A Framework for Improved Robot Utilization in Graf Hall

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Abstract

Mobile robots are excellent platforms for gathering sensor data of indoor environments. While simulation environments provide a quick means of gathering plausible data on robot performance, there are many aspects of real buildings that are not captured by simulation. Most significantly, human behavior is challenging to model convincingly. This motivates the need to deploy robots for data collection, but doing so in practice is difficult, delaying the rate at which we can investigate new ideas as a lab. On the average workday, many lab robots sit idle due to these challenges. This project is motivated by the need to simplify the process of deploying software onto robots to test new ideas, improving hardware utilization and the amount of data collected. The proposed framework is designed to manage multiple ROS-based robots while storing and centrally processing sensor logs as they are collected. Additionally, the framework provides tools for bundling ROS functionality into logical tasks, indicating task dependencies to facilitate code reuse, and scheduling task execution based on temporal constraints. A prototype long-term management system was developed using these capabilities. This system was used to connect and control several different kinds of ROS-based robots in Graf Hall while collecting and generating visual maps of wireless signal strength. The results from this deployment inform future development of the system, including the eventual migration of research robots towards ROS2.

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