DINH-CUONG HOANG received his BSc in Control and Automation Engineering at Hanoi University of Science and Technology (HUST), Vietnam in 2014. He then went to Taipei and completed his MSc in Automation Technology from the National Taipei University of Technology (NTUT) and National Taiwan University (NTU). Since December 2017 he has been a doctoral student with the Center of Applied Autonomous Sensor Systems (AASS), in Örebro Sweden. His research interests lie at the intersection of computer vision, robotics, and machine learning. He is particularly interested in topics involving autonomy for robots, with a focus on perception algorithms.

In order to safely and effectively operate in real-world unstructured environments where a prior knowledge of the surroundings is not available, robots must have adequate perceptual capabilities. This thesis is concerned with several important aspects of vision-based perception for autonomous robotic manipulation. With a focus on topics related to scene reconstruction, object pose estimation and grasp configuration generation, the research aims at helping robots to better understand their surroundings, to avoid undesirable contacts with the environment and to accurately grasp selected objects. As one of the most challenging pieces of scene reconstruction problem, camera pose tracking is difficult due to measurement noise, illumination variation, and more. The most widely investigated class of scene reconstruction methods relies on depth and color information to estimate camera pose. This thesis explores to what extent the use of semantic cues can increase the robustness of camera pose tracking. Beyond the purely geometric model of the environment produced by classical reconstruction systems, the inclusion of rich semantic information and 6D poses of object instances within a dense map is useful for robots to effectively operate and interact with objects. However, recognizing objects and estimating their full pose is difficult due to the complexity of object shapes, presence of occlusions, etc. Thus, the algorithms presented in this work constitute a major step towards accurate 6D object pose estimation for robust manipulation of known objects. To handle novel objects, this thesis further develops an end-to-end deep learning approach for generating grasp configurations, based on 3D point cloud observations of the scene.

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