Jungwon Kang, Ph.D

Postdoctoral Researcher,
Department of Earth and Space Science and Engineering,
Lassonde School of Engineering, York University

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PERSONAL

Date of Birth: Jan. 11, 1981
Place of Birth: Seoul, Republic of Korea
Citizenship: Republic of Korea

RESEARCH INTEREST

Computer Vision and Robotics
• Localization & mapping (including visual SLAM / semantic mapping)
• Perception & navigation
• Computer vision (stereo matching / motion segmentation / object detection and recognition)
• Machine learning & deep learning
• Mobile robot platform development

EDUCATION

KAIST, Daejeon, Republic of Korea
Ph.D., Electrical Engineering, Feb. 2016
• Thesis: Online Motion Segmentation through Multi-Temporal Section Motion Analysis in Dynamic Scenes
• Advisors: Prof. Myung Jin Chung and Prof. Dong-Jo Park

M.S., Electrical Engineering, Feb. 2006
• Thesis: Simultaneous Localization and Map Building for a Mobile Robot Using Sensor Fusion of Laser Range Finder and Omni-Directional Vision Sensor
• Advisor: Prof. Myung Jin Chung
• GPA: 3.97/4.3

Korea University, Seoul, Republic of Korea
B.E., Electrical Engineering, Feb. 2004
• GPA: 4.27/4.5

RESEARCH EXPERIENCE

Augmented Urban Space Modeling Lab (Supervisor: Prof. Gunho Sohn), Toronto, Canada
Postdoctoral Researcher Apr. 2017 – Present

KAIST Institute for Robotics (Director: Prof. Junho Oh), Daejeon, Republic of Korea
Postdoctoral Researcher Apr. 2016 – Jan. 2017

Center for Robot Vision and Perception, **KAIST** (Director: Prof. Myung Jin Chung), Daejeon, Republic of Korea
Researcher Nov. 2009 – Apr. 2014

Institute of Automation, **Universität Bremen**, Bremen, Germany
Visiting Scholar July 5 ~ 31, 2010
Advisor: Prof. Axel Gräser

Robotics Institute, **Carnegie Mellon University**, Pittsburgh, PA, USA
Intern Scholar Jan. 2009 – Sept. 2009
Advisors: Dr. Seok Won Bang (major advisor) and Prof. Christopher G. Atkeson

Unmanned Technology Research Center, **KAIST** (Director: Prof. Soo-Hyun Kim), Daejeon, Republic of Korea
Researcher June 2007 – Dec. 2008, Mar. 2010 – Oct. 2014

Human-friendly Welfare Robot System Engineering Research Center, **KAIST** (Director: Prof. Z. Zenn Bien), Daejeon, Republic of Korea
Researcher Mar. 2004 – Feb. 2008

