

Proposal on “the Research Challenge” : A Higher-level Competition Supporting Basic Research

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Introduction

Due to the rapid development of the whole RoboCup and Robotics, the low-level skills of robots have been getting more and more advanced. Now the RoboCup community would benefit from a larger-scale attempt on paying more attention to investigation into higher-level functions of agents and robots with more principled methods, to support basic research related to the long-term goal of RoboCup. We propose to set up a “research challenge” in the soccer simulation league for this purpose.

Proposal

A middleware will be developed as the bridge between the SoccerServer and the agents. The middleware will provide the agents simplified and abstracted observations, and also some pre-defined high-level actions such as pass, dribble, etc.

High-level actions can be used in the same way as primitive actions. The high-level actions will be realized with combinations of primitive-actions by the middleware. With the help of high-level actions, the researchers can spend more time on high-level decision-making and learning, mainly dealing with cooperation and competition among teammates and opponents.

The complexities of this competition is significantly lower than the traditional 2D league, but much higher than the current benchmarks in common basic research domains. It will offer sufficient complexities to be interesting from a research point of view.

The architecture of the middleware is shown in Fig. 1.

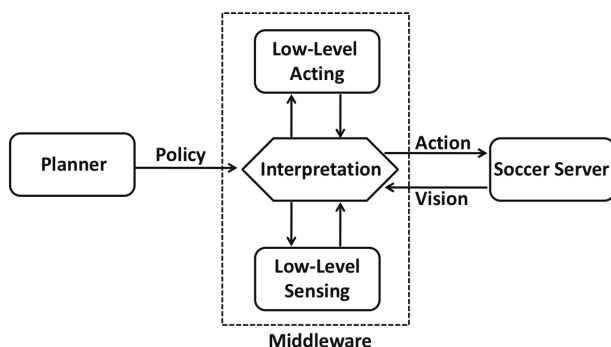


Fig. 1. The Architecture of The Middleware

Implementation

To implement the middleware, we borrow ideas from RL-Glue, a language-independent software for reinforcement learning experiments. We develop protocols for communication between the agents and the middleware. The protocols describe the input and outcome of each agent, i.e. the abstracted actions and observations. In the middleware, the messages received from the server are processed by the low-level sensing component and the high-level actions of the agent are interpreted by the low-level acting component. The low-level components can be implemented by other existing team sources such as WrightEagleBASE. Teams can choose to develop their own implementation of the low-level programs and link them to the middleware.

Benefits

We noticed that state-of-the-art planning and learning methods are generally hard to be adapted or tested on 2D teams, due to the huge problem size. This “research challenge” encourages researchers to focus on the research issues of high-level functions of robots and agents, especially planning and learning. It will produce new opportunities for testing and investigating some state-of-the-art methods with this competition as a common testbed and problem. It will also serve as a new bridge for linking RoboCup competitions with the related basic research.

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