

MAXIM LIKHACHEV

ASSISTANT RESEARCH PROFESSOR
Robotics Institute, School of Computer Science
Carnegie Mellon University

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EDUCATION

09/01 – 09/05 **Carnegie Mellon University** **Pittsburgh, PA**

Ph.D., Computer Science, M.S., Computer Science

Thesis Title: “Search-based Planning for Large Dynamic Environments”

Advisors: Sebastian Thrun and Geoff Gordon

Thesis Committee: Geoff Gordon (co-chair), Sebastian Thrun (co-chair),
Manuel Blum, Sven Koenig

05/94 - 07/99 **Stevens Institute of Technology** **Hoboken, NJ**

M.E., Electrical Engineering/Digital Signal Processing

GPA: 4.0/4.0

B.S., Major: Mathematics, Minor: Computer Science

Major GPA: 4.0/4.0 Minor GPA: 4.0/4.0 Cumulative GPA: 3.9/4.0

RESEARCH INTERESTS

Artificial Intelligence and Robotics: graph search-based planning, real-time planning, planning under uncertainty, planning for single and multi-agent systems including unmanned ground and aerial vehicles, mobile manipulators, articulated robots and teams of tightly-coupled robots

ACADEMIC PROFESSIONAL EXPERIENCE

09/10 – presently Carnegie Mellon University Pittsburgh, PA

Assistant Research Professor

04/09 – 09/10 University of Pennsylvania Philadelphia, PA

Research Assistant Professor

09/07 – 04/09 University of Pennsylvania Philadelphia, PA

Research Associate

09/05 – 09/07 Carnegie Mellon University Pittsburgh, PA

Postdoctoral Fellow – worked under the supervision of Prof. A. Stentz and was also part of Tartanracing team that won the DARPA Urban Challenge in 2007 (the third DARPA Grand Challenge competition)

- ◆ National Dean's List (all semesters)
- ◆ Bachelor of Science with High Honor

FUNDING

- ◆ Defense University Research Instrumentation Program (DURIP) grant by ARO for "Intelligent Mobile Manipulation in the Context of Missions by Highly Heterogeneous Teams of Robots", **PI: M. Likhachev**, \$250K, 2011
- ◆ DARPA 2010 Computer Science Study Panel Amendment grant for "Tight Coupling of Visual Understanding and Actions for Mobility and Manipulation in Human-populated Environments", **PI: M. Likhachev**, \$300K, 2011
- ◆ DARPA 2010 Computer Science Study Panel Phase II award for "Robust Autonomy in Dynamic Adversarial Environments", **PI: M. Likhachev**, \$400K, 2011
- ◆ "Building a Human Lifting Segbot for UAV-Ground Robotic Evacuation" grant by Dragonfly Pictures Inc., **PI: M. Likhachev**, Co-PI: E. Meyhofer, \$39K, 2011
- ◆ Artificial Intelligence Journal (AIJ) grant for the support of the Fourth International Symposium on Combinatorial Search (SoCS), **PI: M. Likhachev**, \$5K, 2011
- ◆ "Development of Standardized Library of Search-based Planning Algorithms and its Application to Planning for Mobile Manipulation and Navigation," granted by Willow Garage, **PI: M. Likhachev**, \$80K, 2010
- ◆ "Cyber-enabled Analysis and Control of Building Evacuation," NSF Human-Centered Computing grant, PI: A. Safonova, **Co-PI: M. Likhachev** and A. Malkawi, \$500K total, 2010
- ◆ PR2 Beta program sponsored by Willow Garage, **PI: M. Likhachev**, Co-PIs: K. Daniilidis, K. J. Kuchenbecker, V. Kumar, D. Lee, J. Shi, C.J. Taylor, M. Yim, 2010
- ◆ Robotics CTA 2010 sponsored by ARL, 5 base years plus 5 option years program, \$64M total, lead: GDRS, \$9.8M funding for UPenn, **Co-PI**, 2010
- ◆ DARPA 2010 Computer Science Study Panel Phase I award, **PI: M. Likhachev**, \$100K, 2010
- ◆ "Detecting and Tracking Multiple Moving Objects from a Moving Platform," DARPA Phase II SBIR, PI for the project: Dragonfly Pictures Inc., **PI at UPenn: M. Likhachev**, Co-PI: J. Shi, \$750K total, 2010
- ◆ "Path Planning in Dynamic Environments," DARPA Phase II SBIR, PI for the project: Dragonfly Pictures Inc., **PI at UPenn: M. Likhachev**, \$750K total, 2010
- ◆ "II-EN: Mobile Manipulation," NSF Infrastructure grant, **PI: M. Likhachev**, Co-PIs: K. Daniilidis, K. J. Kuchenbecker, D.D. Lee, J. Shi, \$298K, 2009

