GDUT_TiJi 2012 2D Soccer Simulation Team Description

Haohui Huang, Wanlu Yang, Zijie Mei, Guangtao Wang
Shibiao, Liufu and Wei Chen

School of Automation, Guangdong University of Technology
Guangzhou, Guangdong Province, P.R.China, 510006
yelwong@gmail.com

Abstract

GDUT_TiJi is a 2D soccer simulation team which has been participating in RoboCup since 2006. This paper briefly describes the background of GDUT_TiJi 2012 and recent innovations since RoboCup2012 in Mexicowhich are mainly focus on optimizing our online planning for offensive situation and developing a new function to update the evaluated value. Also though the improvements of the low-level skills, we are working hard on enhancing the stability of our team.

1 Introduction

GDUT_TiJi, a simulation 2D soccer team of Guangdong University of Technology, was founded in 2006 and has been taking part in annual competitions of RoboCup China Open since 2007.In the preliminary stage, we used UvA_TriLearn as our team base code but we had not got the ideal achievements. Later on we changed our base code and began working on the Helios base code. In the new team base, we had made a deep research to the structure of Agent2D-3.1.0 and we had got the first prize in RoboCup China Open 2011 and the 5th place in RoboCup 2012 in Mexico.

RoboCup simulated soccer has been proved to be an excellent domain for researchers to test their ideas in artificial intelligence [3]. In spite of rigid, our works in the past was mostly focused on the position for both offensive and defensive though some geometric algorithms. In GDUT_TiJi2012, with the purpose of making our agents more flexible and dynamic, we have put our effort more on online planning.

This paper is organized as follows. Section 2 presents a new calculated function in the Field-Evaluator since last games. Section 3 briefly describes the improvement of the defensive skills. Finally, Section 5 concludes this paper and introduces the future work plan of GDUT_TiJi.

2 State Evaluation

As is well-known, the evaluation function in agent2D-base, just considering its X-coordinate, is quite simple but stable. In RoboCup2012, we had restructured the field evaluator by taking full advantage of the y axis of ball position which somehow reduced the rigid dribble. Since the evaluation function we used cannot generate smoothly returned value, the agent always holds the ball and stays in place.

In GDUT_TiJi2012, inspired this idea from USTC [2], we have rewritten with a specific evaluation function by the following equation that can adjust the returned evaluated values and make action that the agent takes be more reasonable:

$$\begin{aligned} tmp = &\sqrt{(Ball\_x + Pitch\_halflenth)^2 + Ball\_y^2} \\ &-\sqrt{(Ball\_x - Pitch\_halflenth))^2 + Ball\_y^2} \end{aligned} \tag{1}$$

$$Eval = a \times \frac{tmp}{Pitch\_Lenth + b} - a \tag{2}$$

The result for the evaluated values are shown in Figure.1, which depicts two characteristics of the balls position: its X-coordinate (the larger the better) and the distance from it to the opponents goal (the smaller the better).

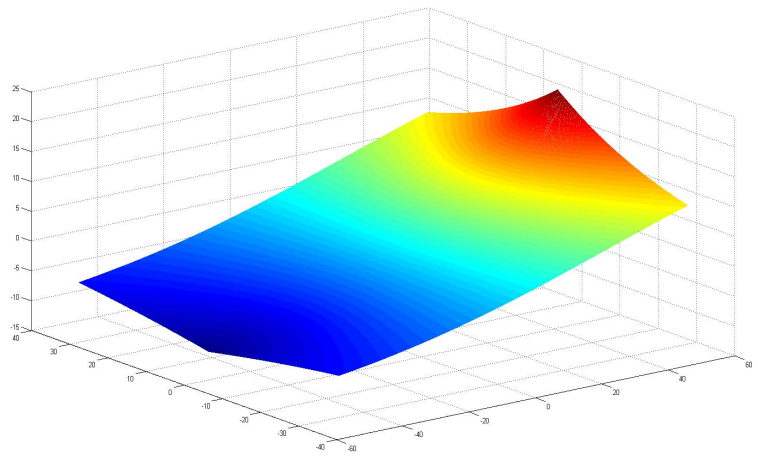

Figure 1: Simulation of the Evaluation Function

3 Defensive Skills Improvement

As of this is obvious, the defensive player in agent-2d base does not intercept before modifying when the opponent dribbles breakthrough our defensive line until it reaches the penalty area. Based on the Handcoded defensive policies we used in GDUT_TiJi of RobuCup2012, we optimize the strategies and adopt some new approaches to finding the efficient solution for assignment of opponents attackers to our defenders.

