

# SEBASTIAN SCHERER

Field Robotics Center, NSH2102  
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## Education

- 2004 -present The Robotics Institute, Carnegie Mellon University  
Ph.D. Candidate (expected graduation September 2010)  
Masters degree awarded May 2007  
Working thesis title: **Low-Altitude Operation of Unmanned Aerial Vehicles**  
*Advised by Dr. Sanjiv Singh*
- 2000-2004 Carnegie Mellon University  
Bachelor of Science in Computer Science  
Minor in Robotics  
*Graduated with University Honors*

## Research Interests

I am interested in solving the problem of operating autonomous aerial vehicles safe and fast at low-altitude. This problem is challenging because the vehicle needs to be aware of the environment and needs to plan and react immediately to new information received. In this domain I have developed several efficient and robust algorithms that address perception, motion planning, obstacle avoidance, landing site evaluation, and landing site search. My coauthors and I have demonstrated these algorithms on several aerial vehicles.

## Research and Professional Experience

### Carnegie Mellon University, The Robotics Institute

*Research Assistant in Field Robotics Center under Dr. Sanjiv Singh* August 2004 – present

- *Hybrid Trajectory Optimization and Planning*: Developed a motion-planning algorithm for multi-objective planning. Applications include landing site search that incorporates obstacle avoidance and dynamics in the motion plan for aerial vehicles.
- *Model-based Landing Site Evaluation*: Developed a real-time algorithm to assess landing sites that considers the ground interaction between a 3D model of the aircraft and a triangulation of the terrain.
- *Limited Incremental Distance Transform (LIDT)*: Developed efficient incremental algorithm to update a distance transform in 3D for unmanned aerial vehicles. The algorithm was tested on a quad-rotor aerial vehicle.
- *Learn to Avoid in 3D*: Developed an imitation-learning algorithm for unmanned aerial vehicles that learns parameters of an obstacle avoidance control law. The algorithm was extensively tested on a Yamaha RMax helicopter.
- *Smart Joystick*: Developed and tested 3D guidance algorithms for safe teleoperation among obstacles. The algorithms were tested on a quad-rotor aerial vehicle.
- *Verified Control*: Verified Java code for robot control system using software model checking. Modified Java Pathfinder to include state model for verification.

- *DARPA Urban Challenge*: Developed simulator and moving vehicle reactive avoidance for Tartan Racing Team vehicle.
- *Dodger 2D*: Developed automatic learning of parameters for reactive obstacle avoidance method for a path following ground vehicle.

*Teaching Assistant*

August 2007 – December 2007

- Held select lectures for Professor Michael Erdmann's course on Math Fundamentals for Robotics.
- Held regular office hours, and graded homework.

*Part-Time Research Staff in Field Robotics Center*

May 2003 – August 2003

- Designed and implemented automation of path generation and map editing for the Red Team off road racer on the DARPA Grand Challenge.

**Carnegie Mellon University, School of Computer Science**

*Part-Time Research Staff in Dependable Systems Laboratory*

August 2001 – May 2003

- Designed and built an experiment to record information about biology experts classifying cell component images. Voice, keyboard, joystick and eye movement information is recorded and can be replayed.
- Dependability case analysis of a robot race. Designed and won with robot after analysis.

*Teaching Assistant*

August 2001 – December 2001

- Supervised/assisted robotic project for Dependable Systems Class (15-416)

*Full-Time Research Staff in Dependable Systems Laboratory*

August 2000 – August 2001

- Designed an algorithm to authenticate users of a Palm Pilot automatically using a decision tree with a distance metric based on dynamic time warping of Graffiti stroke data.
- Implemented data collection application for user studies

**SüdWest Elektronik GmbH**

*Intern*

July 2000 – August 2000

- Designed and produced prototype circuit board for LED sidelight on Mannesmann trucks
- Developed PCB layout for excavator horn and produced two prototypes.
- Tested circuits for car wash heat control.

**SMASH Software GBRmbH**

*CEO, Programmer*

May 1997 – August 2006

- Designed and implemented networked scheduling software for medical offices and a restaurant point of sales system.

**Publications**

S. Scherer, and S. Singh "Online Evaluation of Landing Sites," *AIAA Intotech@Aerospace*, April 2010 (*Runner-Up Best Paper Award*)

S. Scherer, D. Ferguson, and S. Singh, "Efficient C-Space and Cost Function Updates in 3D for Unmanned Aerial Vehicles," *Proceedings International Conference on Robotics and Automation (ICRA)*, May, 2009.

S. Scherer, S. Singh, L. Chamberlain, & M. Elgersma, "Flying Fast and Low Among Obstacles: Methodology and Experiments," *The International Journal of Robotics Research*, Vol. 27, No. 5, May, 2008, pp. 549-574.

S. Scherer, S. Singh, L. Chamberlain, & S. Saripalli, "Flying Fast and Low Among Obstacles," *Proceedings International Conference on Robotics and Automation (ICRA)*, April 2007

B. Hamner, S. Singh, & S. Scherer, "Learning Obstacle Avoidance Parameters from Operator Behavior," *Journal of Field Robotics*, Vol. 23, no. 11-12, pp. 1037-1058, January 2007

B. Hamner, S. Scherer, & S. Singh, "Learning to Drive Among Obstacles," *Proceedings International Conference on Intelligent Robots and Systems (IROS)*, October 2006.

B. Hamner, S. Scherer, & S. Singh, "Learning to Drive Among Obstacles," *NIPS 2005 Workshop on Machine Learning Based Robotics in Unstructured Environments*

S. Scherer, F. Lerda, & E. M. Clarke, "Model Checking of Robotic Control Systems," *Proceedings of the 8th International Symposium on Artificial Intelligence, Robotics and Automation in Space (iSAIRAS)*, September 2005.

### **Awards:**

2005	Siebel Scholarship
2004-present	Carnegie Mellon University Graduate Fellowship
2004	Graduated with University Honors
Fall, 2002	
Fall, 2003	Dean's List School of Computer Science

### **Service:**

Reviewer for the

- *Journal of Field Robotics*
- *IEEE Transactions on Robotics*
- *AIAA Journal of Guidance, Control, and Dynamics*
- *International Conference on Robotics and Automation (ICRA)*
- *International Conference on Intelligent Robots and Systems (IROS)*
- *International Conference on Field and Service Robotics (FSR)*

Member of *IEEE*, *IEEE Robotics Society*, and *AIAA*.

### **Languages**

- Native German, Fluent in English and proficient in Japanese.
- Programming Languages: C, C++, OpenGL, Matlab, Mathematica, SML, Perl, Bash, Python, SQL, Java, Delphi, Pascal, Visual Basic, PHP, HTML, CGI, Latex
- Platforms: Linux, Mac OS X, Windows, and embedded Linux ARM platforms.