PROJECTS	**Terrain Reconstruction with Traversability Analysis**, Agency for Defense Development (ADD), Mar. 2010 – Oct. 2014
	Semantic 3D Mapping for Intelligent Vehicles, Korea Institute for Robot Industry Advancement (KIRIA), Nov. 2009 – Apr. 2014
	Ceiling Vision-Based Robot Navigation in a Large Indoor Environment, Electronics and Telecommunications Research Institute (ETRI), July 2010 – Sept. 2010
	Visual SLAM & Navigation Using Ceiling Images for a Hospital Service Robot, Korea Institute of Robots and Convergence (KIRO), Jan. 2009 – Sept. 2009
	Terrain Reconstruction Using Stereo Vision and LIDARs, Agency for Defense Development (ADD), June 2007 – Dec. 2008
	Coverage Path Planning for a Cleaning Robot, Samsung Advanced Institute of Technology (SAIT), Mar. 2006 – Sept. 2006
	Trajectory Generation for a Tool Center Point of a Robot Arm, Samsung Heavy Industries, June 2004 – Dec. 2004
	Development of Assistive Mobile Robots in a Factory Environment, National Research Foundation of Korea (NRF), Mar. 2004 – Feb. 2008
SKILLS	Languages: C/C++, MATLAB, CUDA Libraries: Qt, OpenCV, OpenGL, and many other libraries Operating Systems: Linux (Ubuntu), Windows
EMBEDDED SYSTEM EXPERIENCE	**Atmel AT90CAN128 & CPLD Altera EPM3128ATC100-5** : I used them for controlling a motor and ultrasonic sensors in the project 'Development of Assistive Mobile Robots in a Factory Environment'.
	Intel PXA255 Processor : I used a board with this processor in the class EE484 - Embedded Systems (Prof. Byung Kook Kim, KAIST, Fall 2004) and SEP562 - System Software for Embedded Systems (Prof. Joonwon Lee, KAIST, Spring 2006), testing kernel porting, device driver, GPIO, serial communication, Socket-based networking.
	Altera FPGA-based Nios II Processor : I used this processor in the class SEP561 - Embedded Computing (Prof. Seungryoul Maeng, KAIST, Spring 2007).
HONORS AND AWARDS	Annual Research Award, Department of Electrical Engineering, KAIST, 2009 Annual Research Award, Department of Electrical Engineering, KAIST, 2008 Annual Research Award, Department of Electrical Engineering, KAIST, 2007 Best Poster Paper Award, The 4th International Conference on Ubiquitous Robots and Ambient Intelligence, 2007
TEACHING EXPERIENCE	Teaching Assistant, KAIST • EE683 Robot Control (Fall 2007) • EE381 Control System Engineering (Spring 2007) • EE582 Digital Control (Fall 2006) • EE103 Introductory Lab. for Electrical and Electronic Engineering (Spring 2006) • CC522 Introduction to Instruments (Fall 2005) • EE305 Electronics Lab. I (Spring 2005)
PUBLICATIONS	*International Journal* [IJ01] **Jungwon Kang** and Myung Jin Chung, "Fast Online Motion Segmentation through Multi-Temporal Interval Motion Analysis," IEICE Transactions on Information and Systems, vol. E98-D, no. 2, pp. 479-484, Feb. 2015. (SCIE) [IJ02] Sijong Kim, **Jungwon Kang**, and Myung Jin Chung, "Probabilistic Voxel Mapping Using an Adaptive Confidence Measure of Stereo Matching," Intelligent Service Robotics, vol. 6, no. 2, pp. 89-99, Apr. 2013. (SCIE) [IJ03] **Jung Won Kang**, Hyun Seok Hong, Bong Sung Kim, and Myung Jin Chung, "Assistive Mobile Robot Systems helping the Disabled Workers in a Factory Environment," International Journal of Assistive Robotics and Mechatronics, vol. 9, no. 2, pp. 42-52, June 2008. [IJ04] **Jung Won Kang**, Hyun Seok Hong, Bong Sung Kim and Myung Jin Chung, "Work Assistive Mobile Robots Assisting the Disabled in a Real Manufacturing Environment,"

International Journal of Assistive Robotics and Mechatronics, vol. 8, no. 3, pp. 11-18, Sept. 2007.

International Conference

[IC01] **Jungwon Kang**, Si Jong Kim, and Myung Jin Chung, "Robust Clustering of Multi-Structure Data with Enhanced Sampling," International Conference on Ubiquitous Robots and Ambient Intelligence, Nov. 2013.

[IC02] **Jungwon Kang**, Sang Un Park, and Myung Jin Chung, "Online Motion Segmentation using Spatially-constrained J-linkage in Dynamic Scene," IEEE International Conference on Robotics and Biomimetics, Dec. 2012.

[IC03] Taek Jun Oh, **Jungwon Kang**, Sijong Kim, and Myung Jin Chung, "A Practical 6D Robot Pose Estimation Using GPS and IMU in Outdoor," International Conference on Ubiquitous Robots and Ambient Intelligence, Nov. 2012.

[IC04] **Jungwon Kang**, Bo Gil Seo, and Myung Jin Chung, "Online 3D World Reconstruction with Independently Moving Point Detection Using Stereo Vision," International Conference on Control, Automation and Systems, Oct. 2012.

[IC05] **Jungwon Kang**, Sijong Kim, Taek Jun Oh, and Myung Jin Chung, "Moving Region Segmentation using Sparse Motion Cue from a Moving Camera," International Conference on Intelligent Autonomous Systems, June 2012.

