Service Robotics Software Engineering

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Robots are increasingly becoming part of our everyday life. In particular, service robots support humans by performing useful, repetitive, or dangerous tasks. Service robots are designed to operate in a variety of environments (e.g., warehouses, hospitals) and provide various services (e.g., logistics, delivering), for which they equip specific capabilities (e.g., navigation, self-localization). A remarkable example are service robots currently used to fight COVID-19 in public environments such as hospitals by performing disinfection and transportation missions.

Despite the promising perspective for the future of service robots, software development has become a bottleneck in their construction due to the challenges that developing such complex systems pose. For instance, companies that provide various service robots able to accomplish a variety of missions for different scenarios will deal with growing complexity in their software systems. Another factor driving complexity is that service robots are safety-critical systems and, consequently, must operate robustly in every possible scenario, even if populated by humans.

This thesis aims at understanding the complexity of service robotics software engineering, analyzing its characteristics and challenges, and developing solutions to solve some of the problems and challenges we identified. Our solutions are mainly intended to simplify the development and integration of software modules for robotic teams and to provide tools for human operators to easily issue commands in their everyday jobs to teams of robots, which in turn must operate under a variety of circumstances.

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