KAI-CHIEH MA

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EDUCATION

University of Southern California (USC), California, USA Aug 2015 – May 2017
Master of Science in Computer Science, Specialization in Intelligent Robotics GPA: 3.94/4.0 (20 units currently)
Advisor: Lantao Liu, Gaurav S. Sukhatme

National Taiwan University (NTU), Taipei, Taiwan Sep 2008 – Jun 2012
Bachelor of Computer Science & Information Engineering (CSIE) GPA: 3.66/4.0

Research Interests

Robotics, Aquatic Robots, Planning Algorithms, Machine learning, Multi-robots, Reinforcement Learning, Robot Vision

PUBLICATIONS

- "An Information-Driven and Disturbance-Aware Planning Method for Long-Term Ocean Monitoring"
  Kai-Chieh Ma, Lantao Liu, Gaurav S. Sukhatme.
  IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2016). Deajeon, Korea. Oct, 2016.
  Best Application Paper Award Finalist (out of 4), also Best Student Paper Award Finalist (out of 6)
- "Multi-Robot Informative and Adaptive Planning for Persistent Environmental Monitoring"
  Kai-Chieh Ma, Zhibei Ma, Lantao Liu, Gaurav S. Sukhatme.
  International Symposium on Distributed Autonomous Robotic Systems (DARS 2016). London, UK. Nov 2016.
- "Multi-robot Informative Planning for Long-Term Ocean Monitoring"
  Kai-Chieh Ma, Lantao Liu, Gaurav S. Sukhatme.
  IEEE International Conference on Robotics and Automation (ICRA 2016) Workshop: AI for Long-term Autonomy. Stockholm, Sweden. May, 2016.
- "A Hierarchical Informative Path Planning Method for Ocean Monitoring"
  Kai-Chieh Ma, Lantao Liu, Gaurav S. Sukhatme.
  The 1st Southern California Robotics Symposium (SCR 2016). San Diego, CA. Apr 2016.
- "Informative Planning and Online Learning with Sparse Gaussian Processes"
  Kai-Chieh Ma, Lantao Liu, Gaurav S. Sukhatme.
  Submitted to IEEE International Conference on Robotics and Automation (ICRA 2017). (ArXived)

WORK EXPERIENCE

Cyberlink Corp. (Full-time) Taipei, Taiwan
Software Engineer, RD-ME-PowerDVD (19 team members) Aug 2012 – Mar 2014

- Developed PowerDVD 12, 13, 14 products (PowerDVD 12/13 Taiwan Excellence Award 2013/2014)
- Handled PowerDVD UI specification requests from OEM clients within tight schedule (HP, Dell, Lenovo, etc.)

PROJECT EXPERIENCE

USC Robotic Embedded Systems Laboratory (Advisor: Lantao Liu, Gaurav S. Sukhatme) Oct 2015 – Current
Research Assistant

- Researched path planning and learning for autonomous aquatic vehicle in unstable and unknown field
- Persistent environmental monitoring and modeling the scalar field using Gaussian Processes
- Informative waypoints generation based on mutual information using dynamic programming
- Disturbance-aware motion control for underwater vehicle using Markov Decision Processes
- Adaptive collision-free path planning for multi-robot systems using Hungarian method
- Adopted Sparse Gaussian Processes for online learning of environmental models
- Adaptive Gaussian Process hyper-parameters optimization using gradient descent

- Designed and implemented “Informative Planning and Online Learning” using ROS (Robot Operating System) on an autonomous boat and did experiments on actual environment

Multi-Robot Simultaneous Localization and Mapping (SLAM) (Instructor: Nora Ayanian) Nov 2016

- Implemented particle-based FastSLAM2.0 for landmark-based mapping and 2D mobile robot localization
- Extended the particle filter to multi-robot SLAM with unknown initial poses
- Estimation of robot motion and measurement model parameters using maximum likelihood estimation
- Used C++ and ROS for the system implementation and visualization

Machine Learning: Santander Customer Satisfaction Competition Apr 2016

- 3rd place among all groups (21) in the class and 566th out of 5236 groups participating the competition
- Dealing with supervised binary classification using gradient boosting and decision trees

Humanoid Robotics (NAO) Control Apr 2016

- Designed stepping behavior for a humanoid robot with 25 DOF's using inverse kinematics
- Motion trajectory planning using minimum jerk

RoboCup Standard Platform League (Advisor: Chieh-Chih (Bob) Wang) (5 team members) 2012, 2014

- Represented NTU Robot Perception and Learning Lab; placed in top 12 in 2012 competition
- Built robot software system from scratch within 3 months
- Devised shape and color-based object recognition algorithms for goal post & soccer ball detection
- Applied sonar-based Occupancy Grid Mapping for obstacle detection
- Implemented robot-to-robot (4 robots) communication via Wi-Fi
- Revised goal post detection for new rules in 2015 RoboCup (2014)
- Researched on motion planning under Partially Observable Markov Decision Process (POMDP) (2014)

Extended Kalman Filter Localization Dec 2011 – Feb 2012

- Tackled localization problem for mobile robot in real environment
- Implemented line feature extraction via Hough Transform based on 2D-laser data points
- Associating features with given map features to achieve robot pose correction

Mobile Robot (Pioneer 3DX) Maze Exploration (3 team members) Dec 2010 – Feb 2011

- Accomplished simple version of simultaneous localization and mapping problem using sonar sensors
- Adopted closed-loop feedback control system to avoid bumping into walls using sonar sensors
- Implemented uniform cost search algorithm to find the shortest path for the second run of the maze

SKILLS

Language: C, C++, Java, Matlab, Python, LaTeX **Tools:** Git, SVN, Linux, Unix-like, Windows

Skills: Robotics, Machine Learning, Planning Algorithms, State Estimation, Computer Vision, ROS