[IC06] **Jungwon Kang** and Myung Jin Chung, "Stereo-Vision Based Free Space and Obstacle Detection with Structural and Traversability Analysis Using Probabilistic Volume Polar Grid Map," IEEE International Conference on Robotics, Automation and Mechatronics, Sept. 2011.

[IC07] **Jungwon Kang**, Sijong Kim, Yungeun Choe, Sangun Park, Inwook Shim, Seung Uk Ahn, and Myung Jin Chung, "Building a Mobile Platform for Spatiotemporal Integration of 3D Outdoor World Models," Korea-Japan Joint Workshop on Frontiers of Computer Vision, Feb. 2011.

[IC08] Sijong Kim, **Jungwon Kang**, Inwook Shim, Sangun Park, and Myung Jin Chung, "Stereo Vision based 3D World Modeling for Intelligent Vehicle Navigation," International Conference on Ubiquitous Robots and Ambient Intelligence, Nov. 2010.

[IC09] **Jungwon Kang**, Myung Jin Chung, Seok Won Bang, Christopher G. Atkeson, Youngjin Hong, Jinho Suh, and Jungwoo Lee, "Ceiling Vision Based Autonomous Navigation of a Mobile Robot using Hybrid Visual Features in a Large Indoor Environment," International Conference on Ubiquitous Robots and Ambient Intelligence, Nov. 2010.

[IC10] **Jungwon Kang** and Myung Jin Chung, "Real-Time Dense Stereo Matching using Adaptive Support Window for Robot Navigation in an Environment with Large Depth Variation," International Conference on Ubiquitous Robots and Ambient Intelligence, Nov. 2010.

[IC11] Woo Hyun Kim, **Jung Won Kang**, and Myung Jin Chung, "Dense Stereo Matching using Texture-less Region Extraction in the Urban Environment," International Conference on Ubiquitous Robots and Ambient Intelligence, Oct. 2009.

[IC12] Ji Hoon Joung, Kwang Ho An, **Jung Won Kang**, Myung Jin Chung, and Wonpil Yu, "3D Environment Reconstruction Using Modified Color ICP Algorithm by Fusion of a Camera and a 3D Laser Range Finder," IEEE/RSJ International Conference on Intelligent Robots and Systems, Oct. 2009.

[IC13] Ji Hoon Joung, Kwang Ho An, **Jung Won Kang**, Woo Hyun Kim, and Myung Jin Chung, "3D Terrain Reconstruction Using 2D Laser Range Finder and Camera Based on Cubic Grid," International Conference on Ubiquitous Robots and Ambient Intelligence, Nov. 2008.

[IC14] **Jung Won Kang**, Bong Sung Kim, and Myung Jin Chung, "Development of Omni-Directional Mobile Robots with Mecanum Wheels Assisting the Disabled in a Factory Environment," International Conference on Control, Automation and Systems, Oct. 2008.

[IC15] **Jung Won Kang**, Bong Sung Kim, and Myung Jin Chung, "Development of Assistive Mobile Robots Helping the Disabled Work in a Factory Environment," IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications, Oct. 2008.

[IC16] Si Jong Kim, **Jung Won Kang**, and Myung Jin Chung, "Efficient Area Coverage Method for a Mobile Robot in Indoor Environments," International Conference on Ubiquitous Robots and Ambient Intelligence, Nov. 2007.

[IC17] **Jung Won Kang**, Hyun Seok Hong, Bong Sung Kim, and Myung Jin Chung, "Development of Assistive Mobile Robots for a Manufacturing Environment," International Workshop on Human-friendly Welfare Robotics Systems, Oct. 2007.

[IC18] Myung Jin Chung, **Jung Won Kang** and Hyun Seok Hong, "Application of Assistive Mobile Robots to a Manufacturing Environment," International Symposium on Humanized Systems, Sept. 2007.

[IC19] **Jung Won Kang**, Si Jong Kim, Myung Jin Chung, Hyun Myung, Jun Ho Park, and Seok Won Bang, "Path Planning for Complete and Efficient Coverage Operation of Mobile Robots," IEEE International Conference on Mechatronics and Automation, Aug. 2007.

