

조형기

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PERSONAL DATA

- Birth: 15th Feb, 1990, in Republic of Korea
- Nationality: Korean
- Language: First language Korean, Fluent in English

RESEARCH EXPERIENCES

Mar. 2021 ~ Now	Jeonbuk National University Assistant Professor Department of Electronic Engineering	Jeonju, Korea
Sep. 2020 ~ Feb. 2021	Korea Electronics Technology Institute (KETI) Senior Researcher Intelligent Robotics Research Center	Bucheon, Korea
Mar. 2012 ~ Aug. 2020	Yonsei University Research Assistant @ Computational Intelligence Lab. Participation in several research projects	Seoul, Korea

EDUCATION

Mar. 2012 ~ 2020	Yonsei University, Ph.D. Department of Electrical and Electronic Engineering <i>Advisor: Prof. Euntai Kim</i> <i>Thesis: Efficient Global Localization Using Deep Learning Based Particle Filter Initialization and Mixture Density-PoseNet</i>	Seoul, Korea
Mar. 2007 ~ Feb. 2012	Yonsei University Department of Electrical and Electronic Engineering <i>Bachelor of Electrical and Electronic and Engineering</i>	Seoul, Korea
Mar. 2005 ~ Feb. 2007	Jeonbuk Science High School	Jeonbuk, Korea

RESEARCH INTEREST

- **Mobile Robotics SLAM**
 - ✓ Specialized in robotics and autonomous vehicle, especially in SLAM, localization and 3D reconstruction based on sensors such as LiDAR, camera, IMU, and GPS. Also had full knowledge of autonomous navigation including graph optimization, EKF, and particle filter.
- **Visual Localization**
 - ✓ Specialized in deep learning-based global localization using a monocular camera.

PUBLICATIONS (SCI ONLY)

1. **H. Jo**, W. Lee, and E. Kim, "Mixture Density-PoseNet and Its Application to Monocular Camera-based Global Localization," *IEEE Transactions on Industrial Informatics* (**IF: 9.112**), vol. 17, no. 1, pp. 388-397, Jan. 2021.
2. **H. Jo**, and E. Kim, "New Monte Carlo Localization Using Deep Initialization: A Three-Dimensional LiDAR and a Camera Fusion Approach," *IEEE Access* (**IF: 3.745**), vol. 8, no. 1, pp. 74485-74496, Dec. 2020.
3. **H. Jo**, H. Cho, S. Jo, and E. Kim, "Efficient Grid-Based Rao-Blackwellized Particle Filter SLAM With Interparticle Map Sharing," *IEEE/ASME Transactions on Mechatronics* (**IF: 5.673**), vol. 23, no. 2, pp. 714-724, Apr. 2018.

PUBLICATIONS (DOMESTIC)

1. **조형기**, 조해민, 이성원, 김은태, "센서 융합 시스템을 이용한 심층 컨벌루션 신경망 기반 6 자유도 위치 재인식," *Journal of Korea Robotics Society*, vol. 14, no. 2, pp. 87-93, Jun. 2019.

PATENTS

1. **H. Jo**, H. Cho, and E. Kim, "Method and Apparatus for Estimating Location of a Moving Object and Generating Maps Sharing a Map between Particles"
Korea - Application No. 10-2016-0161159
Korea - Registration No. 10-1965296
2. **H. Jo**, H. Cho, S. Lee, and E. Kim, "Apparatus for Building Grid Map and Method there of"
Korea - Application No. 10-2017-0171099
Korea - Registration No. 10-2095842
3. H. Cho, **H. Jo**, and E. Kim, "Method and Apparatus for Producing Three-dimensional Image"
Korea - Application No. 10-2016-0060975
Korea - Registration No. 10-1748674
4. H. Jeong, **H. Jo**, J. Kim, H. Lim, and Y. Lee, "Method and Devices for Pill Identification"
Korea - Application No. 10-2017-0111320
Korea - Registration No. 10-1943217
5. **H. Jo**, E. Kim, "Mobile Robot and 3D Global Position Recognition Apparatus Using Pose Estimation Based on Deep Learning"
Korea - Application No. 10-2020-0035622