3.1 Block

The most challenging part in this improvement is determining by two aspects. On one side, firstly, we should realize which defender of us should be assigned to block the opponents attacker dribble and calculate the point where the agent should move so as to tackle or intercept the ball more accurately and actively according the distance to the goal and opponents direction. After last competition, we have re-analyzed the structure of agent2d base and on the basis of the teams performance which was also used the agent2d base in RoboCup 2012, we found that the agents tended to dribble into the bottom line when they were in offensive situation. In GDUT_TiJi2012, therefore, we have strengthened the defensive and intercept ability of the side back players, especially we put more attention into the interception when the opponent has done a through pass. In this aspect, we considered the following parameter to improve the function of the original interception and propose a better interception strategy: the distance between the ball position and the defender position — S_1; the distance between the ball position and the goal — S_2; the velocity of the ball — $ball\_vel$; the running direction of the ball — $ball\_dir$; the weight for the intercept position according to the ball velocity and direction — k. Then the intercept point calculation function is given as follows:

$$Intercept\_pos = ball\_pos \times \text{arctg}(\frac{S_1}{S_2} \times k(ball\_vel, ball\_dir)) \tag{3}$$

Figure.2 depicts an example of procedure of the side back players interception. Actually, the side back players, instead of running back to the basic point, can provide more protection in case the opponent passes the ball to the center opponent or breaks through. How simple it is, but indeed practical.

3.2 Mark

On the other hand, furthermore, we devote to desire a practical one-by-one marking function after GDUT_TiJi2011 which is done in order to keep the opponents away from ball or not let them get the ball easily. Nevertheless, the defender may miss the opponents that should be marked since we just consider two opponents nearest from the defender. For this reason, we have defined the defensive half player, number 6 in GDUT_TiJi2012, as an important offensive

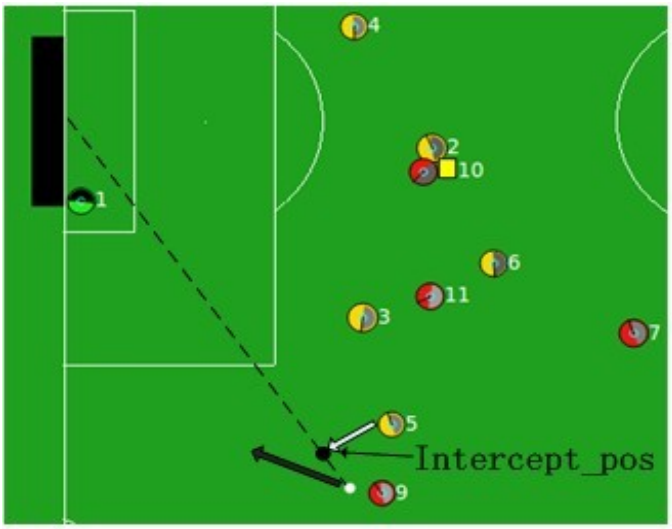

Figure 2: Route of Interception

Table 1: Statistic of the Side Back Defensive

Games Numbers	Defendive Numbers	S(Defend Success)	F(Defend Fail)
20	192	126(65.4%)	66(34.6%)

agent to undertake more defensive mission. To be specific, our one-by-one marking function is constructed by the flow chart shown in fig 3:

4 Experimental Results

In order to evaluate the effectiveness of our previous efforts we did on GDUT_TiJI2012, vast amount of tests were performed against two different teams and each game had run over 100 games to reduce the contingency which definitely exist in 2D simulation. Also we will compare and analyze with GDUT_TiJi2011 both in offensive and defensive.

From fig 3, it is shown obviously that GDUT_TiJi2012 has maximized the winning rate since GDUT_TiJi2011.