[IC20] **Jung Won Kang**, Hyun Seok Hong, and Myung Jin Chung, "Designing Work Assistant Mobile Robot Type III for the Handicapped in a Real Manufacturing Environment," International Workshop on Human-friendly Welfare Robotics Systems, Oct. 2006.

[IC21] Hyun Seok Hong, **Jung Won Kang**, and Myung Jin Chung, "Work Assistant Mobile Robot Type I and II for the Handicapped in a Real Manufacturing Environment," International Workshop on Human-friendly Welfare Robotic Systems, Nov. 2005.

[IC22] Hyun Seok Hong, Sung-Yoon Jung, Jik-Han Jung, Byung-Gu Lee, **Jung Won Kang**, Dong-Jo Park, and Myung Jin Chung, "Development of Work Assistant Mobile Robot System for the Handicapped in a Real Manufacturing Environment," IEEE International Conference on Rehabilitation Robotics, June 2005.

Domestic Journal (in Korean)

[DJ01] **Jungwon Kang**, Seok Won Bang, Christopher G. Atkeson, Youngjin Hong, Jinho Suh, Jungwoo Lee, and Myung Jin Chung, "Monocular Vision Based Localization System Using Hybrid Features from Ceiling Images for Robot Navigation in an Indoor Environment," Journal of Korea Robotics Society, vol. 6, no. 3, pp. 197-209, Sept. 2011.

[DJ02] Sijong Kim, **Jungwon Kang**, Yungeun Choe, Sang Un Park, Inwook Shim, Seunguk Ahn, and Myung Jin Chung, "The Development of Sensor System and 3D World Modeling for Autonomous Vehicle," Journal of Institute of Control, Robotics and Systems, vol. 17, no. 6, pp. 531-538, 2011.

[DJ03] Ji Hoon Joung, Kwang Ho An, **Jung Won Kang**, Woo Hyun Kim, and Myung Jin Chung, "3D Terrain Reconstruction Using 2D Laser Range Finder and Camera Based on Cubic Grid for UGV Navigation," Journal of the Institute of Electronics Engineers of Korea, vol. 45-SC, no. 6, pp. 26-34, Nov. 2008.

[DJ04] Si-Jong Kim, **Jung Won Kang**, and Myung Jin Chung, "Efficient Coverage Path Planning and Path Following in Dynamic Environments," Journal of Korea Robotics Society, vol. 2, no. 4, pp. 304-309, Dec. 2007.

Domestic Conference (in Korean)

[DC01] Jongyong Do, **Jungwon Kang**, Seokwoo Jung, Jiwon Jung, and David Hyunchul Shim, "Lane-Level Vehicle Localization Using Segmented AVM Images," KSME Conference, December 2016.

[DC02] Jeong Hyo Ha, **Jungwon Kang**, Sijong Kim, Seunguk Ahn and Myung Jin Chung, "3D Reconstruction in Urban Environments Using Stereo Matching Algorithm for a Mobile Robot," KIEE Conference, July 2011.

[DC03] Seunguk Ahn, **Jungwon Kang**, Inwook Shim, and Myung Jin Chung, "Analysis of GPU Performance on Implementation of Dense Stereo Matching," ICROS Conference, Dec. 2010.

[DC04] Inwook Shim, Yungeun Choe, Sangun Park, **Jungwon Kang**, and Myung Jin Chung, "Enhanced Sensor Architecture with Fusion of LIDAR and Camera for a Robotic Vehicle in Urban Environments," IEEK Conference, Nov. 2010.

[DC05] Sijong Kim, **Jungwon Kang**, Inwook Shim, Sangun Park, and Myung Jin Chung, "Stereo Vision Based 3D World Modeling for Unmanned Ground Vehicle Navigation," IEEK Conference, Nov. 2010.

[DC06] **Jungwon Kang**, Myung Jin Chung, "Robust Real-Time Stereo Camera 6D Pose Estimation for Robot Navigation," IEEK Conference, Nov. 2010.

[DC07] Inwook Shim, Sangun Park, **Jungwon Kang**, Si Jong Kim, Yeon Geol Ryu, and Myung Jin Chung, "Introduction to Parallel Processing Techniques for Computer Vision," Workshop on Image Processing and Image Understanding, Jan. 2010.

