

JUNG YUN BAE

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EDUCATION

TEXAS A&M UNIVERSITY, College Station, TX MAY 2014
Ph.D. in Mechanical Engineering

Dissertation Title: Algorithms for Multiple Vehicle Routing Problems

HONGIK UNIVERSITY, Seoul, Korea FEB. 2007
Master of Engineering in Mechanical Engineering

Thesis Title: Probabilistic Localization and Path Planner for Mobile Robots

HONGIK UNIVERSITY, Seoul, Korea FEB. 2005
Bachelor of Engineering in Mechanical Engineering

Thesis Title: Exploration Algorithm for Efficient Sensing Using Multiple Robots

RESEARCH EXPERIENCE

MICHIGAN TECHNOLOGICAL UNIVERSITY, Houghton, MI

*Assistant Professor in Department of Mechanical Engineering-Engineering
Mechanics, Department of Applied Computing* AUG. 2019-CURRENT

- Research topics: Multiple Robot Coordination, Heterogeneous Robotic Teams, Job assignment, Path planning, Scheduling, Motion Control, Autonomous Navigation, Algorithms
- “A Vision-Based Autonomous Navigation Platform for Multiple Mobile Robot Systems” Research Excellence Fund sponsored by Michigan Tech

KOREA UNIVERSITY, Seoul, Korea

*Research Professor in Intelligent Systems and Robotics Laboratory
(Mentor: Dr. Woojin Chung)*

SEP. 2014-AUG. 2015
MAR. 2018-JUL. 2019

- Research topics: Multiple Vehicle Path Planning, Multi-robot Control, Coordination of multiple heterogeneous robots, Vehicle routing problems, Unmanned Vehicles, Optimization
- Developed heuristics for the multiple heterogeneous Automated Guided Vehicle (AGV) routing problems
- Created a heuristic for the multiple vehicle routing problem while considering structural and functional heterogeneity at the same time
- Implemented job assignment and path planning for multiple robots for transportation in greenhouse
- Half funded by Korea University with research faculty grant in 2014
- Fully funded by Development group for creative research engineers of mechanical convergence systems (BK21) at Korea University in 2018

TEXAS A&M UNIVERSITY, College Station, TX

*Research Assistant in Autonomous Systems Laboratory
(Advisor: Dr. Sivakumar Rathinam)*

AUG. 2008-MAY 2014

- Research topics: Optimization, Approximation algorithms, Heuristics, Unmanned Vehicles, Multiple Vehicle Path Planning
- Developed approximation algorithms for the multiple vehicle routing problems
- Developed heuristics for the multiple heterogeneous vehicle routing problems based on a primal-dual technique
- Generated MATLAB Simulator for multiple vehicle routing problems

RESEARCH**EXPERIENCE, CON'T**

- KOREA INSTITUTE of INDUSTRIAL TECHNOLOGY**, Ansan, Korea
Researcher in Division of Applied Robot Technology FEB. 2007-JAN. 2008
- Developed simulator of Geolocation System using a single base station
 - Generated evaluation scenarios and designed an intelligent mobile robot performance evaluation system
 - Implemented autonomous navigation algorithms for the personal service robots, SEROPI and CMR-P3

- HONGIK UNIVERSITY**, Seoul, Korea
Research Assistant in Robotics Laboratory
 (Advisor: Dr. Sooyong Lee) DEC. 2003-FEB. 2007
- Research topics: Path planning and Localization of Mobile Robots
 - Developed path planner for sensing and exploration based on probability map and performed experiments on collaborative control of multiple mobile robots
 - Studied a new localization method based on artificial landmark called IRID (InfraRed IDentification)

- KOREA INSTITUTE of SCIENCE and TECHNOLOGY**, Seoul, Korea
Intern in Human Robot Center JUN. 2003-AUG. 2003
- Assisted with development of stationary position control of blimp using optical flow sensors

TEACHING**EXPERIENCE**

- MICHIGAN TECHNOLOGICAL UNIVERSITY**, Houghton, MI
Assistant professor in Department of Mechanical Engineering-Engineering Mechanics, Department of Applied Computing AUG. 2019-CURRENT
- Teaching assignments: LabVIEW Programming for Data Acquisition, Autonomous Systems, Optimization I
 - Designed the courses with hands-on laboratory sessions
 - Recognized by students as a faculty member who did an excellent job of transitioning from face-to-face instruction to remote learning under the pandemic caused by COVID-19, May 2020.

