



Collaborative SLAM for Facilitating Radiological Search and Mapping on a UWB Enabled Multi-Agent Aerial Platform

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Abstract:

Our project is working to advance the state-of-the-art of radiological search, the task of deploying one or more autonomous agents to search a region for dangerous radioactive materials. To these ends, robots must be integrated with delicate radiation sensors and be capable of navigating a range of challenging mission environments. A typical radiological search scenario may have GPS being jammed or unreliable, non-existent or outdated prior maps, and a dangerous time-critical nature. To hasten the search process, we parallelize through intelligent multi-agent coordinated search approaches. In other words, our robot swarm must autonomously divide the region into individual search tasks, intelligently assign them to specific agents, and then execute them in real-time – a process that requires concurrently navigating an unknown environment while constructing a shared inter-agent map. This algorithm, a form of distributed simultaneous localization and mapping (SLAM), must be robust to real-world working conditions; our algorithms must be resilient to loss of connectivity between agents, low communication bandwidth (i.e. cannot rely on sharing all data between agents), and potential permanent catastrophic loss of individual agents.

In service to these research goals, our latest work has focused on the use of multiple ultra-wideband (UWB) sensors to perform relative localization between agents, without need for external infrastructure. This localization system will then be integrated into the larger distributed SLAM pipeline.