

**Title**

Model-free multiple object tracking for learning manipulation skills by observations

**Speaker**

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**Time**

Jan. 6 (Tuesday) 14:00

**Abstract**

Robots operating in open-ended unstructured environments should be able to perceive and manipulate unknown objects that are randomly presented to them. Imitation learning has come to the forefront as a promising tool to teach robot new skills. Despite its importance, visual learning has been relatively less investigated for imitation learning compared to kinesthetic learning due to the difficulties that arise during visual perception of unstructured human demonstrations. In this talk, I will present model-free approach for tracking multiple unknown objects only from RGB-D sensor without any prior knowledge [1-4]. This produces history data of not only their positions but also the changes of shape, which constitutes the semantic knowledge of human demonstrations. This research proposed the simultaneous object learning and tracking framework (SOLT), which enables to represent arbitrary objects and identify captured point cloud data as the learned objects at each time step. To discuss the feasibility of this method for representing dynamic relations of human behavior and deformable object states, I will talk about how the proposed SOLT method can be expanded into learning hierarchical structure in object manipulations.

**Short bio**

Seongyong Koo was born in Junju, South Korea in 1982. He received BA degree in Mechanical Engineering at Hanyang University, Seoul in 2007, and MA degree in Robotics Program at Korea Advanced Institute of Science and Technology (KAIST), Daejeon in 2009. In Feb. 2014, he received PhD degree in Mechanical Engineering at KAIST under the supervision of Prof. Dong-Soo Kwon. During his PhD study, he was a visiting scholar at CoTeSys group (Prof. Martin Buss) in Technische Universität München (TUM) from Sep. 2011 to Feb. 2013. Currently he holds a Post-doc position in TUM with the group of Prof. Dongheui Lee. His research interests include robotics, human-robot interaction, machine learning, and robot vision. He has published several academic papers in robotics conferences (IROS, ICRA) and computer vision journal (JVCI), and won a paper award in IROS 2010.

**Reference**

- [1] S. Koo, D. Lee, and D. -S. Kwon, "Incremental object learning and robust tracking of multiple objects from RGB-D point set data", *Journal of Visual Communication and Image Representation (JVCI)*, Vol. 25, No. 1, pp. 108-121, 2014.
- [2] S. Koo, D. Lee, and D. -S. Kwon, "Unsupervised object individuation from RGB-D image sequences", 2014 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2014), pp. 4450-4457.
- [3] S. Koo, D. Lee, and D. -S. Kwon, "Multiple Object Tracking Using an RGB-D Camera by Hierarchical Spatiotemporal Data Association", 2013 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2013), pp. 1113-1118.
- [4] S. Koo, D. Lee, and D. -S. Kwon, "GMM-based 3D Object Representation and Robust Tracking in Unconstructed Dynamic Environments", 2013 IEEE International Conference on Robotics and Automation (ICRA 2013), pp. 1106-1113.