- ◆ “Development of Standardized Library of Planning Algorithms and New Planning Algorithms for Manipulation Tasks,” granted by Willow Garage, **PI: M. Likhachev**, \$110K, 2009
- ◆ “Decentralized Reasoning in Reduced Information Spaces,” ONR BAA 08-019 MURI program starting in 2009, 3 base plus 2 option years, lead institution: CMU, **PI at UPenn: M. Likhachev**, Co-PI: Jianbo Shi, anticipated funding for UPENN for the base 3 years: \$1.05M, 2009
- ◆ “ANTIDOTE: Adaptive Networks for Threat and Intrusion Detection Or TErmination,” ONR BAA 08-019 MURI program starting in 2009, 3 base plus 2 option years, lead institution: USC, PI at UPenn: V. Kumar, **Co-PI: M. Likhachev**, R. Ghrist, anticipated funding for UPENN for the base 3 years: \$1.35M, 2009
- ◆ “Real-time Determination and Prediction of Aircraft Trajectories Using Limited Sensor Data,” NAVAIR Phase I STTR, PI for the project: Dragonfly Pictures Inc., **PI at UPenn: M. Likhachev**, \$100K total, 2009
- ◆ “Rapid Complex Mapping” funded by SPARWAR, PI: Sarnoff, subcontracted to UPenn, funding for UPenn: \$100K, PI: K. Daniilidis, **Co-PI: J. Shi and M. Likhachev**, 2009
- ◆ “Unmanned Ground & Air System For CBRNE Contaminated Personnel Recovery,” Army Phase II SBIR, PI for the project: Dragonfly Pictures Inc., **PI at UPenn: M. Likhachev**, Co-PI at Upenn: V. Kumar, \$750K total, 2009
- ◆ “Detecting and Tracking Multiple Moving Objects from a Moving Platform,” DARPA Phase I SBIR, PI for the project: Dragonfly Pictures Inc., **PI at UPenn: M. Likhachev**, Co-PI: J. Shi, \$100K total, 2009
- ◆ “Micro Autonomous Systems Technologies (MAST),” 10-year program starting at 2008, funded by ARL, **Co-PI**
- ◆ “Development of Standardized Library of Planning Algorithms and New Planning Algorithms for Manipulation Tasks,” granted by Willow Garage, **PI: M. Likhachev**, \$110K, 2008
- ◆ “Autonomous Landing Site Selection and Confirmation for Unmanned Helicopters,” granted by Dragonfly Pictures Inc., **PI: M. Likhachev**, \$75K, 2008
- ◆ “Path Planning for Unmanned Helicopters Navigating Urban Environments,” granted by Dragonfly Pictures Inc., **PI: M. Likhachev**, \$97K, 2008
- ◆ “Path Planning in Dynamic Environments,” DARPA Phase I SBIR, PI for the project: Dragonfly Pictures Inc., **PI at UPenn: M. Likhachev**, \$100K total, 2008
- ◆ “Unmanned Ground & Air System For CBRNE Contaminated Personnel Recovery,” Army Phase I SBIR, PI for the project: Dragonfly Pictures Inc., **PI at UPenn: M.**

Likhachev, Co-PI at Upenn: V. Kumar, \$70K total, 2008

PUBLICATIONS

Journal and Magazine Articles, Book Chapters:

