

From Designing Human-Robot Cooperation to Mapping Human Motion Behavior

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Abstract:

Controlling multiple autonomous robots and human-robot system in coordination are interesting and challenging research topics, especially to the mobile robot system without explicit inter-robot communication. In this talk, two robot systems having physical interactions among humans and robots will be introduced. In these systems, each robot is controlled as if it has a specified impedance dynamics, and a leader-follower type control algorithm is incorporated for estimating the human/leader robot desired motion based on the intentional force/moment applied by the human and the information of an environment. Our group is also working on developing intelligent robot systems which help activities of our daily life. Passive RT Walking Helper and Wearable Walking Helper are mainly designed for elderly and disabled as a dynamical walking assistant without explicit motion identification. These examples will inspire possible applications of the human-robot interaction in near future.

Recently, we also proposed a concept and architecture of Human Motion Map by representing extracted human behavior in the human living space as a map, by using human state estimation function and mapping function of SLAM. The concept is implemented in a mobile robot system as a high dimensional map structure with multi-layer, and some basic motions on standing, walking and task instruction to robots are represented in the developed Human Motion Map system generated from individual observations of hundred's experiments. A motion feature descriptor is developed based on Human Motion Map for representing various walking behaviors in indoor environments. Human Motion Map could be used for robots' motion planning of robots and further estimation of human motion in dynamic environment.