

Matthew Klingensmith

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Publications

Real-time 3D Reconstruction on a Mobile Device using Chunked Truncated Signed Distance Fields

(Submitted ICRA 2015)

Matt Klingensmith and Ivan Dryanovski

In this paper we present an algorithm for creating large scale, high quality volumetric maps using sparse, noisy sensor data on the Google *Tango* device. By using a novel chunked data structure for storing the volumetric data, we use much less memory than existing approaches, allowing us to map much larger areas.

Object Modelling and Recognition from Noisy and Sparse Data via Voxel Depth Carving

(ISER 2014)

Klingensmith, Hermann et. al

A paper emphasizing the use of *negative space* in object reconstruction and matching, using an efficient voxel carving technique. We extended Hermann's technique to shape reconstruction and matching, and provide a principled approach for object priors from depth images.

Closed-Loop Servoing using Real-time Markerless Arm Tracking

(Workshop ICRA 2013)

Klingensmith, et. al

A systems paper detailing an extremely fast and efficient technique of correcting robot arm localization errors using noisy depth images. We use the technique to control a robot arm to open a door.

Efficient Touch-Based Localization Through Submodularity

(ICRA 2013)

Javdani, Klingensmith et. al.

Laying theoretical groundwork for blind, touch-based localization. We use the technique to open a door from blind touches.

CHOMP: Covariant Hamiltonian Optimization for Motion Planning

(IJRR 2012)

Zucker, Ratliff, et. al.

A journal paper of the CHOMP planner and its extensions. It was a large collaboration paper between several CMU faculty and students who had used/implemented/extended the CHOMP planner. I made several of the figures, and wrote two of the sections (on collision cost and joint limits).

CHOMP-R Covariant Optimization for Motion Replanning

(Tech Report 2012)

Pivtoraiko, Klingensmith et. al.

Improvements on CHOMP for real-time replanning. I wrote most of the code used in the test implementation, and ran most of the experiments.

An Integrated System for Autonomous Robotics Manipulation

(IROS 2012)

Bagnell, Hebert, Pollard et. al.

Describing software/algorithms used in the ARM-S Competition. Large collaboration paper of everyone involved in NREC's competition team.

Work Experience

Google/Motorola Advanced Technologies and Projects

Temporary Project Staff - Summer 2014

Worked on Google's secretive project *Tango*, a mobile device with onboard IMUs, depth cameras, and visual sensors. My role here was to develop real-time 3D mapping capabilities for the sensor, which culminated in the *Chisel* application. My main advisor was Joel Hesch. I worked closely with Ivan Dryanovski from CCNY and Simon Lynen from ETH Zurich.

Completely Fair Games LLC

CEO and Founder - 2013 - present

I founded a computer game company with a friend. We've gone through our initial round of funding and are now getting ready to complete our first game, *Dwarf Corp*, which should ship in 2015.

National Robotics Engineering Center (NREC)

Student Intern - 2012 – 2013,

Software Engineer - Summer 2013

Employed as a student intern (then as a full-time employee) to work on the DARPA ARM-S project. Programmed key parts of the software infrastructure, planning algorithms and high-level behaviors. Assisted with on-site testing.

Willow Garage

Software Engineering Intern - 2011

Worked with Dr. Gil Jones on the ROS Electric Arm Navigation stack. Made improvements to the CHOMP algorithm allowing planning safely out of collision. Wrote key software (Arm Navigation Wizard and the Arm Navigation Warehouse) which would become components of the *MoveIt* software framework.

RE2, inc.

Software Engineering Intern - 2010

Developed sensor visualization, testing, and user-interface software during development of the DARPA ARM robot. Assisted in training the DARPA ARM teams, and created a block-placing demo using the robot.

Wired Up Beads

Assistant 2009

Helped maintain a sales website and took inventory for a jewelry store.

NASA Center of Information, Chugarch, inc.

Document Technician 2007

Prepared damaged / large technical documents for scanning into a database.

Education

Carnegie Mellon Robotics Institute, Pittsburgh, PA. 2013 – present

Intended Degree: Doctor of Philosophy in Robotics

Current QPA: 4.0, Advisor: Sidd Srinivasa

Carnegie Mellon Robotics Institute, Pittsburgh, PA. 2011 – 2012

Degree: Master of Science in Robotics

Final QPA: 3.9, Advisor: Nancy Pollard

Carnegie Mellon School of Computer Science, Pittsburgh, PA. 2008 – 2011

Degree: Bachelor of Science in Computer Science, Minor in Robotics

Final QPA: 3.21

Grapevine High School, Grapevine, TX. 2004 – 2008

Final GPA: 3.88.