1. Maxim Likhachev and Dave Ferguson, "*Planning Long Dynamically-Feasible Maneuvers for Autonomous Vehicles*," The International Journal of Robotics Research (IJRR), 2009
2. Maxim Likhachev and Anthony Stentz, "*Path Clearance*," IEEE Robotics and Automation Magazine (RAM), Special Issue on Cooperative Control of Multiple Heterogeneous Unmanned Aerial Vehicles for Coverage and Surveillance, 2009
3. Maxim Likhachev and Anthony Stentz, "*Probabilistic Planning with Clear Preferences on Missing Information*," Artificial Intelligence Journal (AIJ), Volume 173(5-6), pp. 696-721, 2009
4. Dave Ferguson, Thomas Howard, and Maxim Likhachev, "*Motion Planning in Urban Environments*," Journal of Field Robotics (JFR), 25(11-12), pp. 939-960, 2008
5. Chris Urmson et al., "*Autonomous Driving in Urban Environments: Boss and the Urban Challenge*," Journal of Field Robotics (JFR), Special Issue on the 2007 DARPA Urban Challenge, Part I, 25 (8), pp. 425-466, June 2008
6. Maxim Likhachev, Dave Ferguson, Geoff Gordon, Anthony Stentz, and Sebastian Thrun, "*Anytime Search in Dynamic Graphs*," Artificial Intelligence Journal (AIJ), Volume 172(14), pp. 1613-1643, 2008
7. Sven Koenig and Maxim Likhachev, "*Fast Replanning for Navigation in Unknown Terrain*," Transactions on Robotics (and Automation), Volume 21(3), pp. 354-363, 2005
8. Sven Koenig, Maxim Likhachev, and David Furcy, "*Lifelong Planning A**," Artificial Intelligence Journal (AIJ), 155(1-2), pp. 93-146, 2004
9. Maxim Likhachev and Sven Koenig, "*Lifelong Planning for Mobile Robots*," Lecture Notes in Artificial Intelligence, Vol. 2466: Advances in Plan-Based Control of Robotic Agents, M. Beetz, J. Hertzberg, M. Ghallab, and M. Pollack (Eds.), Springer, pp. 140-156, 2002

Research Overview Publications:

- ◆ Sven Koenig, Maxim Likhachev, Yaxin Liu, and David Furcy, "*Incremental Heuristic Search in Artificial Intelligence*," Artificial Intelligence Magazine, 25(2), pp. 99-112, 2004

Full-length Publications at Conferences:

1. Benjamin Cohen, Sachin Chitta and Maxim Likhachev, "*Search-Based Planning for Dual-Arm Manipulation with Upright Orientation Constraints*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2012.
2. Kalin Gochev, Alla Safonova and Maxim Likhachev, "*Planning with Adaptive Dimensionality for Mobile Manipulation*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2012.
3. Haojie Zhang, Jon Butzke, and Maxim Likhachev, "*Combining Global and Local Planning with Guarantees on Completeness*," Proceedings of the IEEE

- International Conference on Robotics and Automation (ICRA), 2012.
4. Juan Pablo Gonzalez, Andrew Dornbush and Maxim Likhachev, "***Using State Dominance for Path Planning in Dynamic Environments with Moving Obstacles***," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2012.
 5. Armin Hornung, Mike Phillips, Edward Gil Jones, Maren Bennewitz, Maxim Likhachev and Sachin Chitta, "***Navigation in Three-Dimensional Cluttered Environments for Mobile Manipulation***," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2012.
 6. Haifeng Gong, Jack Sim, Maxim Likhachev, and Jianbo Shi, "***Multi-hypothesis Motion Planning for Visual Object Tracking***," International Conference on Computer Vision (ICCV), 2011.
 7. Aleksandr Kushleyev, Brian MacAllister and Maxim Likhachev, "***Planning for Landing Site Selection in the Aerial Supply Delivery***," Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2011.
 8. Jonathan Butzke and Maxim Likhachev, "***Planning for Multi-Robot Exploration With Multiple Objective Utility Functions***," Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2011.
 9. Mike Phillips and Maxim Likhachev, "***Planning in Domains with Cost Function Dependent Actions***," Proceedings of the National Conference on Artificial Intelligence (AAAI), 2011.
 10. Subhrajit Bhattacharya, Maxim Likhachev and Vijay Kumar, "***Identification and Representation of Homotopy Classes of Trajectories for Search-based Path Planning in 3D***," Proceedings of the Robotics: Science and Systems Conference (RSS), 2011 (**Best Paper Award**).
 11. Juan Pablo Gonzalez and Maxim Likhachev, "***Search-Based Planning with Provable Suboptimality Bounds for Continuous State Spaces***," Proceedings of the International Symposium on Combinatorial Search (SoCS), 2011.
 12. Kalin Gochev, Benjamin Cohen, Jonathan Butzke, Alla Safonova and Maxim Likhachev, "***Path Planning with Adaptive Dimensionality***," Proceedings of the International Symposium on Combinatorial Search (SoCS), 2011.
 13. Benjamin Cohen, Gokul Subramanian, Sachin Chitta and Maxim Likhachev, "***Planning for Manipulation with Adaptive Motion Primitives***," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2011.
 14. Mike Phillips and Maxim Likhachev, "***SIPP: Safe Interval Path Planning for Dynamic Environments***," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2011.
 15. Jonathan Scholz, Sachin Chitta, Bhaskara Marthi and Maxim Likhachev, "***Cart Pushing with a Mobile Manipulation System: Towards Navigation with Moveable Objects***," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2011.
 16. Subhrajit Bhattacharya, Vijay Kumar and Maxim Likhachev, "***Distributed Optimization with Pairwise Constraints and its Application to Multi-robot Path Planning***," Proceedings of the Robotics: Science and Systems Conference (RSS), 2010 [accept. rate 16%]
 17. Subhrajit Bhattacharya, Vijay Kumar and Maxim Likhachev, "***Search-based Path***

