Operation Support of Distributed Mono-functional Modules

In order to support operations conducted in *office* or *home*, robots system is required to change its construction method and components. According to this, we propose a modules system for flexible and effective operation. Concretely, robots with mono-function (such as sensing or moving function) and the ability of wire-less communication are defined as mono-functional modules (Fig.1). They are set up distributively on the objects of operation (e.g. table as an object of transporting) or in the working environment (such as wall, ceiling, etc.) and cooperate with each other (Fig.2).

It is necessary for the cooperation of distributed modules to set up the relationship between each other by acquiring their parameters. For instance, in the case that an object, which is equipped with wheel modules, is to transport by gaining the information from the ceiling camera module, the calibration of each module and their positions' and orientations' parameters under an unify coordinate system are indispensable. Traditionally, this kind of decentralized robots system's calibration was carried out manually, and it is also troublesome and time-consuming in general. Based on this point of view, our research is aimed at the automatization for parameter identification in decentralized robots system. We propose an algorithm of rapid and accurate calibration among modules, especially for the transporting case we assumed. In that case, a transporting object, which was installed with wheel modules and a marker, was transported under the guide by catching information from the camera module in the changing environment. Considering the system of only one camera module and one wheel module, to minimize the affect of sensing and locating errors to parameters identification, the simulation for wheel module's movement is illustrated as Fig.3.

Keywords: Mono-functional Modules, Parameter Identification

References

1) K.Matsumoto, H.Chen, J.Ota, T.Arai "Automatic Parameter Identification for Cooperative Modular Robots" ,Proc. Of IEEE Int. Sympo. on Assembly and Task Planning, pp.282-pp.287 (2001).

Fig. 1 Mono-functional module

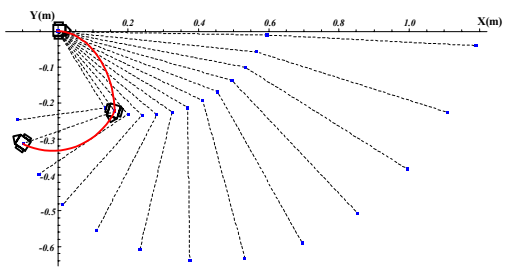

Fig. 3 Path planning for parameter identification

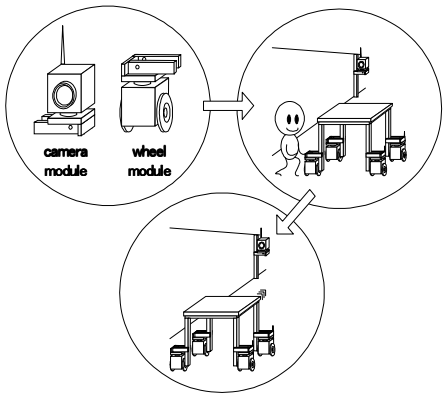

Fig. 2 Usage of modules