A Framework for the Development of Virtual Robotic Games

by

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ABSTRACT OF THESIS

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Abstract

Multiple robotic experiments are inherently high in operating costs. As the number of agents increase, resources in time, cost, and physical space becomes a limiting factor in experimentation. This thesis presents a framework that addresses these problems by virtual reality. The computer gaming industry has made unparalleled advances in computer graphics and dynamic and kinematic modeling. This progress provides a realism that is utilized in virtual robot experiments with close comparability of results with its real-world counterpart. Developing the Virtual Robotic Games framework with the integration of a video game engine produces a testbed for multi-agent experiments while reducing the cost of real-world experimentation.

The Virtual Robotic Games framework is a platform for the development and experimentation of Robotic Games. Robotic Games refers to a variety of robotic scenarios where autonomous or remotely controlled robots are governed accordingly by the Robotic Game’s rules and regulations. These games are a testbed to study robotic algorithms that
are not solutions to only specific scenarios but are applicable to robotic problems of several research topics through a role-based architecture.

The framework distributes Robotic Game algorithms into three leading roles: Game Coordinator, Robot Device, and User Interface. The Game Coordinator is specific to the rules and regulations that must be kept during gameplay. The Robot Device is the player’s control algorithms and strategy implementation. The User Interface maintains the human machine interaction, focusing on providing optimal interfaces to ensure a human player can receive the desired results while providing intuitive and simple inputs. This architecture combined with a virtual robotic testbed defines a framework that is rich, extensible, and inexpensive to develop robot algorithms that can subsequently be incorporated into real-world robots.