AI-Navigation Development Environment: A Research Platform for Semantic Navigation and Robot Learning with Mobile Robots in Real-World

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Abstract

Training and deploying deep-learning-based navigation algorithms on real-world robot systems is challenging. A major reason is the cost, calibration, and engineering iterations required to build a robust real-world mobile platform to collect training data and execute higher-level commands safely. We present the AI-Navigation Development Platform, a low-cost modularized navigation system for learning-based navigation research built on commercialized sensors and hardware platforms. The system takes a goal point, then drives the robot system to that position, and handles localization and mapping, obstacle avoidance, and global planning. We also release rich simulations for each hardware platform with the same sensor and motion model to streamline the testing of users' algorithms. In our experiments, we show 1. the robustness of navigation: it can traverse kilometer scale trajectories safely with drift smaller than 0.5m. 2. low-cost but high-quality data collection: examples of generating KITTI-style datasets in both custom simulation and real-world environments. 3. ready-to-use with custom AI modules: examples of language navigation using our system.