Hexa Opal Soccer Simulation 2D Team Description Paper 2024

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Abstract. RoboCup is an annual international competition. The aim of the competition is to promote robotics and AI research by offering a publicly appealing but formidable challenge. One of the RoboCup leagues is 2D Soccer Simulator. Hexa Opal is a team from students of Allame Helli 7 High School and Allame Helli 10 High School of Tehran, Iran. This paper introduces tactics and work we done to improve performance of our team. We focused to improve our press and shoot function with offside trap to increase our scoring rate and we use StarterAgent2D [1] Base for this work.

Keywords: RoboCup. Soccer Simulation. RCSS. 2D Soccer Simulation

1   Introduction

RoboCup competition founded in 1996 by a group of university professors (including Hiroaki Kitano, Manuela M. Veloso and Minoru Asada). These competitions are held every year in one country [2]. The 2024 tournament be held in Eindhoven, Netherlands. 2D Soccer Simulation league is one of the RoboCup leagues that simulate real soccer games. Server of 2D Soccer Simulation league is on Ubuntu [3]. Ubuntu is a Linux distribution based on Debian. Servers, monitors and other packages of 2D Soccer Simulation based on C++ programming language. Figure 1 shows the SS2D field and Table 1 shows libraries and packages that we need in SS2D [4].

Hexa Opal is one of the 2D Soccer Simulation teams. Our team formed in 2023.We are 6 student of Allame Helli 7 and Allame Helli 10 High School of Tehran, Iran.

In 2024, we want to participate RoboCup and IranOpen competitions.

1.1   Related Work

Some the SS2D teams like Cyrus [5] and Oxsy [6] are the teams that improve the league and develops some packages of SS2D. Some teams like Cyrus and Helios [7] develop some base teams that helps us to learn better some structures. You can access to TDP of other teams on the archive of RoboCup[1]. In the recent years we have concentrated on exploiting artificial intelligence and machine learning techniques

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[1] https://archive.robocup.info/

Fig. 1. 2D Soccer Simulation Field

Table 1. Packages name and usage used for SS2D

Packages name	Usage
Rcssserver[2]	Server of SS2D
Rcssmonitor[3]	Monitor of SS2D
Librcsc[4]	Library of SS2D
Starterlibrcsc[5]	Library of SS2D Starter league
Soccerwindow2[6]	Monitor of SS2D with better options
StarterAgent2D[7]	Starter base team

2   Dynamic Formation

With the help of fedit2 software, we were able to create our team's formations. Fed-it2[8] is a program to create formation for SS2D that developed for Ubuntu by Helios team. We created our formations with fedit2. We developed a script with C++ programming language that can change the formations to compile able script for server of

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[2] https://github.com/rcsoccersim/rcssserver
[3] https://github.com/rcsoccersim/rcssmonitor
[4] https://github.com/helios-base/librcsc
[5] https://github.com/RCSS-IR/StarterLibRCSC
[6] https://github.com/helios-base/soccerwindow2
[7] https://github.com/RCSS-IR/StarterAgent2D
[8] https://github.com/helios-base/fedit2

the match and used them in our team source code. Figure 2 shows environment of fedit2 application.
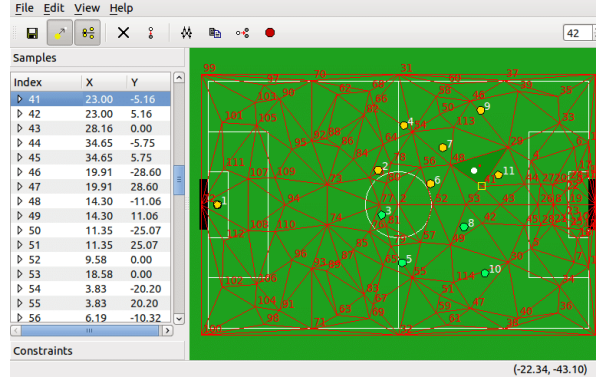

Fig. 2. Fedit2 environment

3   Pass System

We create a system for our pass function. We try to decrease wrong pass rate and increase complete pass rate.

Our system works according to these following steps:

1. Find the nearest teammate and their distance to player that have the ball.
2. Check no opponent near to our target player.
3. Make a Sector2D to target player.
4. Kick the ball using Smartkick() function.

In figure 3, there is one of our player (player 5) that wants to make a pass and shows the nearest players and in figure 4, our player make a Sector2D to get ready to kick the ball using Smartkick().
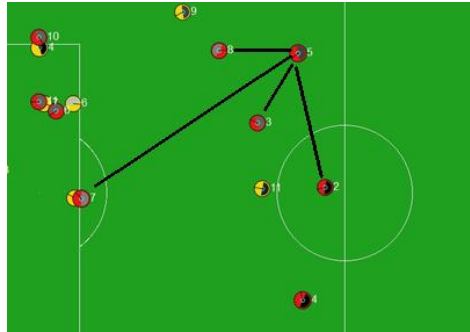

Fig. 3. Player 5 wants to make a pass

Fig. 4. Player 5 create a Sector2D to player 3

3.1   Passing in penalty area

Penalty area is one of the important areas in SS2D because players are near to each other and they can get the ball from opponent easily so we need a system to help us to decrease wrong passes rate in penalty area to keep ball with our players and create a good position to shoot to ball and get a goal.

Our system checks the players of both of the teams that they are in opponent's penalty area. If our player makes pass more than 5 times, the last player get the ball have to pass the ball to nearest player out of penalty area. Otherwise, if our player makes pass less than 5 times, the player has a better chance to make goal and shoot have to shoot the ball and make a goal for our team.

In figure 5 and 6 we can see the both situations of passing in penalty area. In figure 5, player 3 have no choice to pass to player in penalty area and it has to pass to player 6 or player 7 that they are out of penalty area. In figure 6, player 1 have a better chance to shoot and shoot and get a goal for our team.

Fig. 5. One the situations of passing in penalty area

Fig. 6. Another situation of passing in penalty area

4   Offside trap

When the home team is in possession of the ball, we record the position of the rearmost opponent's player (except the goalkeeper) with programming commands and obtain the longitudinal position of the players and consider it as the offside line, then two to three players of our team depending on The conditions of the game are placed exactly on the offside line, and for the player who owns the ball, depending on the position and freedom of action, a player on the offside line is assumed to be the target player. Then, the empty space of the opponent's defenders is supposed to be scanned by the target attacker, and the pass of the player who owns the ball is exactly in the same space, and the target player moves towards the empty space with maximum energy after sending the pass. In figure 7 we show an offside trap and shows the offside line.

Fig. 7. Offside trap of our players and offside lien.

5   Results

We developed our team with playing with Cyrus base[9], Helios base[10] and binaries of other teams like: Cyrus, Helios, YuShan and Hades and we find our bugs in the matches and try to debug them do improve performance of our team.
The binaries of the mentioned teams available at archive of RoboCup[11].

6   Conclusion

This paper describes all of works we do in 8 months to create this team and improve them to be ready for competitions and tournaments like RoboCup 2024 and IranOpen 2024.

7   References

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9   Cyrus base on GitHub: https://github.com/Cyrus2D/Cyrus2DBase
10   Helios base on GitHub: https://github.com/helios-base/helios-bas e
11   https://archive.robocup.info/Soccer/Simulation/2D/binaries/RoboCup/2023/Day4/