Daniel Pickem

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Education

Ph.D., Robotics **Expected May 2016**
Research Topic: Self-reconfiguration of modular robots in 3D
Adviser: Jeff Shamma, Magnus Egerstedt
Georgia Institute of Technology, Atlanta, Georgia (visit to KAUST, Thuwal, Saudi Arabia)

M.S., Electrical and Computer Engineering - Systems and Control **Dec. 2011**
Major: Electrical and Computer Engineering, Minor: Mechanical Engineering
Thesis: 3D reconfiguration using graph grammars for modular robotics
Adviser: Magnus Egerstedt
Georgia Institute of Technology, Atlanta, Georgia

B.S., Electrical Engineering and Computer Science **Juni 2010**
Vienna University of Technology, Vienna, Austria

Professional Experience

R&D Intern, Qualcomm, San Diego **May 2013 – July 2013**

- Intern at the Office of the Chief Scientist, Qualcomm's main research division
- Implemented behavior-based autonomy architecture for Turtlebot in ROS (Robot Operating System)
- Implemented nonholonomic, nonlinear controller for a differential drive robot
- Demonstrated feasibility of architecture for telepresence purposes

Robotics Research Assistant, ASDL, Georgia Institute of Technology, Atlanta **Jan. 2012 – June 2012**

- Lead software and controls engineer for an autonomous aquatic vehicle to participate in the *5th Annual International RoboBoat Competition* hosted by AUVSI
- Implemented behavior-based control architecture to enable vehicle to autonomously operate
- Implemented stereo vision and calibration algorithms for generic USB cameras
- Generated 3D representation of data collected by tilting LIDAR and stereo cameras

Intern, BMW Group, Research and Development Division, Munich, Germany **June 2011 – Aug. 2011**

- Implemented an arc spline method to approximate trajectory data and calculate curve radii for later use in adaptive cruise control
- Implemented various metrics to evaluate the quality of the approximation
- Adapted the GraphSLAM optimization framework g2o to estimate the likeliest trajectory given odometry and GPS data.

Research Assistant, Carnegie Mellon University, Pittsburgh, Pennsylvania **July 2009 – Sept. 2009**

- Extended the Spiral program generation framework (www.spiral.net) by implementing the Stockham variant of the fast Fourier transform
- Generated code for the fast Fourier transform for highly parallel graphics processing units (GPUs) using Nvidia's CUDA programming language
- Directly rehired due to the speedup achieved during the last internship

Research Assistant, Carnegie Mellon University, Pittsburgh, Pennsylvania **Aug. 2008 – Dec. 2008**

- Integrated various embedded systems into the Spiral program generation framework (www.spiral.net)
- Simulated floating-point arithmetic on integer processors and increased performance by a factor of 1.5 to 7.5 compared to emulated floating-point computation of existing libraries
- Selected out of a pool of applicants in a highly competitive internship program

Leadership Experience

Georgia Tech RoboGrads Vice President for Robotics at Georgia Tech	**April 2014 – April 2015**
Georgia Tech RoboGrads Vice President for Communications at Georgia Tech	**April 2013 – April 2014**
Georgia Tech Marine Robotics Group at Georgia Tech	**Sept. 2011 – June 2012**
Rock Climbing Instructor at Outdoor Recreation at Georgia Tech (ORGT)	**Sept. 2010 – May 2012**
Board Member for Exchange at the International Association for the Exchange of Students for Technical Experience (IAESTE), Vienna, Austria	**Sept. 2009 – Aug. 2010**
Treasurer of the Youth Club, Purbach, Austria	**Sept. 2008 – Aug. 2010**

Publications

- D. Pickem, M. Egerstedt, and J. S. Shamma, "*A Game-theoretic Formulation of the Homogeneous Self-Reconfiguration Problem*", Conference on Decision and Control (CDC) 2015 (submitted)
- D. Pickem and M. Egerstedt, "*The GRITSBot in its Natural Habitat – A Multi-Robot Testbed*", IEEE Conference on Robotics and Automation 2015 (ICRA)
- D. Pickem, M. Egerstedt, and J. S. Shamma, "*Complete Heterogeneous Self-reconfiguration: Deadlock Avoidance Using Hole-free Assemblies*", 4th IFAC Workshop on Distributed Estimation and Control in Networked Systems 2013
- D. Pickem and M. Egerstedt, "Self-reconfiguration Using Graph Grammars for Modular Robotics", 4th IFAC Conference on Analysis and Design of Hybrid Systems 2012

Honors and Awards

- **Fulbright Student Grant, Austrian-American Educational Commission** **2010 - 2012**
- **Science Summer Research Scholarship**, Vienna University of Technology **2009**

Skills

Programming	• C/C++, Python, Java, Matlab scripting, Linux bash scripting
Simulations	• Robotic Operating System (ROS), Gazebo, Player/Stage, Matlab, Simulink
Operating Systems	• Windows 2000/XP/7, Linux (Ubuntu, Fedora, Debian), embedded Linux
Software	• Eclipse, Microsoft Visual Studio, Microsoft Office, Open Office, Latex
Systems and Control	• Stability, controllability, and observability analysis, eigenvalue placement • Observer design, Kalman filter design, PID controller design • Networked and multi-agent control systems • Optimal control of linear systems
Robotics	• Path planning with A*, RRT*, and RRT Connect, self-reconfiguration planning • Computer vision (blob detection, object recognition, stereoscopic vision) • Machine learning basics, behavior-based robotic systems • Kinematics and inverse kinematics of robotic manipulators • Static, dynamic, velocity, and stiffness analysis of robotic manipulators
Modeling	• Solidworks 3D model design basics, Eagle circuit board design
Prototyping	• Arduino, Raspberry Pi, and Beaglebone-based prototyping, actuator control and data collection using microcontrollers • Atmega-based circuit board design • Epilog Lasercutter, basic 3D printing, circuit milling, SMD soldering