

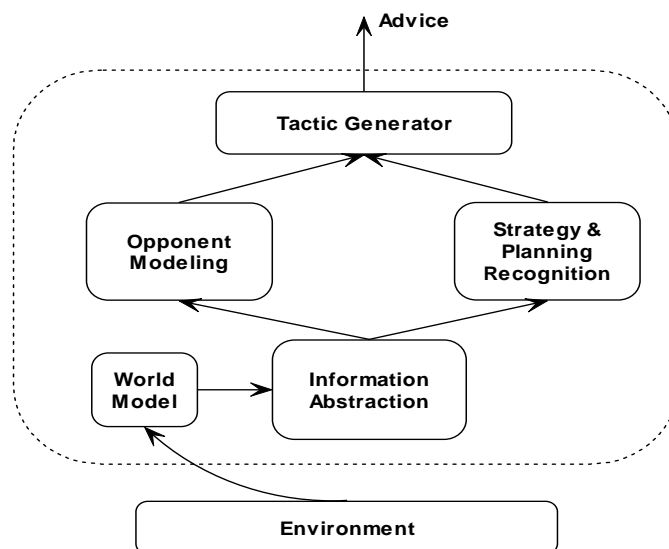
WrightEagle Coach 2004 Description

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Abstract. WrightEagle Coach is built upon WrightEagle Online-Coach-2003. Our goal is to improve adaptability of Multi-Agent Systems in diversiform adversary or competitive environments. We focus on two things. One is Opponent Modeling using System Identification method and plan recognition techniques. The other is Countermeasure Creating employing Plan Template Library and Search method.

Framework



Opponent Modeling

Opponent Modeling is very useful in choosing the right tactics when competing with opponents. The WrightEagle Coach adopts many analysis methods to model opponents. It mainly includes two important parts: individual player modeling and team modeling.

- **Team Modeling** describes the information about the opponent team, such as the formation of the opponent team, playing style etc. We predefine a set of parameters to describe an opponent team. When the game is playing, the coach calculates the game statistics and assigns these parameters as an evaluation for his opponent. Below are some of the parameters we considerate.
 - ✓ **Formation:** *identifies how opponent teams to assign their players in the field.*
 - ✓ **Position Density:** *describes the density that the players stand in the field.*
 - ✓ **Team Mentality:** *concerns the playing tendency of the opponent, like offensive, normal, defensive etc.*
 - ✓ **Playing Style:** *describes the type of attack and defense the opponent team are used, such as long-pass, short pass, possession play etc.*
 - ✓ **Offside Tactic**

- **Individual Modeling** is concerned with the knowledge about individual players of the opponent team. It evaluates characteristic and action tendency for each player.
 - ✓ **Player Type:**
 - ✓ **Action Ability:** *describes skills of a player, such as dribbling ability, kick ball ability, interception ability etc.*
 - ✓ **Action Tendency:** *describes the action tendency of a player in different situations, such as shooting tendency, dribbling tendency etc.*

Plan Recognition

The WrightEagle coach uses a mechanism based on statistics to analyze opponents' behaviors, recognize the key-scenes [1] and retrieve their plans automatically. The rationale is to track back the sequence of the important scenes, which we call *events*, and utilizes the statistical dependency detection technique to analyze their dependency after the opponent team has performed a successful attack or defense. By this means, we can finally find out and retrieve the opponent team's inherent behavior patterns or plans.

For instance, when the opponent team has completed a shot, the WrightEagle coach will search its memory backward, and then keep tracking every significant action of the opponent players, such as a pass, dribbling along the left side etc. After that, the coach will extract the sequence of these events and analyze the statistical dependency those events to find out inherent behavior patterns..

Counter Measure Creating

- **Plan Template Library Construction**

- **Plan Instantiation & Selection:** Randomly create several whole plan instances according to the templates, and predict the ending world states of the plans' execution with the aid of opponent position model. Then coach can choose the plan leading to the best world state and communicate it to teammates.
- **Defense Formation Adjustment:** Base on the opponent plan model we try to avoid the scenes that leading to bad result by re-selecting formations and defensive teammates' positioning models.

References

- [1] Zhanxiang Huang, Yang Yang, Xiaoping Chen, *Description of On-line Coach for WrightEagle Simulation Soccer Team 2002*, in Robocup 2002: Robot Soccer World Cup VI, The 2002 International Robocup Symposium Pre-Proceedings, June 24-25, 2002, Fukuoka, Japan.