- Planning with Homotopy Class Constraints*," Proceedings of the National Conference on Artificial Intelligence (AAAI), 2010 [accept. rate 26.9%]
18. Sachin Chitta, Benjamin Cohen and Maxim Likhachev, "*Planning for Autonomous Door Opening with a Mobile Manipulator*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2010
 19. Benjamin Cohen, Sachin Chitta, and Maxim Likhachev, "*Search-based Planning for Manipulation with Motion Primitives*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2010
 20. Joseph T. Kider Jr., Mark Henderson, Maxim Likhachev, and Alla Safonova, "*High-dimensional Planning on the GPU*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2010
 21. Subhrajit Bhattacharya, Maxim Likhachev, and Vijay Kumar, "*Multi-agent Path Planning with Multiple Tasks and Distance Constraints*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2010
 22. Jennifer King and Maxim Likhachev, "*Efficient Cost Computation in Cost Map Planning for Non-Circular Robots*," Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2009
 23. Alex Nash, Sven Koenig and Maxim Likhachev, "*Incremental Phi*: Incremental Any-Angle Path Planning on Grids*," Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI), 2009 [accept. rate 25.7%]
 24. Aleksandr Kushleyev and Maxim Likhachev, "*Time-bounded Lattice for Efficient Planning in Dynamic Environments*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2009
 25. Paul Vernaza, Maxim Likhachev, Subhrajit Bhattacharya, Sachin Chitta, Aleksandr Kushleyev and Daniel D. Lee, "*Search-based Planning for a Legged Robot over Rough Terrain*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2009
 26. Dave Ferguson, Thomas Howard, and Maxim Likhachev, "*Motion Planning in Urban Environments: Part I*," Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2008
 27. Dave Ferguson, Thomas Howard, and Maxim Likhachev, "*Motion Planning in Urban Environments: Part II*," Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2008
 28. Maxim Likhachev and Dave Ferguson, "*Planning Long Dynamically-Feasible Maneuvers for Autonomous Vehicles*," Proceedings of the Robotics: Science and Systems Conference (RSS), 2008 [accept. rate 25%]
 29. Maxim Likhachev and Anthony Stentz, "*R* Search*," Proceedings of the National Conference on Artificial Intelligence (AAAI), 2008 [accept. rate 24.2%]
 30. Dave Ferguson, Chris Baker, Maxim Likhachev and John Dolan, "*A Reasoning Framework for Autonomous Urban Driving*," Proceedings of the IEEE Intelligent Vehicles Symposium (IV), oral presentation, 2008
 31. Maxim Likhachev and Anthony Stentz, "*Information Value-Driven Approach to Path Clearance with Multiple Scout Robots*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2008
 32. Maxim Likhachev and Anthony Stentz, "*Goal Directed Navigation with Uncertainty in Adversary Locations*," Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2007

