

Distributed Mono-Functional Modular Robot System (Prof. T. ARAI and Prof. J. OTA)

In order to support human work in office and home environments, a robot system that consists of modules is proposed. By altering modules configuration, the robot system has the adaptability to a variety of tasks. Concretely, we define the mono-functional module as a robot, which has only mono-function (e.g. sensor or actuator) and radio communication function (Fig.1). Then a robot system can be formed and it is useful to achieve operations by attaching modules to working object and by placing them into the environment (Fig.2).

According to the above, we deal with the following research subjects.

1) Design for the modular system with open architecture

Aiming at the open architecture of modules and control system's configuration for different operations, modules' functions are called depending on the classified description of modules' functions and operations via Petri net, and the framework to carry out certain operation is designed.

2) Automatic calibration for distributed modules

Automatic calibration for the relative position and orientation among modules is focused on. We execute proper motions to actuator, which is one of the system components, and then we propose an algorithm to identify the relative position and orientation parameters with sufficient accuracy by observing the changes of the system state with cameras.

3) Human interface for controlling the modules

In a modular robot system made up of a moving module and several camera modules, we designed the algorithms for: A) instructions to the operator about the relationships among multiple pictures; B) instructions to the robot system according to the environmental feature commands on the pictures. Experiments of object-transportation and object-insertion were conducted with a real modular robot system (Fig.3).

Keywords: Open Architecture, Modular Robot System, Petri net, Calibration, Human Interface

References

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- 3) Kohsei MATSUMOTO, Kenichi SHIMADA, Huiyung CHEN, Jun OTA and Tamio ARAI: "Interface Design and Implementation for Mono-functional Modular Robots," Proc. of 2002 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems, pp. 3018~3022, 2002.

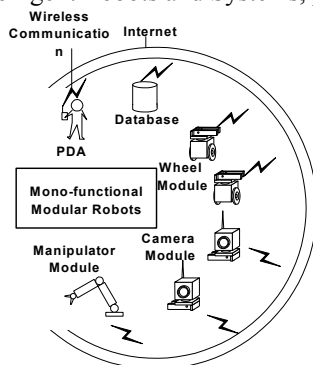


Fig. 1 Mono Functional Modules

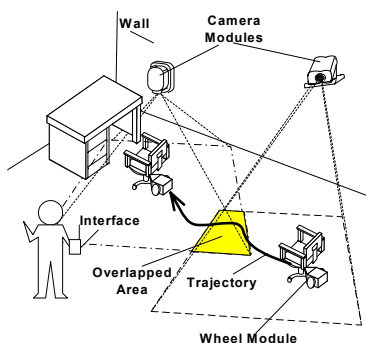


Fig. 2 Open Architecture

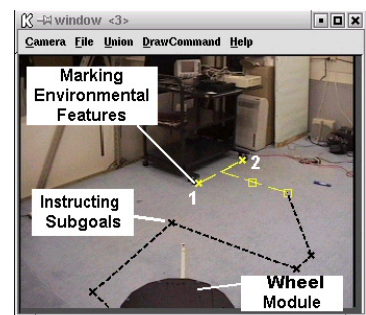


Fig. 3 Intuitive Human Interface