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Ayoung Kim

EDUCATION

University of Michigan *Dec. 2012*
Ph.D. in Mechanical Engineering
Dissertation: “Visual SLAM with Exploration for Autonomous Underwater Navigation”
Advised by Dr. Ryan M. Eustice

University of Michigan *Dec. 2011*
M.S. in Electrical Engineering (Systems)

Seoul National University (SNU) *Feb. 2007*
M.S. in Mechanical and Aerospace Engineering (MAE)
Dissertation: “Stiffness Analysis and Hybrid Control for Parallel Manipulator”
Advised by Dr. Frank C. Park

Seoul National University (SNU) *Feb. 2005*
B.S. in Mechanical and Aerospace Engineering (MAE)
Graduated *Summa cum laude*

POSITIONS

Assistant Professor *Sep. 2014 - present*
Dept. of Civil and Environmental Engineering
Korea Advanced Institute of Science Technology (KAIST)

Senior Researcher *Nov. 2013 - Aug. 2014*
IT Convergence Technology Research Laboratory
Electronics and Telecommunications Research Institute (ETRI)

Post-doctoral Research Fellow *Oct. 2012 - Sep. 2013*
Perceptual Robotics Laboratory (PeRL)
Naval Architecture and Marine Engineering Department, University of Michigan

Graduate Student Research Assistant *Sep. 2007 - Aug. 2012*
Perceptual Robotics Laboratory (PeRL)
Naval Architecture and Marine Engineering Department, University of Michigan

Graduate Student Research Assistant *Mar. 2005 - Feb. 2007*
Robotics Lab
Mechanical and Aerospace Engineering (MAE), Seoul National University (SNU)

FIELD OF INTEREST

Visual simultaneous localization and mapping (SLAM), Navigation, Path planning, Computer vision, Autonomous vehicles, Mobile robotics, Robotic perception

RESEARCH EXPERIENCE

Smart Post Project

2014 - present

Senior Researcher

ETRI

- Currently Working on optical character recognition (OCR) engine improvements for Korean letters.
- Research focus is on image processing and machine learning.

Autonomous Ship Hull Inspection

2007 - 2013

Graduate Student Research Assistant / Post-doctoral Research Fellow

PeRL Lab

- Implemented real-time visual SLAM front-end and demonstrated on several different real-world ship hulls using Hovering autonomous underwater vehicle (AUV) (HAUV).
- In collaboration with Massachusetts Institute of Technology (MIT) and Bluefin Robotics.
- Worked on real-time vision-based multisession SLAM and high-resolution photomosaic of underwater images.

Perception-driven Navigation

Ph.D. Thesis

Graduate Student Research Assistant

PeRL Lab

- Introduced quantitative measure for visual saliency for use in SLAM framework based on bag-of-word image representation.
- Developed perception-driven navigation to balance competing strategies for underwater robotic area coverage problem by calculating expected information gain and reward to determine revisit or exploration.
- Implemented and validated the saliency informed SLAM and perception-driven navigation in real-world hull inspection applications in real-time.

Multi-AUV Testbed for SLAM and Navigation research

2007 - 2012

Graduate Student Research Assistant

PeRL Lab

- Modified stock Ocean-Server's Iver2 into a multi-AUV testbed for robotic navigation research.
- Mapped National Oceanic and Atmospheric Administration (NOAA) Thunder Bay National Marine Sanctuary using two modified AUVs equipped with sidescan sonar and optical cameras.

Sensor Data Based Motion Planner project

2006 - 2007

Graduate Student Research Assistant

SNU Robotics Lab

- Participated in the mobile manipulation and movement coordination subproject.
- Researched control algorithms for a mobile manipulator with holonomic/nonholonomic constraint under consideration of mobile robot dynamics.

Modular Robot System Design and Motion Generation Simulator Project

2005 - 2006

Graduate Student Research Assistant

SNU Robotics Lab

- Developed robot hardware interface module for a Lie group dynamics-based simulator.

- Analyzed and developed a control algorithm for parallel manipulator to achieve stiffness improvement by exploiting redundant actuation.

PUBLICATIONS AND PRESENTATIONS

Journal Papers

- Ayoung Kim and Ryan M. Eustice. Active visual SLAM for robotic area coverage: Theory and experiment. *International Journal of Robotics Research, Special Issue on Robot Vision*. Accepted. To appear
- Ayoung Kim and Ryan M. Eustice. Real-time visual SLAM for autonomous underwater hull inspection using visual saliency. *IEEE Transactions on Robotics*, 29(3):719–733, June 2013
- Franz S. Hover, Ryan M. Eustice, Ayoung Kim, Brendan Englot, Hordur Johannsson, Michael Kaess, and John J. Leonard. Advanced perception, navigation and planning for autonomous in-water ship hull inspection. *International Journal of Robotics Research, Special Issue on 3D Exploration, Mapping, and Surveillance*, 31(12):1445–1464, Oct. 2012
- Hunter C. Brown, Ayoung Kim, and Ryan M. Eustice. An overview of autonomous underwater vehicle research and testbed at PeRL. *Marine Technology Society Journal*, 43(2):33–47, 2009