33. Sven Koenig, Maxim Likhachev and Xiaoxun Sun, "***Speeding up Moving-Target Search***," Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2007 [accept. rate 22.8%]
34. Maxim Likhachev and Anthony Stentz, "***Path Clearance Using Multiple Scout Robots***," Proceedings of the Army Science Conference (ASC), 2006
35. Maxim Likhachev and Anthony Stentz, "***PPCP: Efficient Probabilistic Planning with Clear Preferences in Partially-Known Environments***," Proceedings of the National Conference on Artificial Intelligence (AAAI), 2006 [accept. rate 21%]
36. Sven Koenig and Maxim Likhachev, "***Real-Time Adaptive A****," Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2006 [accept. rate 23.1%]
37. H. Brendan McMahan, Maxim Likhachev, and Geoff Gordon, "***Bounded Real-Time Dynamic Programming: RTDP with monotone upper bounds and performance guarantees***," Proceedings of the International Conference on Machine Learning (ICML), 2005 [accept. rate 27.3%]
38. Maxim Likhachev, Dave Ferguson, Geoff Gordon, Anthony Stentz, and Sebastian Thrun, "***Anytime Dynamic A*: An Anytime, Replanning Algorithm***," Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS), 2005 [accept. rate 25%]
39. Maxim Likhachev, and Sven Koenig, "***A Generalized Framework for Lifelong Planning A****," Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS), 2005 [accept. rate 25%]
40. Maxim Likhachev, Geoff Gordon and Sebastian Thrun, "***Planning for Markov Decision Processes with Sparse Stochasticity***," Advances in Neural Information Processing Systems 17 (NIPS), MIT Press, Cambridge, MA, 2005 [accept. rate 25%]
41. Maxim Likhachev, Geoff Gordon and Sebastian Thrun, "***ARA*: Anytime A* with Provable Bounds on Sub-Optimality***," Advances in Neural Information Processing Systems 16 (NIPS), MIT Press, Cambridge, MA, 2004 [accept. rate 30%]
42. Maxim Likhachev and Sven Koenig, "***Speeding up the Parti-Game Algorithm***," Advances in Neural Information Processing Systems 15 (NIPS), MIT Press, Cambridge, MA, 2003 [accept. rate 27.6%]
43. Maxim Likhachev and Sven Koenig, "***Incremental Replanning for Mapping***," Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Vol. 1, pp. 667-672, 2002
44. Sven Koenig and Maxim Likhachev, "***D* Lite***," Proceedings of the National Conference on Artificial Intelligence (AAAI), pp. 476-483, 2002 [accept. rate 26%]
45. Maxim Likhachev, Michael Kaess, and Ronald C. Arkin, "***Learning Behavioral Parameterization Using Spatio-Temporal Case-Based Reasoning***," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), Vol. 2, pp. 1282-1289, 2002
46. J. Brian Lee, Maxim Likhachev, and Ronald C. Arkin, "***Selection of Behavioral Parameters: Integration of Discontinuous Switching via Case-Based Reasoning with Continuous Adaptation via Learning Momentum***," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), Vol. 2, pp. 1275-1281, 2002
47. Sven Koenig and Maxim Likhachev, "***Incremental A****," Advances in Neural Information Processing Systems 14 (NIPS), MIT Press, Cambridge, MA, 2002

[accept. rate 31.1%]

48. Maxim Likhachev and Ronald C. Arkin, "*Spatio-Temporal Case-Based Reasoning for Behavioral Selection*," Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), Vol. 2, pp. 1627-1634, 2001
49. Maxim Likhachev and Ronald C. Arkin, "*Robotic Comfort Zones*," Proceedings of SPIE: Sensor Fusion and Decentralized Control in Robotic Systems III Conference, Vol. 4196, pp. 27-41, 2000

Short-length Publications at Conferences:

- ◆ Mark Henderson, Joseph T. Kider Jr., Maxim Likhachev and Alla Safonova, "*High-Dimensional Planning on the GPU*," NVIDIA GPU Technology Conference, 2009 (**Best Poster Award**).
- ◆ Dave Ferguson and Maxim Likhachev, "*Efficiently Using Cost Maps For Planning Complex Maneuvers*," Proceedings of ICRA Workshop on Planning with Cost Maps, 2008.
- ◆ Maxim Likhachev and Sven Koenig, "*Incremental Heuristic Search in Games: The Quest for Speed*," Proceedings of the Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE), Poster Abstract, 2006
- ◆ Dave Ferguson, Maxim Likhachev and Anthony Stentz, "*A Guide to Heuristic-based Path Planning*," Proceedings of ICAPS Workshop on Planning under Uncertainty for Autonomous Systems, 2005
- ◆ Sven Koenig and Maxim Likhachev, "*A New Principle for Incremental Heuristic Search: Theoretical Results*," Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS), Poster Abstract, 2005
- ◆ Sven Koenig and Maxim Likhachev, "*Adaptive A**," Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS), Poster Abstract, 2005

PATENTS

- ◆ Patent 7,136,813 (issued 11/14/2006, filed 09/25/2005), "**Probabilistic networks for detecting signal content**," (Intel Corporation).

INVITED TALKS AND TUTORIALS

- ◆ Tutorial "Search-Based Planning: Toward High Dimensionality and Differential Constraints" at AAAI (together with Mihail Pivtoraiko and Sven Koenig), 2012
- ◆ Invited talk "Search-based Planning in Robotics" at Virginia Tech, 2010
- ◆ Invited talk "Solving hard planning problems in robotics with simple graph searches" at Stevens Institute of Technology, 2010
- ◆ Invited talk "Search-based Planning with Motion Primitives" at CoTeSys-ROS Fall School on Cognition-enabled Mobile Manipulation, Munich, Germany, 2010
- ◆ Invited talk "Solving hard planning problems in robotics with a series of simple A*-like searches" at NREC, CMU, 2010

- ◆ Tutorial “Real-Time Planning in Dynamic and Partially-Known Domains” at ICRA (together with Sven Koenig), 2010
- ◆ Invited talk “Solving Hard Planning Problems in Robotics with Simple Graph Searches” at MIT, 2010
- ◆ Invited talk “Search-based Planning in Robotics” at Transport and Telecommunications Institute, Riga, Latvia, 2010
- ◆ Tutorial “Real-Time Planning in Dynamic and Partially-Known Domains” at ICAPS (together with Sven Koenig), 2009
- ◆ Tutorial “Real-Time Planning in Dynamic and Partially-Known Domains” at IJCAI (together with Sven Koenig), 2009
- ◆ Internal talk “Solving Hard Planning Problems in Robotics with Simple Graph Searches” at GRASP seminar at University of Pennsylvania, 2008
- ◆ Invited talk “Solving Hard Planning Problems in Robotics with Simple A*-like searches” at the First International Symposium on Search Techniques in Artificial Intelligence and Robotics (at AAAI conference), 2008
- ◆ Invited talk “Planning Long Dynamically-Feasible Complex Maneuvers for Autonomous Vehicles” at NREC, CMU, 2008
- ◆ Invited talk “Challenges of Planning in Dynamic Cluttered Environments” at DARPA sponsored workshop on Cognitive Mobile Robotics, 2008
- ◆ Invited talk “Pushing the Limits of Search-based Planning” at Intel Research, Pittsburgh, 2007
- ◆ Invited talk “Search-based Planning under Time Constraints and under Uncertainty” at NREC, CMU, 2007
- ◆ Invited talk “Search-based Planning under Time Constraints and under Uncertainty” at State University of New York, Stony Brook, 2007
- ◆ Invited talk “Fast Replanning” at ICAPS Summer School on Artificial Intelligence Planning 2006 (together with Sven Koenig)
- ◆ Invited talk “Search-based Planning for Large Dynamic Environments” at Palo Alto Research Center (PARC) 2005
- ◆ Part of the tutorial “Greedy On-Line Planning” given by Sven Koenig and Anthony Stentz at AAAI 2005
- ◆ Part of the tutorial “Greedy On-Line Planning” given by Sven Koenig and Anthony Stentz at ICRA 2005

