Rearrangement Task by Multiple Mobile Robots

Rearrangement tasks involving multiple objects are fundamental for mobile robots. Robots transport objects from an initial to a goal configuration. These tasks have various applications within production systems. These production systems can be more flexible than traditional AGV system because robots develop by themselves the order of transportation and moving paths. At first, robots develop their motion plans, and then they realize these plans. It is unfeasible to apply former methods to rearrangement problem because rearrangement problem is very complex involving multiple robots and movable object. The search space is exponentially large in the number of robots and objects. Furthermore, there exist many kinds of difference between a real world and simulation. To realize rearrangement plan, we must deal with these difference.

To solve rearrangement problem and generate motion plan, we divide the entire complicated problem into multiple simple sub-problems; Project Scheduling Problem (referred to here as a PSP) and the path planning problem for single mobile robot [1]. PSP and motion planning problem for single robot is relatively easy and have been studied many years. To deal with between a real world and simulation, we divide developed plan into several "behavior". Each behavior is designed to deal with some differences to achieve each sub-goal [2]. For example, to localize robot's positions, we give some information about arrangement of walls and landmarks beforehand. And each robot specify position so that arrangement of landmarks which is measured by robot itself and those of which is given in advance.

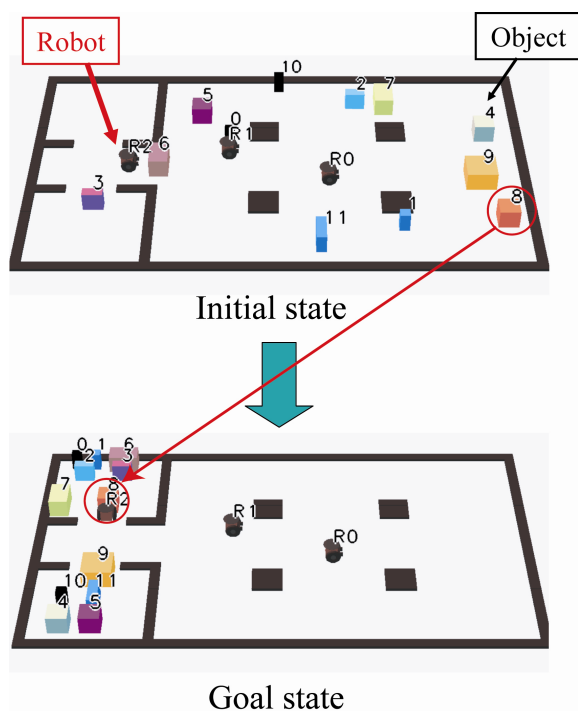*Keywords*: Multiple mobile robots, rearrangement task, environmental model.

Fig. 1 An example of Rearrangement Task.

References

1) Norisuke Fujii, Reiko Inoue, and Jun Ota, Multiple Robot Rearrangement Problem Using an Extended Project-Scheduling Problem Solver, Proc. of IEEE International Conference on Robotics and Biomimetics, pp. 2007-2012, (2008).

2) Yoshihiro Takebe, Norisuke Fujii, Reiko Inoue, and Jun Ota, Realization of rearrangement task by multiple robots, Proc. of the Society of Instrument and Control Engineers Annual Conference, (2009), (To appear.)
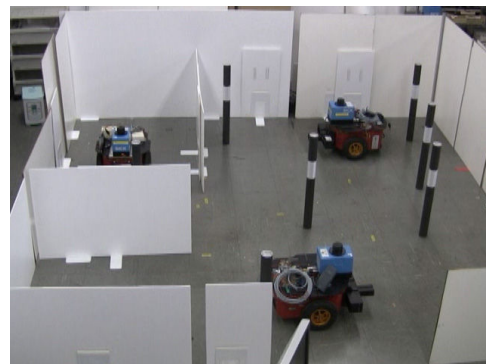
Fig. 2 An experience in real environment.