[DC08] Sangun Park, Inwook Shim, **Jungwon Kang**, Si Jong Kim, Yeon Geol Ryu, M. J. Chung, "Implementation of Dense Stereo Matching Using GPU," Workshop on Image Processing and Image Understanding, Jan. 2010.

[DC09] Woo Hyun Kim, Kwang Ho An, **Jungwon Kang**, Ji Hoon Joung, and Myung Jin Chung, "Real-Time 3D Terrain Reconstruction Based on Stereo Vision with GPS/IMU," The Workshop of Military Robots, Oct. 2008.

[DC10] Ji Hoon Joung, Kwang Ho An, **Jung Won Kang**, Woo Hyun Kim, and Myung Jin Chung, "3D Terrain Reconstruction Using CCD Camera and Laser Range Finder Based on Cubic Grid for UGV Navigation," The National Defence Information and Control Technology Conference, July 2008.

[DC11] **Jung Won Kang**, Kwang Ho An, Ji Hoon Joung, Woo Hyun Kim, and Myung Jin Chung, "Real Time 3D Terrain Reconstruction Using Stereo Vision for UGV Navigation," KRS Conference on Advanced Intelligent Robot, June 2008.

[DC12] **Jung Won Kang**, Si Jong Kim, Myung Jin Chung, and Farrokh J. Sharifi, "A Person Following for a Mobile Robot Using a Vision and Sonar Sensors," KRS Conference on Advanced Intelligent Robot, June 2008.

[DC13] Si Jong Kim, **Jung Won Kang** and Myung Jin Chung, "Efficient Coverage Path Planning in Dynamic Environments," The Summer Conference on Korean Intelligent Robot, June 2007.

[DC14] **Jung Wong Kang**, Jae-Hean Kim, and Myung Jin Chung, "Simultaneous Localization and Map Building for a Mobile Robot Using Sensor Fusion of Laser Range Finder and Omni-Directional Vision Sensor," Control Automation and Systems Symposium, June 2006.

Book Chapter

[BC1] Hyun Seok Hong, **Jung Won Kang** and Myung Jin Chung, "Work Assistive Mobile Robot for the Disabled in a Real Work Environment," in Rehabilitation Robotics, ISBN : 978-3-902613-01-1, Edited by Sashi S Kommu, pp.65-80, I-Tech Education and Publishing, ARS(Advanced Robotic Systems) International, 2007.

PATENTS

US Patent

• Hyeon Myeong, Seok-won Bang, **Jungwon Kang**, Si-jong Kim, Myung-Jin Chung, and Su-jinn Lee, "Method of Dividing Coverage Area for Robot and Device Thereof," Patent No. 7933686, Publication date: 2011-04-26, United States.

Korea Patent

• Bo Gil Seo, **Jungwon Kang**, Sijong Kim, Yungeun Choe, Taek Jun Oh, and Myung Jin Chung, "Multiple Sensor System and Method for 3D World Modeling", Application No. 10-2012-0115517, Date of Filing: 2012-10-17, Republic of Korea.

• Seunguk Ahn, **Jungwon Kang**, Sijong Kim, Yungeun Choe, Taek Jun Oh, and Myung Jin Chung, "Fast Scene Understanding Method in Urban Environment Using Laser Scanner," Application No. 10-2012-0027835, Date of Filing: 2012-03-19, Republic of Korea.

• Myung Jin Chung, Inwook Shim, **Jungwon Kang**, Yungeun Choe, Sijong Kim, Sang Un Park, and Seunguk Ahn, "Sensor System and Method for 3D Terrain Reconstruction," Application No. 10-2011-0018502, Date of Filing: 2011-03-02, Republic of Korea.

• Sijong Kim, Kwang Ho An, Chang Hun Sung, **Jungwon Kang**, Myung Jin Chung, and Joon Kim, "Device and Method for 3D World Modeling Using Multi-Sensor Fusion", Application No. 10-2010-0126391, Date of Filing: 2010-12-10, Republic of Korea.

REFERENCES

President/Prof. Myung Jin Chung

President of Gwangju Health University
·Tel: +82-62-958-7500
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Emeritus Professor
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Prof. Dong-Jo Park

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·Tel: +82-42-350-3438
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