Helli-Respina 2002 Team Description Paper

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Abstract. Helli-Respina 2002 soccer simulator team's main research focus is agent cooperation and collaboration and team level coaching. After the experience of participating in the first coach competition, in 2001, one of the main objectives of the development of Helli-Respina 2002 is to build a team manageable by a coach agent in the team-level aspects.

1 Introduction

Helli-Respina 2002 is the successor to Helli-Respina 2001 which participated in RoboCup 2001 for the first time and got the first place in soccer simulation evaluation competitions. The main research focus in development of this team is cooperation among agents, and team-level coaching. Furthermore, in the area of players' individual skills Helli-Respina 2002 has more achievements than its predecessor.

In this paper, section 2 gives a description of enhancements in players' individual skills; section 3 describes agent cooperative and collaborative behaviors. Our approaches to coaching are described in section 4.

2 Enhanced Player Individual Skills

All players' individual skills in Helli-Respina 2002 have parameters which can be changed dynamically during the game. These parameters are all controllable by the coach agent through using team-level and standard advices described in section 4.

As a part of our research work, to obtain the best combination for using various actions, different agent abilities (such as dribble, shoot, pass, tackle) estimate an integrity value, dependant on the game situation, which is the basis for choosing player actions in each time step. The integrity value expresses efficiency of doing the action in the game situation. The procedures of generating integrity values control the combination between different agent actions.

The following three subsections are descriptions of new individual skills for Helli-Respina 2002 players.

2.1 Hyper Dribbling

In real soccer, the dribbling is a key ability for players, and certainly in soccer simulation it's a superior way-out for many situations. Helli-Respina 2001 used a simple dribbling method for limited situations in the game, so we designed a new dribbling method for our agents and tested it in various situations against players from Karlsruhe Brainstormers 2001 and Tsinghuaeolus. The outcome is a skill named Hyper-Dribbling which leads to good solutions in nearly all situations.

One of the problems of Hyper-Dribbling is that it may be unable to dribble the players who can tackle. Tackle is a new action in RoboCup simulation league 2002.

2.2 Pass Selection

The new pass selection method is based on modeling teammates and the opponents. In this model, the opponents are considered as ideal players. This new approach, made the players cleverer in attacking (and counter-attacking) and eliminated a lot of ball loses. The statistical results extracted by Helli-Respina coach in a game against Karlsruhe Brainstormers 2001 showed that the percentage of successful passes improved from about 37 percent in Helli-Respina 2001 to 65 percent in Helli-Respina 2002.

2.3 Creating Precise World Model by Using Individual Eyesight

One of the most significant changes in RoboCup 2002 is the limitation of "say" messages. Using the new Soccer Server, players are not allowed to say messages longer than 10 bytes. It means that no one can share all its world model information with other agents. Helli-Respina 2001 agents were sharing their world models using "say" messages and lack of this ability hurt players' overall performance. To solve this problem, Helli-Respina 2002 has an entirely new neck management system. This neck management system selects the direction of player's neck angle based on its information about important spots on the field.

3 Agent Cooperation and Collaboration

Cooperation among agents is a major improvement in Helli-Respina 2002. These cooperative actions consist of role exchange and coordination in defensive and offensive modes.

3.1 Role Exchange

In some situations, players need to change their roles in the field. Players decide autonomously about role exchange and fulfill it when necessary. The important point in this process is collaboration among players. In a past research done by

Peter Stone et al [2][4], it was suggested that the agents use a communication protocol when switching their tasks. Also in the method used by FCPortugal [1], the communication among agents was used. But this year, with a more limited communication bandwidth, it's necessary to organize players by using only local eyeshot.

3.2 Defensive and Offensive Cooperation

Cooperation in defensive and offensive modes is so necessary. In such situations, each player must decide about his own action based on his world model (which may not be accurate) and also should take care of collaboration among agents.

4 Coaching and Statistical Behavior Extraction

One of the most inventive concepts of RoboCup domain is the concept of coaching. Last year, a standardized language for coaches was founded. Helli-Respina was one of the four competitors of Coach Competition in 2001; and again it completely supports CLang (coach language).

In 2001, there were some problems in our coachable components, so all of its components are rewritten for 2002. Now the team supports all features of coach language.

Like last year, our approach to coaching is a kind of opponent modeling based on statistical data from the game. A module named SBE (Statistical Behavior Extractor) analyses all the game and extracts the required data such as: percentage of opponent's successful passes, average cycles they hold the ball when it's kickable, etc. Using these data, the coach sends appropriate advices to the agents. There are two general messages which will be sent to the agents: one is the advices in format of Clang, and the others are Helli-Respina Coach Language (HRCL) messages.

The HRCL is a language inherited from some parts Coach Uni-Lang [3]. This language contains the information about team-level behaviors such as game speed, team pressure, field use, taken risk in actions, playing style, etc.

5 Conclusion and Future Works

Helli-Respina 2002 research work targets agent cooperation, improvement of individual skills and adaptation to the environment by using coach agent advices. All of the agent behaviors are dependant on coach agent's recommendations. We use HRCL to communicate between coach and players concerning team-level features of the game and it proved useful in our tests. Because the coaching is still young, creating a successful coach based on standard language may attract other researchers to this field. Our goal is to create an influential coach for all coachable teams.

In the area of individual skills, we will implement a method to use tackle in the competitions. And training the Hyper Dribbling against tackling agents is the next goal for us.

The role exchange, some times caused disorders; we want to make it reliable in all situations. Also migrating current role exchange and coordination mechanisms to a heterogeneous environment is a good research case for future (an earlier research in this area is done by Peter Stone for ATTUnited team [5]).

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