論文内容要旨

論文題目 On Multiple Mobile Robot Surveillance
（複数の移動ロボットによる巡回監視）

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Remote surveillance of complex environments is an important task that arises in diverse applications including search and rescue, planetary exploration and security patrolling. In the last decades witnessed tremendous advances in distributed mobile sensing technologies. Mounting a sensor on a mobile robotic agent and using the agent to sense the environment can achieve the automation of such surveillance tasks.

It is crucial to design algorithm to perform effective surveillance tasks in an autonomous fashion. In this dissertation, we study fundamental problems that arise in surveillance mission in complex environments with distributed multiple mobile robot system.

The first sub problem we address is the complete coverage of a bounded indoor environment. The problem leads to the strategic planning to provide the complete surveillance of the target environment using multiple robotic agents. Our algorithm provides complete coverage with scalability, robust and computational efficiency according to the use of self-organizing planner. We present experimental and simulation results, which verify the performance of the algorithm.

With the abstraction of sensor model using the strategic planner, our algorithm can be used with various kinds of actual sensors. We present an algorithm that provides the raw sensor data to construct the environmental model. The environmental model works as the connection between strategic planner, sensing module and action executor. The sensing complexity can be address as one of sub problem in our research.

The final sub problem we address for efficient surveillance mission using multiple mobile robots is a task allocation problem. The decomposition of system-level task (surveillance) for each robot to achieve the effective system performance is discussed. The task allocation in combinatorial point of view validates our algorithm in simulation up to 5 distributed mobile robots. The comparison and discussion according to the results lead the further applications in multiple mobile robot domains.