1] **Metric Localization using Street View**, IROS, October 2015, Hamburg, Germany.
- [2] **Robust Graph-Based Localization and mapping**, May 2015, Center for AI and Research (CAIR) at Defence Research and Development Organization (DRDO), Bangalore, India.
- [3] **Robust Graph-Based Localization and mapping**, May 2015, International Institute of Information Technology, Hyderabad, India.

- [4] **Global Metrical Localization using Google Street View**, October 2014, Field Robotics Center Seminar, Carnegie Mellon University, Pittsburgh.
- [5] **Experimental Analysis of Dynamic Covariance Scaling for Robust Map Optimization Under Bad Initial Estimates**, ICRA, June 2014, Hong Kong.
- [6] **Helmert's and Bowie's Geodetic Mapping Methods and Their Relationship to Graph-Based SLAM**, ICRA, June 2014, Hong Kong.
- [7] **Robust Map Optimization using Dynamic Covariance Scaling**, ICRA, May 2013. Karlsruhe, Germany.
- [8] **Dynamic Covariance Scaling for Robust Robot Mapping**, ICRA, Workshop on Factor Graphs, May 2013. Karlsruhe, Germany.
- [9] **Variable reordering strategies for SLAM**, IROS, November 2012, Vilamoura, Portugal.

#### Bachelor and Master students supervised

- [1] Mohammad Chit, **Using Dual-Quaternions For Computing Maximum Likelihood Maps With Gradient Descent**, Master Thesis, 2014.
- [2] Michael Rudolph, **Autonomous Landing of Multi-Rotors**, Bachelor Thesis, 2014. **Received the highest grade.**
- [3] Lukas Germein, **Terrain Classification based on Traffic Participants**, Bachelor Thesis, 2014. **Received the highest grade.**

#### Robotics related community service

##### Reviewer for:

IEEE Transactions on Robotics (T-RO)	2013
International Joint Conference on Artificial Intelligence (IJCAI)	2013
European Conference on Mobile Robots (ECMR)	2013
IEEE Int. Conf. on Intelligent Robots and Systems (IROS)	2012 - 2015
IEEE Int. Conf. on Robotics and Automation (ICRA)	2012 - 2015

##### Reviewing the review process: An open review experiment for the robotics community

Co-organizer of the workshop at Robotics Science and Systems, 2015.

#### Professional Experience

**Doctoral research assistant at the University of Freiburg.** August 2012-April 2015  
 Research includes applying robotics to help visually impaired and physically disabled people, robust back-end SLAM optimizers, computer-vision, multi-object multi-sensor tracking.

**Graduate Student Research Assistant at the University of Michigan.** Nov 2011-June 2012  
 Worked on multi modal lidar scan matchers, robust slam capable of handling false loop closures and visual aliasing, variable reordering for non-linear SLAM techniques and autonomous planning and mapping for a nursing robot.

**Navigation Team, Michigan Autonomous Aeronautical Vehicles (MAAV)** Aug 2010-July 2012  
 Responsible for Scan Matching, state estimation and autonomous planner for an in-house quadrotor.

#### Position of Responsibility

**Technical Head of IEEE, Student Chapter, Manipal.** 2008-2009  
 Organized and taught in various C++ basic and advanced workshops. Taught data structures to freshmen and sophomores, conducted IQ based competitions, Programming contests, Tech Talks on search Engines.

**Core Member, Management Committee, Red-X Social-Adventure Club**, Manipal University. 2006-2008  
 As a member of RED-X, organized treks and trips for more than 200 people, taught basic computers to underprivileged school children.