- YANGJAE HIGHSCHOOL**, Seoul, Korea
Team Advisor JUN.-OCT. 2017/ JUN.-NOV. 2018
- Participated in Research and Education Competition Program
 - Awarded for Bronze prizes in 2017, 2018
 - Short paper title#1: Path planning and control of a drawing manipulator
 - Advised three sophomore students to generate simulator to draw pictures of their own chosen characters using manipulator with MATLAB
 - Short paper title#2: Path planning and control of a car-like mobile robot
 - Advised four junior students to generate path planner for a mobile robot that has motion of Durbin's car and generated simulation of a robot having tour in a virtual shopping center.

- TEXAS A&M UNIVSERSITY**, College Station, TX
Teaching Assistant AUG. 2008-MAY 2010
- Assisted with Statics and Particle Dynamics (80 students), Solid Mechanics in Mechanical Design (35 students), Introduction to Mechanical Engineering Design (100 students)
 - Organized problem sessions, regular office hours
 - Performed lectures when the instructor was absent

HONGIK UNIVERSITY, Seoul, Korea

Teaching Assistant

DEC. 2003-FEB. 2007

- Assisted drafting of teaching guide/aid for network-based robot education system course
- Performed supplementary lectures to undergraduate students on using programming tools for simulations
- Created handouts for ‘Mechanism design,’ ‘Control systems and Design’ and ‘Introduction to Mechatronics’ courses

AWARDS/ACTIVITY

- **Certified for online teaching**, Educational Technology Organization of Michigan, June 2020.
- **Most Downloaded Article Award from 2017 to 2018** from International Journal of Precision Engineering and Manufacturing, Oct. 2019
- **Outstanding Paper Award** from 16th International Conference on Ubiquitous Robots (UR), June 2019
- **International Conference Travel Award** from support program for non-tenure track Ph.D. Women in STEM Korea, funded by Korea Center for Women in Science, Engineering and Technology, May 2019
- Served as an **Associate Editor** for International Conference on Robotics and Automation (ICRA) 2020, which is the largest international conference on robotics.
- **Active Reviewer** for multiple international peer-review journals: “Intelligent Service Robotics,” “International Journal of Advanced Robotic Systems,” “International Journal of Precision Engineering and Manufacturing,” “Soft Computing,” “Autonomous Robots,” “Industrial Robot.”

PATENTS

- [1] Korean Patent, Application number: 10-2018-0150821, “**AUTOMATED TRANSPORTATION SYSTEM AND JOB ASSIGNING METHOD**,” under review, Nov. 2018
- [2] Korean Patent, Application number: 10-2019-0050306, “**TASK ASSIGNING METHOD AND TASK ASSIGNING SYSTEM FOR TWO HETEROGENEOUS ROBOTS**,” under review, April, 2019

PUBLICATIONS

Journals

- [1] J. Bae and W. Chung, “**Heuristics for Heterogeneous Robot Coordination to Minimize the Maximum Traveling Cost**,” Sensors, vol.19, no. 11, pp. 2461, doi: 10.3390/s19112461, 2019 ([IF 3.031](#), [Instruments & instrumentation](#), SCIE)
- [2] J. Bae and W. Chung, “**Efficient Path Planning for Multiple Transportation Robots under various loading conditions**,” International Journal of Advanced Robotic Systems, vol.16, no.2, doi: 10.1177/1729881419835110, 2019 ([IF 0.952](#), [Robotics-SCIE](#))
- [3] J. Bae and W. Chung, “**A heuristic for Path Planning of Multiple Heterogeneous Automated Guided Vehicles**,” International Journal of Precision Engineering and Manufacturing, vol.19, no.12, pp.1765-1771, 2018 ([IF 1.661](#), [Manufacturing/Engineering](#), [Engineering](#), [mechanical](#) -SCIE)
- [4] J. Bae and W. Chung, “**A Heuristic for a Heterogeneous Automated Guided Vehicle Routing Problem**,” International Journal of Precision Engineering and Manufacturing, vol.18, no.6, pp.795-801, 2017 ([IF 1.661](#), [Manufacturing/Engineering](#), [Engineering](#), [mechanical](#) -SCIE)
- [5] J. Bae and S. Rathinam, “**A primal-dual approximation algorithm for a two depot heterogeneous traveling salesman problem**,” Optimization Letters, vol.10, no.6, pp. 1269-1285, 2016 ([IF 1.031](#), [Operations Research & Management Science/Mathematical](#), [Applied](#)-SCIE)
- [6] J. Bae and S. Rathinam, “**Approximation Algorithm for a Heterogeneous Vehicle Routing Problem**,” International Journal of Advanced Robotic Systems, 2015, 12:113. doi: 10.5772/60086,

