Algaurizim 2013 Soccer 2D Simulation Team Description Paper

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Abstract. Algaurizim is a 2D soccer simulation team based on Agent2D base team. The focus of the researches in Algaurizim team is about how we can simulate a soccer match better and make a more realistic soccer team. Algaurizim was started as a school research project in 2011 and now is participating in international robotic competitions for the first time. In this paper we describe the latest changes of our team and recent implemented ideas.

1 Introduction

Algaurizim is soccer2D simulation team that is now based on "Agent2D" base code information. This team was established in 2012 and taking part in the *International Iran Open 2012* competitions was its official experience. Then we participated Sharif Cup 2012 competitions then *Salam Cup 2012* competitions and we obtained good result there (the3th place).
This year we are going to take part in the *International RoboCup Competitions* in Netherland and gain good result, also we are going to join in the *Iran Open 2013* competitions and exhibit the best game of Algaurizim.
We hope our scientific activities and ideas can have an impact on soccer2D simulation.

2 Formation

In simulation 2D the Gridiron is rather small but each part of it has special situation and is completely different from the other parts which in each place a primary & a supposed place is considered for each player.

We should mention that different areas of the Gridiron have special features which require a change of first primary spots.

By observing the different formation of teams such as Helios -which has a system with high potential or the floating form like Oxsy and the simple kind formations- we realized that the one who cared about formation and the players place in the Gridiron in different conditions was the most successful but the simple teams didn't mention these subjects. So formation can be an advantage to most of present teams.

In order to achieve this purpose there are different placements for different situations, in each place which is called *Area* from now on, there are special places for each players such as forward, defender, etc. regarding their role, shirt number, areas and places we determine a suitable position for them. Positioning proximity of each player in the different areas is another factor which is noticed in this case.

Near the penalty area of our team some of defenders are placed between the players and the goal like a defensive wall, because the goalkeeper can't secure the game enough, so the defensive wall can disorder shooting of opponents. During this time one of the halfbacks or defenders catches the ball and in an optimist way the ball will be out of dangerous situation.

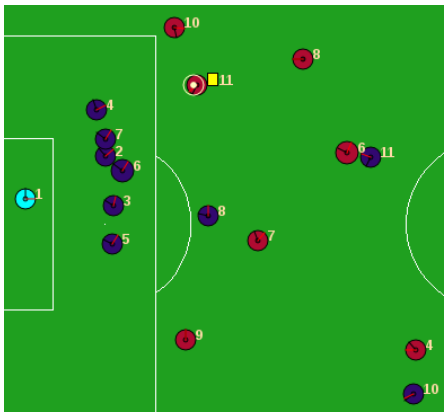

Fig.1 Defensive wall

However, if it isn't done carefully, by default one of the defenders who is the nearest player to the ball runs toward the ball and tries to catch it while doing his duty. If he wasn't successful in getting the ball he would make trouble for the goal.

3 Strategy

This team changes its playing tactics according to the opponent team's tactics and its relative potency. In the following section, we will write about the data analysis procedure, the result of the analyses contributing to the game strategy and the nature of the relationship between the components of the team.

3.1 Data collection and Analysis

The first step in forming a strategy is obtaining data. Therefore, accurate data collection and processing is significant. Each player can obtain unique data based on its position and view. Therefore, each player is tasked with storing the required data for strategy such as the position of the ball, and then carries out minor processing which require no single mind (System Strategy) such as estimating the position of the ball circulation. Then they transfer all these data to the commander.

3.2 Analysis

When data is collected, *Single Mind* (System Strategy) starts analyzing it. Because each player's view is different, the collected data is different. Hence, some common or unified data must be chosen to carry out the main analysis. Such procedure is called "Data Unification".

Commander changes his team playing according to the opponent's team play type and its comparative potency so that within the first 1200 cycle, the *Single Mind* (System Strategy) of the team studies the ball's circulation in different field zones. Then by using data analysis, it chooses one of the following positions for the rest of the play: offensive, equilibrate and defensive. Factors like ball's circulation in the field zones, percent of ball property, number of passes, sending successful passes and even goal numbers, affect on the *Single Mind* (System Strategy).

3.3 Result

3.3.1 Offence

We try to make goal position available; provided that we make sure there is no risk for the team defense when we are focusing on offence. When we believe most of our passes have succeeded facing the opponent, when we have been successful keeping the ball away from goal and when we could avoid failing a pass, we will change the play strategy to offensive by changing in formation, the important pass factors, etc.

Change in formation operates in the way that the defensive wall opens slightly and halfbacks join the offence. Also in pass, we decrease the safe pass importance in order to increasing the number of offensive passes and we enhance the importance of advancing to the opponent zone.

3.3.2 Equilibrate

When we are not sure about offence and more defenses are not needed, either, we will continue playing in default position.

3.3.3 Defensive

When the goal is at risk and we neither could have avoided the ball approaching our goal nor we have sent enough and numerous passes within the exam time (the 1200 first play cycle), we try to eliminate the opponent offence situation. And by providing counter-attack situation; first we dispossess the ball of our goal, and second, we create offence situation for our team by cracking the opponent offensive line.

From cycle 1200 to 2000 the System Strategy studies the performed decision. If the change in strategy ends up in bad result, we will change the play to default position. However, the system has been written with enough and necessary awareness.

3.4 The Nature of the Relationship

Production of and contribution to the science of artificial intelligence is an important issue gathering us together. Accordingly, relating and connecting the agents in a multi-agent system is an important issue in artificial intelligence. In 2D soccer, "Say" capability is a way of relating and connecting the agents. Bearing in mind that "Coach" is also a possible and executable method, we preferred this novel method over Coach.

