UQ CrocaRoos: An Initial Entry to the Simulation League

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Abstract. The UQ CrocaRoos entered the RoboCup Simulation League for the first time in 2001. The team demonstrated many of the basic functions required to play the simulated game: vision, action and multi-agent planning. The design of the team extends many of the concepts developed for the real robot leagues. This paper describes the fundamental architecture of the team, and the principles for developing the team in the future.

Introduction

The University of Queensland has had and continues to have a presence at RoboCup, first with the RoboRoos [5] and with the ViperRoos [1]. This year the University has also entered a Simulation League team, the CrocaRoos.

The CrocaRoos is furthering the work on the applicability of MAPS (Multi Agent Planning System) and introducing a coach agent. By using MAPS in the CrocaRoos it is hoped to further research into its use on agents with incomplete world models [1], to test its scalability moving from the current five agents to the eleven of the simulator league and explore its ability to work with autonomous agents with limited communication skills.

Multi Agent Planning System (MAPS)

MAPS technology was developed for use in the University of Queensland's small-size league team, the RoboRoos. MAPS has demonstrated very promising results as a general coordination system in both competition and testing environments [2, 3, 4]. It improves coordination among agents by choosing individual goals for each agent that will improve the probability of achieving the team's goal. MAPS coordinates agents through the superposition of potential fields. Each field reflects the probability of positive or negative influence of an environment attribute on the team's goal in the near future. The summation of all the fields maps the best choice of an agent to perform an action and where it should perform that action.

A. Birk, S. Coradeschi, and S. Tadokoro (Eds.): RoboCup 2001, LNAI 2377, pp. 547-550, 2002.

In the small-sized league, MAPS utilizes a world model obtained from an overhead camera, and as such has a complete world model. Even with this world view MAPS considers the world from each player's perspective when making decisions that accomplish coordinated multi-agent plans [4]. Each robot receives a complete world model from the vision system as well as the MAPS command, which when combined with its own reactive navigation routines, enable it to navigate or kick to the desired location.

In the simulation league, MAPS is run on each agent independently relying on the partial world model created from the sensory data from the Soccer Server. MAPS functions in the same as it does in the small-size league, but instead of sending plans to all robots it only sends one, its host's. The problems faced here are similar to those of the ViperRoos [1].

CrocaRoos Agent Base

As MAPS already exists for the small-size league, the CrocaRoos agents are designed to integrate it. As MAPS uses grids of potential fields, the simulated agents had to be able to generate a world model that would create these grids. Figure 1 shows the components of the CrocaRoos agent.

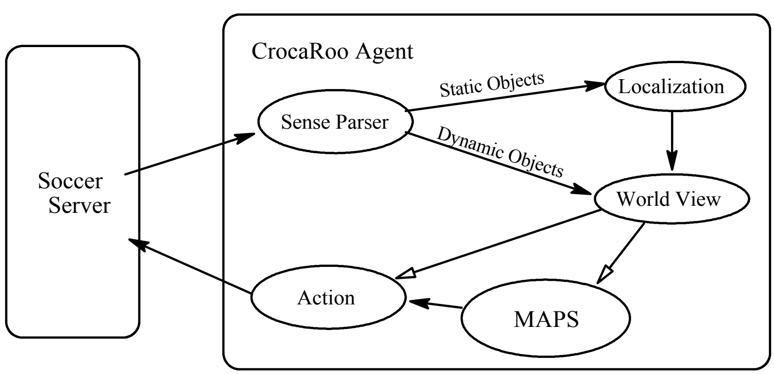

Figure 1: The CrocaRoos Agent Composition.

Developing a World Model

Ultimately the action of the CrocaRoos agent depends on the developed world model. Data from the **see** message received from the server is split into two data structures containing information about two types of objects, static and dynamic. The agent uses the static objects, lines and flags, to locate itself within the MAPS grid. The player determines its direction from lines it sees, and its position on the field from the flags it sees. It averages its position gained from flags seen within ***unum_too_far_length*** to create a grid location.

Dynamic objects, the ball and other players, are located with respect to the sensing agent. All dynamic objects seen remain in an agents memory, those objects sensed in a **see** message are updated, while the memory of unseen objects decays over a series of cycles.

MAPS uses the generated world view and returns an action command, KICKTO, GOTO or DEFEND and the location of where this action is to take place. The Action component then determines the best way to carry out this action.

Communication

The CrocaRoos currently communicate to enhance each agent's world model. Every two **sensebody** cycles each player, in turn, broadcasts its world model. Players hearing this message adjust, where appropriate, their own world model.

Coach Agent

The CrocaRoos coach agent has been developed to comply with the standard coach language. While functionality has been implemented to allow the coach to give reasonable advice on marking players, the primary functionality used in the 2001 simulation coach competition was the allocation of player types. In order to effectively select player types the CrocaRoos coach first allocates players to positions based on their distance from the oppositions goal. Four player positions are allocated: one striker, three offence, three midfielders and three defense. The allocated striker is the player who has the smallest average distance from the opposition's goal. The remaining players are also allocated based on their average position from the opposition's goal.

Once the player positions have been assigned, the coach will select which of the seven possible player types should be allocated to each position. The striker type is chosen with the aim of maximizing speed while still maintaining an accurate kick. The offence type is chosen to maximize speed, while maintaining an acceptable stamina. The midfielders are expected to be required to run for larger portions of the game and are therefore allocated the player type with the maximum stamina. The defense type is selected with the aim of maximizing the distance the player is required to be from the ball before gaining possession of it.

Future Work

At present, MAPS in the CrocaRoos agent only uses dynamic objects it has seen in the last few cycles and then only the static information. To get better performance from MAPS future work will be on determining predicted locations of seen objects, and probable locations of objects outside of the sensory fields.

Current communication between players is also limited to aging static information of the caller. Future work in this area will be to include action plans along with world models, as well as developing algorithm as to which agent is best suited to providing that information.

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