RoboCupRescue 2012 - 2D Soccer Simulation League Team Description, Ri-one

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Abstract. Ri-one is 2D soccer simulation team based on Agent2D base team. We researched ball possession because we think it is essential for getting score to keep ball possession better. We will mainly introduce team features, the new techniques and ideas that is included in Ri-one2012.

1 Introduction

Ri-one is a project team of College of Information Science and Engineering at Ritsumeikan University, organized in 2005. Our team is developing agents for RoboCup 2D soccer and rescue simulation leagues now. The development of our 2D soccer simulation based on UvA Trilearn started in 2005. We have participated in the annual world competition for five times. In 2006, We won the third place in the competition held in Bremen, Germany. We changed our base code from UvA Trilearn to Agent2D this year in order to implement a new idea.

This TDP is separated into three sections. In the second section, we will explain our strategy and ideas. In the third section, we will state experiment we held.

2 PotentialField

A variety of formations and tactics are used in recent 2D soccer simulation league. We think attack is most important in soccer. For example, our agents snatch a ball around center of the field and pass forward progressively. We think shooting a goal quickly before being snatched by opponents leads to the advantageous situation.

Our main tactics was that through pass. This tactics was simple and effective in games with earlier teams. Today, many teams work out countermeasures and our tactics lost the effect. We explored the way to increase our ball possession. We include potential field method for handling ball safely. As one of the tactics for increasing ball possession, we use 3-4-3 formation in order to gain our ball possession. Our MF and DF agents have a simple role. They snatch ball and pass to FW as beginning the counter. FW agents' role is that catching pass from MF and shooting a goal. If MF or DF can snatch ball, FW move to position solved by potential field method.

2.1 Ball possession

We think high ball possession is essential for agents to act tactically. There are two reasons, one is a problem of our through pass described in above. Another is today's situation. In 2D simulation league, high-ranking teams' agents keep high ball possession and we guess that enable their tactical actions. For that reasons, we assumed high ball possession lead agents' tactical actions.

2.2 Potential Field

The potential function was introduced as an algorithm for newly determining action of an ally agent by Ri-one this time. It is because we thought that each agent can find the optimal action in consideration of other objects. In Ri-one, from the spatial relationship of all the agents and goals, it is evaluated whether the position of a ball is suitable. Moreover, an agent acts based on the valuation function. The valuation plan which we introduced is shown below. The evaluation value of the ball for which it asks is set to v. The evaluation value of the agent of a predicted ally, it is a resultant when the particles generate the influence F which draws a ball of the agent of an ally. From these, an agent is considered to be a sphere, it considers having influence F on the minute area of the ball surrounding the outer shell which contains a ball as a point uniformly.

If distance of a ball and the agent a_i of an ally team is set to r_i, the coefficient k is provided in arbitrary value, the influence F which should be applied between a ball and an agent is searched for by the formula 1.

$$F_{a_i} = \frac{k}{4}\pi r_{a_i}^2 \tag{1}$$

At this time, replace expression coefficient $\frac{k}{4}\pi$by K. It can shown that influence which works between ball and agent is expressed like the expression 2.

$$F_{a_i} = \frac{K}{r_{a_i}^2} \tag{2}$$

Identically, it can be shown that influence F_o which works between ball and agent of a partner team like an expression 3

$$F_{o_j} = -\frac{k}{4}\pi r_{o_j}^2 \tag{3}$$

Accordingly, the evaluation value of the ball can be derived as in 4

$$v = \sum_{j=1}^{11} \frac{K}{r_{a_i}} + \sum_{j=1}^{11} -\frac{K}{r_{o_j}} \tag{4}$$

The bigger the value of circular K becomes, the bigger influence the potential field method makes.

By implementing the potential field method, we realized dribble avoiding enemies and pass which is hard to be deprived.