PROFESSIONAL SERVICES

- ◆ **Member of advisory boards/councils for:** Symposium on Combinatorial Search (SoCS)
- ◆ **Chair for:** Symposium on Combinatorial Search (SoCS), 2012 (co-chair), Symposium “Robot Motion Planning: New Frameworks and High Performance” at IROS’11 (co-chair), Symposium “Robot Motion Planning: Achievements and Emerging Approaches” at IROS’11 (co-chair), Symposium on Combinatorial Search (SoCS), 2011 (co-chair), Workshop “Bridging the Gap Between the Task and Motion

- Planning” at the National Conference on Artificial Intelligence (AAAI), 2010(co-chair), Workshop “Bridging the Gap Between the Task and Motion Planning” at the International Conference on Automated Planning and Scheduling (ICAPS), 2009 (co-chair)
- ◆ **Member of Senior Program Committee for:** International Joint Conferences on Artificial Intelligence (IJCAI) 2011
 - ◆ **Associate Editor for:** IEEE International Conference on Robotics and Automation (ICRA) 2011, 2012, IEEE International Conference on Intelligent Robots and Systems (IROS) 2011, 2012
 - ◆ **Member of Program Committee for:** Robotics: Science and Systems (RSS) Conference 2012, National Conference on Artificial Intelligence (AAAI) 2012 (Regular track and Robotics track), International Conference on Automated Planning and Scheduling (ICAPS) 2012, Robotics: Science and Systems (RSS) Conference 2011, National Conference on Artificial Intelligence (AAAI) 2011 (Physically-grounded AI track), International Conference on Automated Planning and Scheduling (ICAPS) 2011, International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2011, Robotics: Science and Systems (RSS) Conference 2010, National Conference on Artificial Intelligence (AAAI) 2010, Symposium on Combinatorial Search (SoCS) 2010, International Joint Conferences on Artificial Intelligence (IJCAI) 2009, Symposium on Combinatorial Search (SoCS) 2009, National Conference on Artificial Intelligence (AAAI) 2008 (PC member at both the main track and Physically-grounded AI track), Workshop “Search in Artificial Intelligence and Robotics” at AAAI’08, Workshop “Path Planning on Costmaps” at ICRA’08, International Conference on Machine Learning (ICML) 2007
 - ◆ **Session Chair for:** International Joint Conferences on Artificial Intelligence (IJCAI) 2011, National Conference on Artificial Intelligence (AAAI) 2010, Symposium on Combinatorial Search (SoCS), 2010, IEEE International Conference on Robotics and Automation (ICRA) 2010, National Conference on Artificial Intelligence (AAAI) 2008, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2007
 - ◆ **NSF Panel Participant 2010, 2012**
 - ◆ **Reviewer for the following journals:** Journal of Autonomous Agents and Multiagent Systems (AAMAS) 2011, Computational Intelligence Journal 2011, Artificial Intelligence Journal (AIJ) 2011, IEEE Transactions on Robotics (TRO) 2011, Autonomous Robots 2011, International Journal of Robotics Research (IJRR) 2010, IEEE Transactions on Robotics (TRO) 2010, International Journal of Robotics Research (IJRR) 2009, IEEE Transactions on Robotics (TRO) 2009, Journal of Artificial Intelligence Research (JAIR) 2008, Artificial Intelligence Journal (AIJ) 2008, Journal of Intelligent and Robotic Systems (JINT) 2008, Artificial Intelligence Journal (AIJ) 2007, Artificial Intelligence Journal (AIJ) 2006, Journal of Artificial Intelligence Research (JAIR) 2006 (2 papers), IEEE Transactions on Robotics (TRO) 2006, Journal of Machine Learning Research (JMLR) 2005, Journal of Artificial Intelligence Research (JAIR) 2005, IEEE Transactions on Robotics (TRO) 2005, IEEE Transactions on Robotics and Automation (TRA) 2003, IEEE Transactions on Robotics and Automation (TRA) 2002.
 - ◆ **Reviewer for the following conferences:** SIGGRAPH 2011, IEEE International Conference on Robotics and Automation (ICRA) 2011, SIGGRAPH ASIA 2011,