Against a stronger team as Marlik2011 as shown in fig 5, however, the percentage of winning had not been improved apparently compared with GDUT_TiJI2011 but seem to be more stable. In addition, table 1 depicts a statistical analysis, gathering from the games of GDUT_TiJi2012 && Marlik2011, about the defensive ability of side back players to test the utility of interception function as Equation (3). Here, we defined S if the agent could stop the opponent who tried to break though along the bottom line or pass the ball to the center attacker, otherwise it would be F.

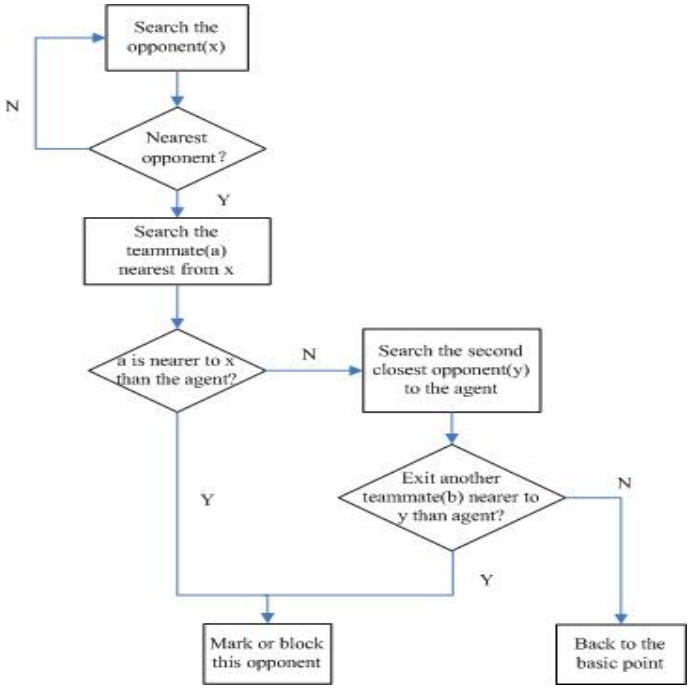

Figure 3: on-by-one marking function

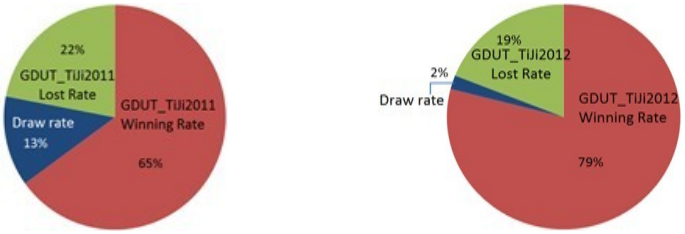

Figure 4: Route of Interception

5 Conclusions and Future Works

In this paper, we have briefly described our latest works since RoboCup2012 mainly focusing on the defensive situation in the field of MAS. Although it had enhanced the stability of each agent, there is more problems and bugs such as the vision information, stamina etc. that need to be solved or fixed in the future. In addition, we propose a new evaluation function to make up for the ignorance of the Y-coordinate and the discontinuous of the return evaluation values. Also, some experiments were performed to show the effectiveness of our approaches.

Despite these efforts, in order to apply the on-line planning in the defensive part, we are developing an anti-calculation system for our team which is used to predict the opponents action in the next cycle. Even if there are many

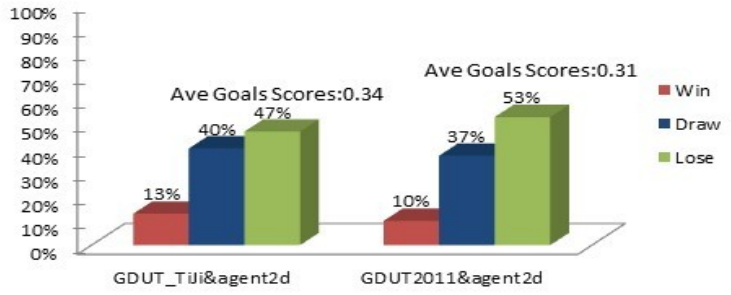

Figure 5: Statistic of GDUT && Marlik2011

problems in it, we hope not only can it work on our team in the near future, but also contribute to the defensive strategy. Moreover, we will also consider more abstractly in the low-level skills to let the agents act more like human.

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