

Realization of a Heavy Object Transportation by Mobile Robots Using Handcarts and Outrigger

Mobile robots are expected to carry physical loads on behalf of humans in the near future, in part owing to their wide range of movement. In particular, object transportation is a job that can be applied to many scenes such as house-moving and rearrangement. If mobile robots transport an object that is difficult for one human to carry, it leads to the reduction of human labor.

We improved the transport capacity of small mobile robots using a handcart reported in previous works. We focused in facing two main problems: 1) the risk of a slip and fall under the influence of the reaction force produced when the robot handles the object, 2) the slipping of the handcart as the robot stacks an object on it.

In our method we proposed the use of an outrigger to deal with both above mentioned problems. We placed the outrigger on the rear side of the robot, when the robot tilts an object the outrigger is set before start pushing the object as shown in Figure 1. The experiment was conducted by transporting an object (35kg) as it is shown in the experiment in Figure 2.

[1] 大橋 二紗夫, 上西 康平, Figueroa Jorge, 加藤 裕基, 太田 順: “台車とアウトリガを用いた複数台の小型移動ロボットによる大型重量物搬送,” 第27回自律分散システム・シンポジウム論文集, pp. 209-210, 2015



Fig.1 アウトリガ

Fig.2 アウトリガを取り付けたロボットによる大型物体搬送実験

Mechanical Design of Multiple Mobile Robots for Transformation of Large Objects

Considering environments at offices/homes, it is necessary not only to transport large objects but also to be able of manipulate them for different usages. Therefore, we are also consider tasks in which is necessary to deal with objects which shapes can be modified (for example, tasks involving unfolding chairs or tables). The purpose of this research is to design the gripper that can be adapted on mobile robots as a tool to allow them deal with this kind of tasks.

The proposed tool design in this research includes 3 DOFs, this includes the movement produced by the robot wheels as well as the end effector for manipulate objects. We aim to allow mobile robots to get large output by making the mechanism as simple as possible while keeping certain freedom by providing more than necessary DOFs. Two mobile robots using the designed tool are shown in Figure 3, in the experiment the robots performed a task for opening an unfolding chair.

[2] 松井 尚孝, Jorge Figueroa, 大橋 二紗夫, 黄 之峰, 緒方 大樹, 太田 順, 複数の小型移動ロボットによる大型物体変形作業のための機構開発, 2015年度精密工学会春季大会学術講演会論文集, pp. 957-958, 2015.



Fig.3 2台の移動ロボットによる折り畳み椅子展開実験