Research and Implementation of an Autonomous Agent using Adaptive and Real-time Learning in a 3D Soccer Environment

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Abstract

This project builds upon the Robocup soccer simulation league, using many parts of this system to implement a combined 3-dimensional graphical interface and full 22-player client system. Robocup consists of three primary systems: the server, which maintains the current world state; the client, which represents a player, and receives data from the server, processes this data, and sends action commands back to the server; and the monitor, which receives perfect world information from the server and then renders the scene graphically. Our project concentrates on artificial intelligence and machine learning, incorporating elements from genetic algorithms, memetic learning, and traditional artificial intelligence. We use these simple traditional methods to attempt to implement both simple behavioral responses (passing, dribbling, shooting) and rudimentary teamwork strategies. For the goalie, however, we use both a genetic and memetic algorithm to learn goalie ball blocking. We also study in the efficacy of each learning method in this environment. To accomplish these tasks, we designed a system capable of communicating with the Robocup server as a monitor, coach, and team of clients. Data concerning the state of the field is received from the server, parsed, and stored. User input is then processed (the user can interactively control one client), and the client AI is computed. The clients then send commands to the server, and the scene is drawn from a variety of selectable cameras. To complete the project, we integrated these features and additional elements from both the client and monitor into one Windows executable.