A Deep Learning Based Behavioral Approach to Indoor Autonomous Navigation

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Abstract

We present a semantically rich graph representation for indoor robotic navigation. Our graph representation encodes: semantic locations such as offices or corridors as nodes, and navigational behaviors such as enter office or cross a corridor as edges. In particular, our navigational behaviors operate directly from visual inputs to produce motor controls and are implemented with deep learning architectures. This enables the robot to avoid explicit computation of its precise location or the geometry of the environment, and enables navigation at a higher level of semantic abstraction. We evaluate the effectiveness of our representation by simulating navigation tasks in a large number of virtual environments. Our results show that using a simple sets of perceptual and navigational behaviors, the proposed approach can successfully guide the way of the robot as it completes navigational missions such as going to a specific office. Furthermore, our implementation shows to be effective to control the selection and switching of behaviors.

Keywords

Navigation, Semantics, Visualization, Simultaneous localization and mapping, Robustness, Measurement.