

Team 11monkeys Description

11monkeys

Shuhei Kinoshita, Yoshikazu Yamamoto

SK, YY: Keio University, Japan

Abstract. *The major purpose of our research is to study cooperative planning for multi-agent system in time-critical environment. The RoboCup simulator league is the most interesting target for our research. Each agent of the team 11monkeys is realized as an autonomous agent that has two sets of rules, namely state dependent rules and position specified rules. We call the former dynamic role and the latter static role, since it is assigned to agents before the game begins and remains as they are until drastic formation change occurs. On the other hand, state dependent rules are dynamically changing according to the state of the agent, for example it has a ball or is near the ball. When the agent changes its dynamic role, robustness is the most important issue. Since our agents are autonomous, dynamic role change are triggered by their own recognition of the current state. For cooperative planning, we propose three layers planning, strategy, group, and individual.*

1 RoboCup Simulator League

The major purpose of our research is to study cooperative planning for multi-agent system in time-critical environment. The RoboCup simulator league is the most interesting target for our research. Soccer Server is the official servers of RoboCup.[1]

2 Dynamic Role Assignment

Role is necessary for autonomous agents. If agents don't have any role, agents behave selfish. In many cases roles were allocated statically. It was not so flexible. We use dynamic role assignment system. We call dynamic roles as "Player with ball" or "Player for support". In our team, dynamic role number is six. In offense mode there are three roles, and in defense mode there are also three roles. At first agents autonomously make a judgement of offense mode or defense mode. Next agent most suitable player to catch ball is allocated "Player near the ball". If in defense mode "Player near the ball" is named "First Defender". If in attack mode "Player with ball" is named "First Attacker".

Offense Mode

First Attacker Player with Ball
Second Attacker Player who supports First Attacker
Third Attacker Other Players

Defense Mode

First Defender Player near ball
Second Defender Player who supports First Defender
Third Attacker Other Players

That is agent selects autonomously the most suitable role of the six. He does not depend on others in making the decision. In order to take into accounts robust. The moment one player catch the ball, the others' roles automatically change.

3 Static Role Assignment

However the only dynamic role assignment does not work. Without static role agent cannot behave correctly. Static role assignment is position specific rule.[3] In our team static role means position such as "Right Forward" or "Right Center Back". Eleven roles are defined according to the requirement of the formation, such as 4-4-2. Dynamic roles and Static roles do not conflict. By changing the formation, strategy can be changed. Changing the formation according to the opponent modeling is thought to be potent. But it is not implemented now.

4 Cooperative Planning

For cooperative planning, we propose three layers planning, strategy, group, and individual.

4.1 Strategy Layer

Strategy Layer covers all teammates. In this layer Agents select their formation, tactics, and decide the policy of resource management. These must be decided depending upon opponent model. [2] Static role assignment is done in this layer. There are many team styles, indeed. So we need to adapt them effectively. Layer approach is popular one[4][5].

4.2 Group Layer

Group Layer planning include about three or four teammates in local state near ball. In group layer agent who finds the chance, can be a planner. If there are no fatal condition to execute the plan, agreement will be done, and plan in group level can be executed.

4.3 Individual Layer

Individual Layer planning covers only 1 vs 1 state. Agent selects most suitable pre-planned module. There are fatal condition, which agents withdraw his plan in every simulation step. For example agent cannot find pass course in defense area, he makes a decision of clearing ball.

5 Result

We won the first championship in Japan Open'99, which was held in Nagoya on May 1-3,1999. Total score is 14-3 for 5 matches.

6 Conclusion and Future Work

Our dynamic role assignment system led me to the championship. But we can say this system depend on RoboCup domain. Although, we cannot help depending on this domain, it is necessary to consider generic systems. For example, machine learning is potential. On the other hand, research about cooperative planning in real world domain is now started. In current condition agents behave too reactively. But to avoid enemy's trap, we need more sophisticated planning mechanism.

References

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