Conference Papers

- Stephen M. Chaves, Ayoung Kim, and Ryan M. Eustice. Opportunistic sampling-based planning for active visual SLAM. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, Chicago, IL, Sep 2014. Accepted, To Appear
- Ayoung Kim. Toward autonomous underwater structure inspection using perception-driven navigation. In *ICCES Symposium on Mechatronics and robotics for civil structures*, Changwon, S. Korea, Jun. 2014. Abstract. Accepted, To Appear
- Ayoung Kim and Ryan M. Eustice. Perception-driven navigation: Active visual SLAM for robotic area coverage. In *Proceedings of the IEEE International Conference on Robotics and Automation*, pages 3181–3188, Karlsruhe, Germany, May 2013
- Ayoung Kim and Ryan M. Eustice. Next-best-view visual SLAM for bounded-error area coverage. In *IROS Workshop on Active Semantic Perception*, Vilamoura, Portugal, Oct. 2012
- Ayoung Kim and Ryan M. Eustice. Combined visually and geometrically informative link hypothesis for pose-graph visual SLAM using bag-of-words. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, pages 1647–1654, San Francisco, CA, Sep. 2011
- Ayoung Kim and Ryan Eustice. Pose-graph visual SLAM with geometric model selection for autonomous underwater ship hull inspection. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, pages 1559–1565, St. Louis, MO, Oct. 2009
- Ayoung Kim and Ryan M. Eustice. Toward AUV survey design for optimal coverage and localization using the cramer rao lower bound. In *Proceedings of the IEEE/MTS OCEANS Conference and Exhibition*, pages 1–7, Biloxi, MS, Oct. 2009
- Hunter Brown, Ayoung Kim, and Ryan Eustice. Development of a multi-AUV SLAM testbed at the University of Michigan. In *Proceedings of the IEEE/MTS OCEANS Conference and Exhibition*, pages 1–6, Quebec, Canada, Sept. 2008
- Ryan M. Eustice, Hunter C. Brown, and Ayoung Kim. An overview of AUV algorithms research and testbed at the University of Michigan. In *Proceedings of the IEEE/OES Autonomous Underwater Vehicles Conference*, pages 1–9, Woods Hole, MA, Oct. 2008

- A-Young Kim, Sitae Kim, Jay-Il Jeong, Jongwon Kim, and F.C. Park. Exploiting redundant actuation to enhance the static stiffness of parallel mechanisms. In *The 13th International Conference on Advanced Robotics*, Jeju, Korea, Aug. 2007

Dissertations

- Ayoung Kim. *Active visual SLAM with exploration for autonomous underwater navigation*. PhD thesis, University of Michigan, Ann Arbor, MI, Aug. 2012
- Ayoung Kim. Stiffness analysis and hybrid control for parallel manipulator. Master's thesis, Seoul National University, Seoul, Korea, Dec. 2007

Presentations

- Civil and Environmental Engineering, Korea Advanced Institute of Science and Technology, Daejun, Korea, Apr., 2014.
- Korea Institute of Ocean Science and Technology, Daejun, Korea, Nov., 2013.
- Mechanical Engineering and Aerospace Engineering, Seoul National University, Seoul, Korea, Sep., 2012.
- Samsung Heavy Industries Research Institute, Daejun, Korea, Sep., 2012.
- Mechanical Engineering / Ocean and Resource Engineering, University of Hawaii, Honolulu, HI, USA, Sep., 2012.
- Ocean Systems Engineering, Korea Advanced Institute of Science and Technology, Daejun, Korea, Nov., 2010.

AWARDS AND HONORS

2009, 2011	Rackham Travel Grant Award
2005 - 2007	Funding from Samsung Electronics, Inc.
2005	Graduated <i>Summa cum laude</i> , MAE, SNU.
2004	“Best Presentation Award of Bachelor Thesis”, MAE, SNU.
2002	Idea Prize in “Creative Design” course to be a selected participant to International Design Contest (IDC) held at MIT
2001 - 2005	Scholarship, MAE, SNU.

PROFESSIONAL MEMBERSHIPS

2008 -	Institute of Electrical and Electronics Engineers (IEEE)
2009 -	Korean-American Scientists and Engineers Association (KSEA)
2011 -	IEEE Robotics and Automation Society
2011 -	IEEE Oceanic Engineering Society
2011 -	IEEE Women in Engineering
2014 -	Korea Robotics Society (KROS)
2014 -	Korean Society of Ocean Engineering (KSOE)
2014 -	Women in Science, Engineering and Technology (WISET), Guest Mentor
2014 -	Institute of Control, Robotics and Systems (ICROS)

SERVICES

Undergraduate Student Volunteer: Computer Lab

Sep. 2002 - Feb. 2005

- Mechanical and Aerospace Engineering, Seoul National University

Reviewer

- AIAA Journal of Guidance, Control, and Dynamics.
- Elsevier Robotics and Autonomous Systems.
- Elsevier Ocean Engineering.
- IEEE/RSJ International Conference on Intelligent Robots and Systems.
- IEEE International Conference on Robotics and Automation.
- International Journal of Control, Automation and Systems.
- International Journal of Precision Engineering and Manufacturing.
- Methods in Ecology and Evolution.

LANGUAGES & SKILLS

- Korean (native), English (fluent)
- MATLAB, C/C++, CAD/CAE softwares (Solidworks, Auto CAD)
- L^AT_EX, subversion, Microsoft Office, Ubuntu, Windows