INTERNATIONAL CONFERENCES

1. B. Choi, **H. Jo** and E. Kim, "Normal Distribution Mixture Matching based Model Free Object Tracking Using 2D LIDAR," in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2019), Macau, China, November, 2019.
2. H. Cho, **H. Jo**, S. Lee and E. Kim, "Odometry Estimation CNN Using Sparse LiDAR Data," in Proc. of the 16th International Conference on Ubiquitous Robots (UR 2019), Jeju, Korea, June, 2019.
3. S. Lee, **H. Jo**, H. Cho and E. Kim, "Visual Loop Closure Detection over Illumination Change," in Proc. of the 16th International Conference on Ubiquitous Robots (UR 2019), Jeju, Korea, June, 2019.
4. H. Cho, **H. Jo**, S. Lee and E. Kim, "Large Scale Representation of Volumetric Fusion using ICP," in Proc. of the 18th International Conference on Control, Automation and Systems (ICCAS 2018), Gangwon, Korea, October, 2018.
5. S. Lee, **H. Jo**, H. Cho and E. Kim, "Robust Loop Closure Detection with Repetitive Structures," in Proc. of the 15th International Conference on Ubiquitous Robots (UR 2018), Hawaii, USA, June, 2018.
6. **H. Jo**, H. Cho, S. Lee and E. Kim, "Robust 6-DOF Localization Using Sensor Fusion System in Indoor-Outdoor Environments," in Proc. of the 15th International Conference on Ubiquitous Robots (UR 2018), Hawaii, USA, June, 2018.
7. S. Lee, **H. Jo**, H. Cho and E. Kim, "Empty Area Search on Occupancy Grid Map for Mobile Robot Navigation," in Proc. of the 18th International Symposium on Advanced Intelligent Systems (ISIS 2017), Daegu, Korea, Oct, 2017.
8. **H. Jo**, H. Cho, S. Lee and E. Kim, "Multi-Resolution Point Cloud Generation Based on Heterogeneous Sensor Fusion System", in Proc. of the 2017 14th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI 2017), Jeju, Korea, Jun, 2017.
9. **H. Jo**, S. Jo, H. Cho, and E. Kim, "Efficient 3D Mapping with RGB-D Camera Based on Distance Dependent Update," in Proc. of 2016 16th International Conference on Control, Automation and Systems (ICCAS 2016), Gyeongju, Korea, Oct., 2016.
10. H. Cho, S. Jo, **H. Jo**, and E. Kim, "A Simple Extrinsic Calibration Method of Color and Depth Camera," in Proc. of 2015 International Conference on Fuzzy Theory and Its Applications (iFuzzy2015), Yilan, Taiwan, Nov, 2015.
11. S. Jo, **H. Jo**, H. Cho, and E. Kim, "Pose Estimation and 3D Environment Reconstruction using less Reliable Depth Data," in Proc. of The 2015 IEEE/ASME International Conference on Advanced Intelligent Mechatronic (AIM 2015), Busan, Korea, July, 2015.
12. **H. Jo**, S. Jo, S. Jun, C. Yoon, E. Kim, "3D FastSLAM Algorithm with Kinect Sensor," in Proc. of Joint 7th International Conference on Soft Computing and Intelligent Systems and 15th International Symposium on Advanced Intelligent Systems (SCIS&ISIS 2014), Kitakyushu, Japan, Dec., 2014.
13. **H. Jo**, H. Choi, S. Jo and E. Kim, "Grid Mapping Adaptive to Various Map Sizes for Sbot," in Proc. of 2013 13th International Conference on Control, Automation and Systems (ICCAS 2013) , Gwangju, Korea, pp.1678-1680, Oct., 2013.

PROJECTS

- A research of the real-time management system based on RDF for autonomous navigation
(From Agency for Defense Development, 2012)
 - Polygon shaped road database management
 - Road database based vehicle localization
- Cognitive model-based global localization for indoor robots
(From Ministry of Knowledge Economy, 2012 ~ 2013)
 - Data association for ceiling view features using JPDA, MJPDA

- Development of Commercialization Element Technology for Market-friendly Intelligent Transport Robot
(From Ministry of Trade, Industry and Energy, 2013 ~ 2014)
 - Artificial and natural landmark based MCL using RGBD sensor
 - Obstacle avoidance
- Development of Omni Direction Surroundings Recognition Algorithm using Laser Scanner
(From Hyundai Motor Company, 2013)
 - LiDAR signal processing
 - Object segmentation
- Development of Hydraulic Robot Control Technology based on Accurate and Fast Force Control for Complex Tasks
(From Ministry of Trade, Industry and Energy, 2014 ~ 2018)
 - Three-dimensional map building using tree-based network optimizer
 - Multi-core programming based three-dimensional RBPF-SLAM using RGBD sensor
- Development of Integration Module Technology for Localization and Autonomous Driving Control Based on Multi-modal Sensor for Wheel Drive Service Robot
(From Ministry of Trade, Industry and Energy, 2017 ~ 2018)
 - Camera & IMU Sensor fusion
 - Visual feature based localization module using low price multi-modal sensors
- Development of Robot Intelligence Technology for Mobility with Learning Capability Toward Robust and Seamless Indoor and Outdoor Autonomous Navigation
(From Ministry of Trade, Industry and Energy, 2016 ~ 2020)
 - Graph optimization for map building
 - Deep learning based visual relocalization
 - LiDAR-based global localization in highly dynamic urban environments

SKILLS AND TECHNIQUES

- Implementing skills of autonomous ground vehicles using C/C++, CUDA and Robot Operating Systems (ROS)
- Machine learning and deep learning techniques using MATLAB, Python
- Libraries: various computer vision and robotics packages (OpenCV, PCL, MRPT)

REFERENCES

- Available upon request.

Last updated: Feb 23, 2021