UI-AI 2004 Team Description

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Abstract. UI-AI Robocup simulation team participated in Robocup 2003 soccer simulation competitions for the first time. Despite the powerful defense design which resulted in conceding no goals in total, severe problems in team design and some problems in coding made the team to withdraw the second round. Therefore to refurbish the team again, the team members changed and a new software team architecture was applied which will be described quickly in this paper.

1 Introduction

Previous soccer simulation competitions show that how much teams with the same world models, sensings, and low levels(based on the same source code) could play and gain results so different from each other. Therefore the better way players act or respond to their world data, the better reward they will receive in this way. This shows how much action selection and performing different actions correctly can give advantage over the opponent team in a soccer simulation match. Our main goal in UI-AI soccer simulation team was to develop a team based on better action performance and flexible action selection.

2 Team Architecture

UI-AI 2004 team is based on UvA-Trilearn 2003 low level source code[3], as described completely in [4] we used a simple priority/probability architecture. The model's block diagram is shown in figure 1. Basic actions are stored in agents action repository. Based on the activation rules, some of the action are activated for further analysis and they are fetched each cycle from the action generator. The action generator generates different possible types of each action. Each action generated is evaluated using the probability model. The actions with probability lower than the success threshold are not taken into consideration. The remaining actions are evaluated using the priority model. The action selector
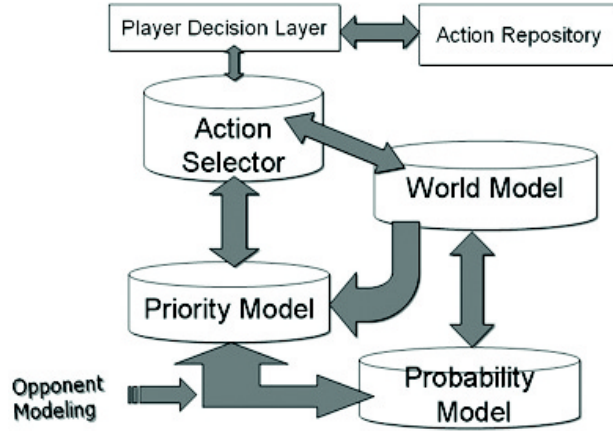
Fig. 1. Priority/Probability Model data block diagram

method combines the priority/probability results and will select the action with the highest reward.

Different probability mining approaches were used to determine the probabilities for the actions generated by our action generator. Simple heuristic knowledge tables and Neuro Fuzzy Approaches such as ANFIS were used to extract the probabilities. In our architecture which was a first-order Sugeno fuzzy model, for the sake of simplicity a common rule set with two fuzzy if-then rules is as following(five rules were used in our test):

Rule 1 : if x_1 is $A_{1,1}$ and x_2 is $A_{2,1}$ and ... and x_{48} is $A_{48,1}$, then $f_1 = P_{1,1}x_1 + P_{1,2}x_2 + ... + P_{1,48}x_{48} + R_1$.

Rule 2 : if x_1 is $A_{1,2}$ and x_2 is $A_{2,2}$ and ... and x_{48} is $A_{48,2}$, then $f_1 = P_{2,1}x_1 + P_{2,2}x_2 + ... + P_{2,48}x_{48} + R_2$.

The corresponding equivalent ANFIS architecture is as shown in Figure 2.

3   Defense System

In 2003, our team used a kind of wall defensive system which actually blocks 4 to 5 players from normal play during the entire game. The system lacked flexibility and prevented our team from attacking in a good manner. The players would only switch to their normal situations during the game when simple triggers happened during the game like when our team was leading in the number of goals. This year we are using a combination of our new defense system which is mainly based on TsinghuAeolus[2] defensive style and our old wall based defense. Our team will switch between the two types of defense based on the game situation.
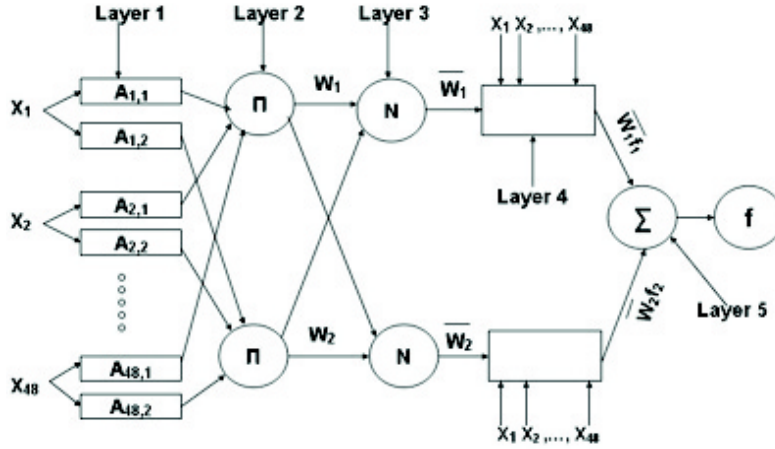
Fig. 2. ANFIS Architecture for extracting value of success

Although the system leads to more goals received by our team but also makes the team more offensive in attacks. Thus we used a kind of tradeoff factor between the goals we conceded and the goals scored to switch between the two defensive styles.

4 Goalie Design

In 2003, our goalie used a simple line blocking system which was moving up and down on a line near to the goal line. In this year's goalie design, we used a probabilistic model which uses a number of possible points around the goal which the goalie can move there to block the ball from being scored. In each cycle several factors are assigned to the points, such as the distance the goalie must travel, being able to intercept the ball from the point (if it is kicked towards the goal line), closing the pass line for opponent attackers and .... Based on the factors the best point for blocking is decided. Furthermore our goalie now understands simple situation such as antiattack and One-on-One which he will leave his normal position and dashes toward the ball. A modification of [7] has been used to define different situations of field for the goalie.

5 Passing Options

Two major passing systems in now used in our team, the first is based on calculating interception times using Newton method[8]. Different trajectories and speeds is generated when each player has control over the ball. For each generated trajectory the fastest opponent and teammate interceptors are calculated. If our teammates are the fastest to the generated ball trajectory, then, based on

different factors such as the difference between the interception times the best passing option is found. Our second passing system is a fast and simple algorithm to find some reliable pass options based on angles between opponents, the passing system finds and returns the fastest found passing option to the main players loop where the action are executed.

6 Conclusion and Future Work

After completing the main parts of our architecture design the team showed large amounts of flexibility. Due to the little time we had to develop the basic actions such as passing or dribbling the team does not perform very well in different action, although the architecture is doing fine. Our Future work is based on refining basic parts of the code and player actions. To refine these parts means of communication and coordination is really needed which we are applying coordination graphs mainly to them[9].

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