<div align="center">論 文 内 容 要 旨</div>

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学位論文題目	Study of Object Conveyance Using Multiple Mobile Robots with Dynamic Team ダイナミックチームを有する群ロボットを用いた物体搬送に関する研究

内容要旨

The object conveyance as known as "piano mover problem" is a well-studied topic in multiple mobile robot systems where robots are expected to transport a box to a destination cooperatively. In this task, the robots are expected to reach the main goal of transporting an object to a goal location as well as the maintenance several condition including approaching the object with a formation, maintaining closure with the object and maintaining straight movement. The use of multiple mobile robot systems in object conveyance is chosen because it offers several advantages that single robot cannot achieve such as fault tolerant, efficiency, low cost, and flexibility. However, the formation and motion control may become more difficult because of the increase in sensor information and actuators since the number of the robots is increased.

The object might be moved by using only one or two robots with simple push action. And it may need more robots to move because it is heavy. Because of the number of robots used in the team depends on the target object, the coordination technique for object conveyance problem using mobile robots that can adapt to any kind of object without prior information of its shape is needed. The adaptable number of mobile robot in a team can be addressed by dynamic team strategy

The first simulation result uses three robots that are divided into one pusher robot and two aligner robots. Pusher robot is required to push from behind the object and the aligner robots are required to navigate object conveyance so the object can be transported on the desired trajectory. The aligner robots are added because we realize that the conveyance by single robot cannot maintenance object orientation.

The algorithm for determining the number of the robot in multiple mobile robot object conveyance is developed and verified in a simulation with regular shape and irregular object. It demonstrates the effectiveness in searching push points both regular and irregular object. In this, research we have also examined up to five robots in three combinational straight lines trajectory. Moreover, we demonstrate the use of virtual structure and sliding mode control for moving algorithm of the multiple mobile robots.

We optimistically convince that there are a lot of the potential applications of proposed method such as indoor cleaning robot system and automatic warehouse system.