2015 (IF 0.952, Robotics-SCIE)

- [7] J. Bae, S. Rathinam, “**Approximation algorithms for multiple terminal, heterogeneous problems,**” Optimization Letters, vol.6, no.1, pp. 69-85, 2012 (IF 1.031, Operations Research & Management Science/Mathematical, Applied-SCIE)
- [8] J. Bae, G. Kim, S. Lee, “**Application of Perturbation/Correlation based Gradient Estimation for Environment Exploration**”, IJCS, vol.7, no.2, pp.233-241, 2009 (IF 2.173, Automation & Control Systems-SCIE)
- [9] J. Bae, S. Lee, J. Song, “**Use of coded infrared light for mobile robot localization,**” Journal of mechanical science and technology, vol.22, no.7, pp. 1279-1286, 2008 (IF 1.194, Engineering, mechanical -SCIE)

Conferences

- [1] S. Rathinam, R. Ravi, J. Bae, K. Sundar, “**Primal-Dual 2-Approximation Algorithm for the Monotonic Multiple Depot Heterogeneous Traveling Salesman Problem,**” SWAT 2020: 17th Scandinavian Symposium and Workshops on Algorithm Theory, June 2020
- [2] J. Bae, W. Chung, “**A Heuristic for Coordination of Two Heterogeneous Mobile Robots while Minimizing Maximum Travel Cost,**” International Conference on Ubiquitous Robots 2019 (UR), June 2019
- [3] J. Bae, J. Lee, W. Chung, “**A heuristic for Task allocation and Routing of Heterogeneous Robots while Minimizing Maximum Tour Cost,**” International Conference on Robotics and Automation (ICRA), May 2019
- [4] J. Bae, W. Chung, “**A heuristic for a Dispatching and Routing problem of Multiple Heterogeneous Transportation Robot,**” Korean Robotics Society Annual Conference (KRoC), January, 2019
- [5] J. Bae, S. Rathinam, “**A Primal-Dual Algorithm for a Heterogeneous Traveling Salesman Problem,**” ASME Dynamic Systems and Control Conference (DSCC), 2011
- [6] S. Yadlapalli, J. Bae, S. Rathinam, S. Darbha, “**Approximation Algorithms for a Heterogeneous Multiple Depot Hamiltonian Path Problem,**” American Control Conference (ACC), USA, 2011
- [7] G. Kim, J. Bae, K. Nam, S. Lee, W. Shon, S. Kim, and J. Kang, “**Self-Localization of Mobile Robot using High Accurate Two-Dimensional Geo-Location System,**” The 6th International Conference on Computing, Communications and Control Technologies (CCCT), USA, 2008
- [8] J. Bae, S. Lee, J. Song, “**Use of IRID (InfraRed IDentification) for Mobile Robot Localization,**” ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, Vol. 2: 30th Annual Mechanisms and Robotics Conference, Parts A and B, pp.919-923, 2006
- [9] J. Bae, S. Lee, B. Lee, “**Mobile Robot Path Planner for Environment Exploration,**” International Conference on Ubiquitous Robots and Ambient Intelligence (URAI), pp.337-343, 2006
- [10] J. Bae, S. Lee, “**Exploration Algorithm for Multiple Robots,**” the 12th International Conference on Advanced Robotics (ICAR), pp. 895-900, 2005
- [11] J. Bae, S. Lee, “**Active Sensing Based Mobile Robot Exploration,**” IEEE/ASME International Conference Advanced Intelligent Mechatronics (AIM), pp. 934-939, 2005