3 Experiment

3.1 Settings

By analyzing the log of games, we examined how strong potential field method affects the ball possession and the result of the games. We selected Agent2D 3.1.0 as the opponent team. The version of rcssserver was 15.0.1. We assumed ball possession as follows:

- If agents of only left team are kickable a ball, left team possess ball.
- If agents of both teams are kickable, the team as follow possess ball.
  - If there are more agents of left team than agents of right team within a 15-meter radius from a ball, left team possess.
  - If there are same number of agents of both teams in circle, comparing the toal of distance between a ball each agents and the team which sum of distance is less possess the ball.

For example, left team possess in Fig.1

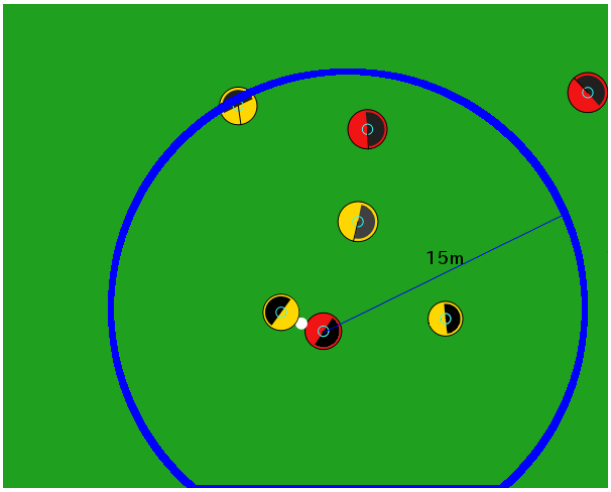

Fig. 1. Case in which left team possess the ball.

At first, we held 500 games with the team without potential field. Then, we held 2500 games with the team with potential field. In each 500 games of latter 2500 ones, we used different values as coefficient K.

3.2 Result

We analyzed the logs of 3000 games. The ball possession and winning percentage of each case are shown in Fig.2. The horizontal line indicates the value of coefficient K, and the vertical line indicates the average of each ball possession and winning percentage.

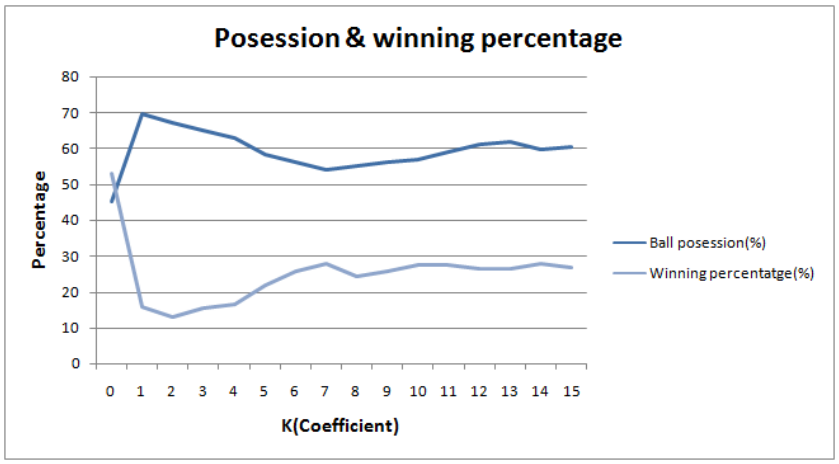

Fig. 2. Average of ball possession and winning percentage

According to Fig.2, ball possession remarkably improved after adopting potential field. In the game which the test team has good ball possessive, however, the winning percentage tend to be low. These results show that introducing potential field method improves ball possessive. We also discovered that good ball possessive do not connect to victory.

4 Conclusion

In this Team Description Paper, we introduced the strategies and technologies of Ri-one. Then, we explained the algorithm which plays an important role in Ri-one.

This year, we obtained logs of games to proof the effect of potential field. The result shows that potential field method strongly affected the ball possession. Also, ball possession turned to be a factor that do not affect the result of the game directly. Due to the result, we studied that we should keep seeking important factors to win the game.

References

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