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**Toward Human-Robot Collaboration**

**Abstract**
Recently robots have been launched as tour-guides in museums, as lawnmowers, as in-home vacuum cleaners, and as remotely operated machines in so-called distant, dangerous and dirty applications. While the methods to endow robots with a degree of autonomy has been a strong research focus, the methods for human-machine control has not been given as much attention. As autonomous robots become more ubiquitous, the methods we use to communicate task specification to them become more crucial. This thesis presents a methodology and a system for the supervisory collaborative control of a remote semi-autonomous mobile robot. The presentation centers around three main aspects of the work and offers a description of the system and the motivations behind the design. The supervisory system for human specification of robot tasks is based on a Collaborative Virtual Environment (CVE) which provides an effective framework for scalable robot autonomy, interaction and environment visualization. The system affords the specification of deictic commands to the semi-autonomous robot via the spatial CVE interface. Spatial commands can be specified in a manner that takes into account some specific everyday notions of collaborative task activity. Environment visualization of the remote environment is accomplished by combining the virtual model of the remote environment with video from the robot camera. Finally the system underwent a study with users that explored design and interaction issues within the context of performing a remote search task. Examples of study issues center on the presentation of the CVE, understanding robot competence, presence, control and interaction. One goal of the system presented in the thesis is to provide a direction in human-machine interaction from a form of direct control to an instance of human-machine collaboration.