システム情報工学研究科修士論文概要

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論文題目

Moving Obstacle Avoidance for Robot Moving on Planned Path
(指定経路上を走行するロボットのための移動障害物回避法)

論文概要

For mobile robot navigation, it is a necessity to travel to a destination while avoiding collision. Generally, a robot needs to find the way to reach the goal while able to avoid obstacles on the path. In a partially known multiple robot environment with decentralized system, the robot is required to detect and avoid other moving robot as it moves along its designated path. There are many well researched methods developed for static obstacle avoidance, namely potential field, visibility graph and grid-based methods. Using adaptation of these static obstacle avoidance methods, moving obstacle avoidance can be achieved as well. Besides, recently there are many planning methods considering configuration space with time dimension.

These methods identifies the shortest path to destination, thus do not follow closely to a designated path for the robot. In this research, the robot is to follow a designated path and move within the path boundary while avoiding moving obstacles when they are found in the mid of the path. This is crucial for robot to move within its movable space considering the environment may have prohibited zone for robots such as door way (robot may run into opening door) and descending stairway (can't be detected easily). It may be better for robot to stay close to its designated route to avoid complicated recalculation, especially in outdoor environment. Thus, robot is to make a new avoidance path which stays within the path boundary to prevent collision with the obstacle and to travel the designated path as much as possible. Besides, the robot is allowed to move in several velocities in order to stay closely to the designated path. It is proposed that with the implementation of moving obstacle avoidance via velocity estimation by Tsubouchi et al. a robot can travel in a designated path while avoiding collision with other mobile robots coming from all directions, even those approaching from behind and sideways of the robot.

As the research setting, a nonholonomic robot mounted with two laser range sensors having 240 degrees scanning area (one sensor each at front and back of the robot to provide 360 degrees view of the robot environment) is set in a multiple robot environment without communication network.

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