IEEE International Conference on Robotics and Automation (ICRA) 2010, IEEE International Conference on Intelligent Robots and Systems (IROS) 2010, IEEE International Conference on Intelligent Robots and Systems (IROS) 2009, IEEE International Conference on Robotics and Automation (ICRA) 2009, American Control Conference (ASC) 2009, IEEE International Conference on Robotics and Automation (ICRA) 2008, IEEE Multi-conference on Systems and Control (MSC) 2008, IEEE International Conference on Robotics and Automation (ICRA) 2007, International Joint Conference on Artificial Intelligence (IJCAI) 2007 (5 papers), Robotics: Science and Systems (RoSS) 2006, International Joint Conference on Artificial Intelligence (IJCAI) 2005, International Conference on Intelligent Autonomous Systems (IAS) 2005 (2 papers), IEEE International Conference on Robotics and Automation (ICRA) 2005, International Joint Conference on Artificial Intelligence (IJCAI) 2003, Advances in Neural Information Processing Systems (NIPS) 2002 (6 papers).

STUDENTS

Current PhD students:

- ◆ Jonathan Butzke (PhD student in Robotics, CMU)
- ◆ Chris Clingerman (PhD student in CIS, UPenn, co-advised with B. Taskar)
- ◆ Ben Cohen (PhD student in CIS, UPenn)
- ◆ John Drake (PhD student in CIS, UPenn, co-advised with A. Safonova)
- ◆ Steven Gray (PhD student in MEAM, UPenn, co-advised with V. Kumar)
- ◆ Kalin Gochev (PhD student in CIS, UPenn)
- ◆ Bradford Neuman (PhD student in Robotics, CMU, co-advised with A. Stentz)
- ◆ Aline Normoyle (PhD student in CIS, UPenn, co-advised with A. Safonova)
- ◆ Mike Phillips (PhD student in Robotics, CMU)

Graduated PhD students:

- ◆ Subhrajit Bhattacharya, “Topological and geometric techniques in graph search-based robot planning,” MEAM, UPenn, co-advised with V. Kumar, 2011

Graduated Masters Students:

- ◆ Shinsuke Okada, Robotics, UPenn, 2011
- ◆ Dinesh Thakur with thesis “Opportunistic Refinement: Path Planning With Dynamic Constraints,” Robotics, UPenn, co-advised with V. Kumar, 2010
- ◆ Ian Ferguson with thesis “Heterogeneous Multi-Robot Coverage Mapping,” Robotics, UPenn, 2010
- ◆ Sameera Anirudh Peesapati with thesis “High-Fidelity Dynamics And Stabilization Controls For Quadrotor Uav”, ESE, UPenn, 2010
- ◆ Alex Kushleyev with thesis “Efficient Planning For Problems With Structured Uncertainty,” ESE, UPenn, 2009

Member of Thesis Committees:

- ◆ Martin Rufli, advised by R. Siegwart, ETH Zurich, Switzerland, plan to defend in 2012
- ◆ Xiaoxun Sun, “Incremental Search-based Path Planning for Agent Navigation towards a Moving Target,” advised by S. Koenig, University of Southern California, USA, defended in 2012
- ◆ Michael Dille, advised by S. Singh, Carnegie Mellon University, USA, proposed in 2011
- ◆ Paul Vernaza, “Efficient Learning and Inference for High-dimensional Lagrangian Systems,” advised by D. Lee, University of Pennsylvania, USA, defended in 2011
- ◆ Thomas Allen, “Time-optimal Active Decision Making”, advised by S. Scheduling, University of Sydney, Australia, defended in 2011
- ◆ Collin Green, advised by A. Kelly, Carnegie Mellon University, USA, proposed in 2010
- ◆ Liming Zhao, “Constructing Good Quality Motion Graphs for Realistic Human Animation,” advised by A. Safonova and N. Badler, University of Pennsylvania, USA, defended in 2009

TECHNICAL SKILLS

- ◆ Programming Languages: C/C++, Fortran 77, Lisp, Scheme, Matlab, Intel Assembly, Motorola DSP Assembly, FoxPro.
- ◆ Platforms: UNIX, Windows

LANGUAGES

Fluent in English & Russian. Some knowledge of Latvian language.

INTERESTS AND ACTIVITIES

Fishing, downhill skiing, the history of old silver

REFERENCES

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CITIZENSHIP STATUS

Citizenship of USA, Top Security Clearance