Analyzing and Learning Opponent's Strategies in the RoboCup Small Size League

Kotaro Yasui, Kunikazu Kobayashi, Kazuhito Murakami and Tadashi Naruse

Graduate School of Information Sciences and Technology,
Aichi Prefectural University

Abstract. This paper proposes a dissimilarity function to analyze and learn opponent's strategies in RoboCup Soccer. This function shows the difference between opponents' deployments at two different times, and we extend it to the difference between those of two different time intervals. We exploit the dissimilarity function to analyze opponent's strategies. The dissimilarity function generates a dissimilarity matrix. Employing the matrix, the opponent's strategies are classified by the cluster analysis. As a first step, we try to classify the opponent's strategies used in set plays. We apply this method to the logged data of the small size league's games played in RoboCup 2012. By the experiments, we show we can effectively classify the attacking strategies used in set plays. We also discuss a method to learn the opponent's attacking strategies and to deploy the teammates in advantageous positions on-line in actual games.

1 Introduction

In the robotic soccer in RoboCup Small Size League (SSL), at most 6 robots per team compete with each other on the 6050 mm by 4050 mm field. Two cameras set at 4 m high over the field take the pictures of the field every 1/60 second and send them to the vision computer dedicated to the image processing. The vision computer calculates the positions of the robots and the ball on the field and sends them to each team's computer. Then, the team's computer computes, for their robots, the next positions to move according to their strategy and send them to each teammate's robot through radio communication. Additionally, a referee box computer, which controls the progression of the game, sends the messages like 'start throw-in', 'start corner kick' etc. to each team's computer. So, the game advances automatically without interventions of any person except for referees and a person controlling the referee box.

In the SSL, a moving speed of a robot is going faster year by year. For instance, the champion team in the RoboCup 2012 controls its robot by 3.5 m/s at maximum[1]. Also, the champion team can pass the ball at speed of over 4 m/s. In these environment, the prediction of the behaviors of the opponents is very important.

In recent SSL, each team decides its strategy based on the positions and velocities of the teammates, the opponents and the ball. The referee box's signals are also used. On the other hand, in human soccer, each player decides his/her