

Caspian 2003 Coach Description

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Abstract. Our main scientific goal is designing a *Multi Agent System Director* that models the system through their interactions and probabilistic methods and guides the whole system. In this research we consider the team as multi agent system, coach as the director and ball movement among the players as the interactions. The main probabilistic method that our team has especially focused on is using *Markov Chains* for prediction of system future states.

Introduction. In our approach we have tried to model the opponent team by recognition of ball movement patterns in the field and prediction of future state of the game. In soccer simulation competitions it is frequently seen that each team has some kind of pattern for ball movement on the field. Being more precise, it can also be seen that there is a general pattern in ball movement that is the result of teams' strategies, and the probability of ball presence differs across different regions of the field. Ignoring special cases like kick off, offside and other similar occasions that the ball is moved suddenly by the referee, the ball position in each cycle depends on its position in the previous cycles. These features in ball movements show "Markov Property" to a good extent and we decided to analyze the game using Markov chains. In this approach it is tried to predict the game status in the future cycles using Markov theory. To implement this kind of analysis, soccer field is discretized into a grid of regions, and the probability of displacement of the ball to each neighbor region by each team will be estimated.

Trough this approach coach will be enabled with these capabilities:

- i. Using Markov theory it can be predicted that in what regions there is more probability of ball presence and optimize team formation and positioning according to this information.
- ii. When the opponent has the ball, the coach can predict which regions have the highest probability of having the ball in future cycles. In this way the coach can generate rules for better ball chasing.
- iii. The regions, in which highest number of ball loss has been occurred, are detected and considering this information the passing patterns and attacking strategies will be improved.

Of course according to alternations of teams' formations and strategies, we need to update our prediction and rules periodically, this point is considered in Caspian coach design.

Future Work. In this research we gained some ideas about something like a "Director with Future Insight" in multi agent systems and invoked us to research more in this field.