DWARF & COOPERATION

Cooperative Transportation with Real-Time Task Assignment

This research deals with motion planning of multiple mobile robots that change their role in the group adaptively according to the environment (Fig.1). To transport a large object to the goal in the environment with many people or obstacles, various functions that change dynamically (tasks: to look around, to remove an obstacle, to handle an object, etc.) are needed. Here, we propose real-time motion planning architecture that repeats the following two steps: (1) assign needed tasks, (2) plan motion of robots independently of each task. This enables us to cope with dynamic environmental change. As for (1), we propose an architecture that generates task instances by inputting sensory information into templates in which tasks are described, and assigns them among robots with linear programming method considering. Effectiveness of the architecture was verified by a simulation (Fig.2). As for (2), we mainly deal with “looking around” task. We proposed cooperative sensing strategy that calculates the area to be sensed and allot to robots. A simulation verified the effectiveness of this strategy (Fig.3). Our architecture was implemented on omni-directional mobile robots (Fig.4),.and validated through the experiments.

Keywords: Multiple Mobile Robots, Cooperative Transportation, Real-Time Task Assignment, Linear Programming Method

References

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2) Natsuki MIYATA, Jun OTA, Yasumichi AIYAMA, Hajime ASAMA, and Tamio ARAI: “Cooperative Transport in Unknown Environment —Application of Real-time Task Assignment—,” Proc. 2000 IEEE Int. Conf. on Robotics and Automation, pp.3176~3182, 2000.

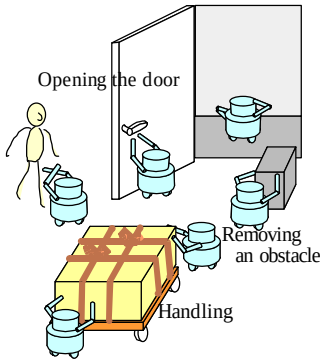
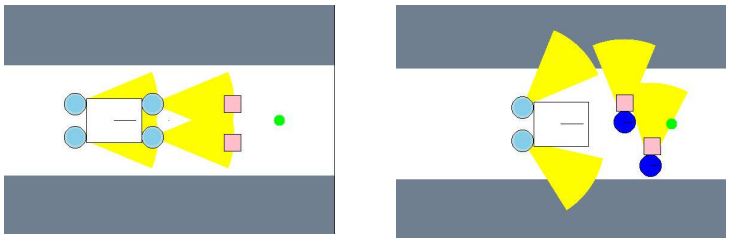
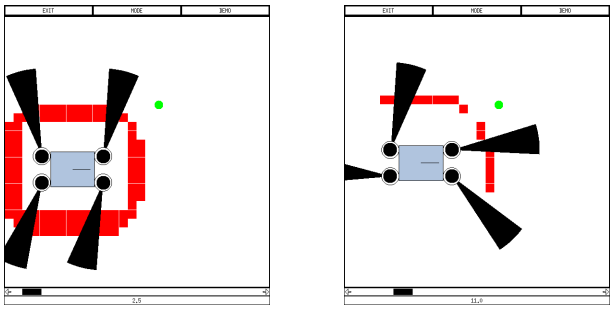


Fig. 1 Robots in cooperation



(a) Initial state (b) Removing obstacles

Fig. 2 Simulation results (task assignment)



(a) Initial state (b) After moving for a while

Fig. 3 Simulation results (cooperative sensing)

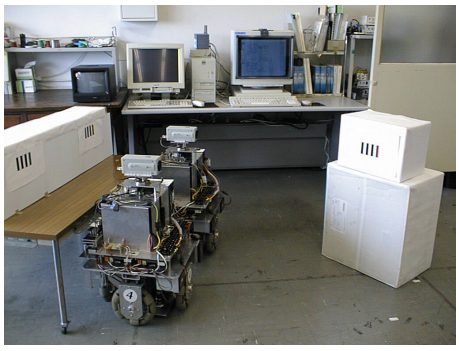


Fig. 4 Experimental setup