

Helli-Respina 2001 Team Description Paper

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1 Introduction

One of the most important problems for development of intelligent agents is adaptation to the environment. In this paper we briefly describe Helli-Respina soccer simulator team that uses a new self-adaptive method named Dynamic Multi-Behavior Assessment (DMBA). By using built-in behavior manager named dynamic behavior transformer method lets the agent can choose the best algorithms to decide during the game. This system always tries to choose a set of available algorithms to get the best result against each opponent. The main objective in this research is how to choose a set of algorithms dynamically to get the best result against an opponent.

2 Dynamic Multi-behavior Assessment

Helli-Respina agent architecture is based on DMBA[1]. Several objects called assessors are connected to the agent's kernel named Core. Each assessor processes the game with a particular algorithm and tells its decision about current state of the game and the probability of successfully taking that action. Core has a built-in assessor manager that every server cycle asks each assessor about its decision and chooses the one with higher success rate. If Core finds out that one assessor can recommend good decisions against an opponent, it may increase the probability of choosing that assessor's decision in the following states of the game. Two types of assessors can be connected to the Core: with ball assessors and without ball ones. For instance, when an agent has the ball, Core asks about decision of current state of the game from with-ball assessors.

Core has built-in behavior evaluators [1] that evaluate the decency of an algorithm against the opponents. If an assessor could not take good actions with its decision-making methods, Core decreases the probability of accepting that assessor for the next states of the game. This method lets the agent throw away algorithms that cannot decide good actions against the opponents. For example, a problem occurred to CMUnited99 [2] simulator team in Robocup 99 against of Zeng99 [3] when CMUnited players in breakaway modes mistook a defender for the goalkeeper and missed some goal opportunities. To avoid such problems,

after losing some breakaway occasions, Respina players decrease the probability of choosing breakaway assessor's decision, and make it a useless one.

All of our high-level behaviors except the formation selecting module are assessors so we can add every new high-level method to our agents and if it works well, Core will pay more attention to it due to the results it achieves against the opponent team.

The complete details about Dynamic Multi-Behavior Assessment are available in our paper submitted to the 5th RoboCup symposium [1].

2.1 Sharing Assessors Decency Knowledge

When Core of a player transforms assessors' decencies, it tries to share its information about the opponents with other players, to help the teammates to use assessors as well as possible. The decency of assessors may differ between two player with different tasks or different types in a heterogeneous environment, so each player may share the information about its assessors and players with the same types and tasks. Another usage of sharing decencies with the other teammates is that due the dynamic positioning of players, a player may sometimes be in a position in the field that is not for its task. For instance, a midfield player may be placed in position of a striker; so the player, temporarily, changes its assessors' decencies with received information from a teammate striker in the past. Also this feature is for times that a role exchange will happen; Because of decreasing stamina and also heterogeneous environment, it's necessary.

2.2 Pre-training Assessors' Decencies

Fast adaptation to the environment is very important for soccer agents. So for better performance in real-time mode, agents must use pre-trained values for their assessors. After training agents against different teams, the overall achievement of an assessor will be the default decency value for that assessor. For instance, if an assessor that analyses the perceptions with decision trees fails in many tests and trainings, the default decency value will be lower and vice versa.

Our team uses a classification of assessors' decency values based on previous competitors (especially previous year teams) that lets faster regulating decency values.

2.3 Our Implementation of DMBA

Our architecture for agents is a fully multi-threaded system and each assessor is a thread. Each cycle, after telling their decision to the Core, assessors suspend themselves until the next cycle. The multi-threaded architecture lets complete implementation of DMBA system that needs a parallel processing of assessors each cycle. Because of optimum implementation of base assessors, if some assessors with high load of game processing can not finish their decision making through one cycle, Core can choose an assessor from available ones.

3 Conclusion and Future Works

Our opinion is that DMBA is sufficient agent architecture and learning method for both adaptation and learning areas. Our future works concern designing more assessors, better pre-training of assessors' decencies and creating new opponent modeling assessors. A high load of our future plans concern the coach standardized language and players' teamwork and coordination. As other types of learning methods like Q-Learning and Neural-Networks can process the game like assessors, we plan to create more agent learning methods as assessors under the design of DMBA. Some ideas like a positioning method named Liquid Positioning (LQP) and another method based on LBG algorithm are not described in this paper and used for RoboCup 2001 competitions.

Respina 2001 team with DMBA architecture got the first place in Scientific Evaluation Challenge of Soccer Simulation competitions in RoboCup 2001.

References

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