However, this capability has its own problems: uncertainty in message transfer to all players, server noise, etc. The structure of our strategy is programed in a way that a particular player or in some cases all players should hear the voices and as a result these problems are compounded. We have tried to improve the situation to some extent by utilizing the reflection system. This system is inspired by the Flooding Algorithm in networking.

Flooding is a simple routing algorithm in which every incoming packet is sent through every outgoing link.

There are several variants of flooding algorithm. Most work roughly as follows:

1. Each node acts as both a transmitter and a receiver.
2. Each node tries to forward every message to every one of its neighbors except the source node.

One of the drawbacks of Flooding is in sending multiple messages causing high network traffic. In networking packets are guaranteed to be sent to all external devises, and Flooding is guaranteed to detect and select the shortest route for sending packets, as there are naturally many routes in a network. This algorithm is not complicated and is easy to follow. Flooding, however, has some disadvantages, as packets are sent to all external links and therefore causes a waste in bandwidth. Moreover, routing protocols such as DVMPR, OSPF, and ad-hoc wireless networks use Flooding algorithm.

This does not cause problems in 2D soccer simulator, but rather makes sure that the message is received by the right person. Therefore, we have optimized the algorithm in order to reduce the traffic caused by Flooding. We had to imagine the players in a complete graph because of the non-limitation factor of "Say". If there is no limitation for Flooding, infinite loop will result.

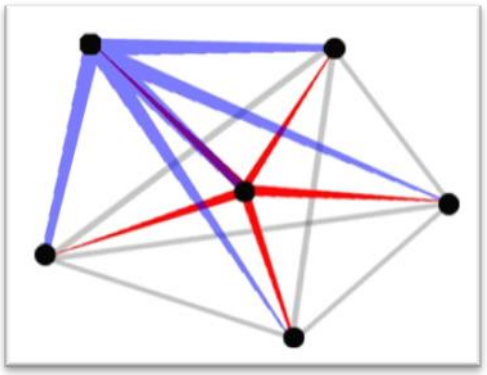

Fig.2 The effect of noise on "say" Capability

The optimization process took place as follows:
Each player is programed to repeat whatever he hears loudly unless he hears the same message he has recently heard. This is to make sure that a message is not repeated infinitely and that it is spread all over the field and has reached the *Single Mind* (System Strategy).

To further optimize the Flooding algorithm, we have divided the field into different sections, and each player who reflects the message adds a signal related to his location to the end of the message. Anyone receiving the message pays attention to these signals. Regarding the number of cycles for each message and the analysis each player carries out on it, if there is a location which has received no signal, this player then sends a message to that location.

An important issue here is that if several players want to send out a message simultaneously, there is hubbub and messages are not heard well. To prevent this, this player has a specific time and turn to reflect the message.

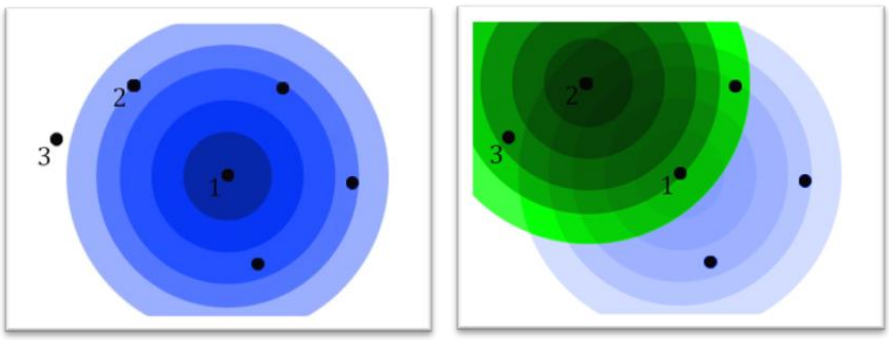

Fig.3 The view of massage reflection in gridiron

It should be mentioned that the idea and algorithm of this section is completed and we will apply this algorithm until competition.

4 Pass

It's evident that passing is a great pole in each team and it will have a desirable result if the process of performance is correct and without any mistake.

Passing in this team is divided into two parts: *Direct* and *Through*

4.1 Direct pass

In *Direct* pass each player has the target in the number of his teammates for pass and the main action is to choose the best target. There are many standards to choose the best target like being to the front or toward the goal or the distance to the target.

Some indexes are regarded for each of these factors and then the best one is chosen by getting the average, so that pass is sent by specific speed.

It should be mentioned that some factors like off-side will eliminate the supposed pass from the average stage.

But the most important part is to know if our pass reaches our teammate or it goes to our rival.

For this reason our functions simulate the Gridiron and predict areas for teammates and opponents regarding the speed of ball and other factors. If the path of moving ball and our opponents situation has something in common in a way that our teammate can't find the path this pass will go out of schedule like other unauthorized passes.

4.2 Through pass

The *Direct* pass may not reach to our teammate since there are not enough scores or other reasons in some parts of the game.

Sometimes it is necessary to make somebody mistake with an unexpected action to break the defense of the opposite team. So we use *Through* pass which will have a good result for this action.

In this action we use some functions which can predict the Gridiron to regard some spots which are in common with our teammates as the target spot, and then we give scores to these spots from two directions, the teammate who is supposed to catch the ball and the spot which the ball goes to. Then once more we get the average and choose the best spot then the ball will be sent there.

5 Future works

We plan to program a system for the team which can predict several future passes of the opponent team. The system will not only allow such passes but also will tangibly shift control of the game to the opposite team, and by providing such ideal conditions will lure it to use specific tactics desirable to us. And then we try to regain possession of the ball. Imposing specific conditions on the opponent team, we can also launch a counter-attack and score a goal.

Having launched the strategy thoroughly in the offence, we plan to identify weak points in the opponent's defense. Then using ant-colony algorithm, we plan to devise effective attacks.

6 References

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