

Man-Machine System Model for Remote Control in Uncertain Environment

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Abstract: A mobile robot such as a space rover has to be able to cope with enormous uncertainties. The robot can obtain detail information of terrain, however, the range of view is limited. The operator is able to help such robots by planning paths using global maps, however, in many cases, such maps are rough that it is difficult to give appropriate command. This paper describes a methodology to assist an operator, who is working on complex and time-dependent problem solving tasks. In order to realize robust and adaptive action of a mobile robot under uncertainties, the robot needs not only the path-plans but also information about the purpose of the plan. The remote control problem has been formulated as a multi-criteria optimization problem, in order to extract the purpose of the remote control. The preferences for each criterion are shared between the operator and the robot, which enables the partly autonomous robot to select an adaptive action. What we define reasonable action, in this paper, is that it matches the task goal, even if it does not match the path plan. The proposed methodology has been applied to a path-planning problem of a space rover, whose results are also described in this paper.

Keywords: Coping with Uncertainties, Guidance of Remote Robot, Multi Criteria Problem, Design of Human-Machine Interaction
