Sepanta 2D simulation Team Description Paper 2013

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Abstract. Sepanta as a 2D soccer simulation team reestablished in 2011 to extend the ESKILAS project in Allame Helli High school. This paper briefly describes our current research efforts and future plans in soccer simulation field. This manuscript focuses on our communication system, our center-based defense strategy and Pass skill.

Keywords. 2D soccer simulation, Sepanta, agent2d, Robocup

1 Introduction

In late 2011 Allame Helli 2D soccer simulation team reformed and aimed to participate in robocup simulation competitions as a context research on decision making and artificial intelligence.
Sepanta project is based on our school previous attempts in this field[1] and supposed to use Mersad-Base initially. After participation in some robocup competition held in 2012 and after evaluation of agent2d we decided to switch on agent2d base code. So, after summer 2012 we concerned to revise our Mersad based source code so that to be used in agent2d and also we impact to develop the Helios based team toward new ideas. The base code we are using is a modified version of agent2d which is enriched with some of the utilities provided by Mersad-base. This code is publicly available[2].

2 Communication System

An optimized approach of encoding and decoding of the sent and received information by players using **say** command is a very effective notion that develops the amount of the exchanged information.
In each cycle, every agent can say a string of data. Agent2d itself sets each letter and places a specific letter at the end of the data by which the receiver can identify what the previous letters are about and how to decode them. Our team

innovated a new approach in order to enhance the amount of the exchanged information.
Considering that each letter in the saying string can be selected among of 73 characters(specified by rcssserver), in the present approach the string variable is considered as a representative of a number in base 73 with the digits as much as the string letters. As we identify some types of say which differ based on the used method of decoding, we specify a *flag* for each type of say message in order to determine the proper decoding method for the listener by that flag. We add this flag to the say message at first by this method:

$$FinalSaidNumber = \sum_{i=1}^{n} (SayMessage_i * \prod_{k=1}^{i-1} SayMessageBase_k) * 20 + flag_i$$

Then we encode the say massage by this algorithm: Each say message consists of several parts which we call SayItem. Each SayItem has two propeties, base and code. Base is the maximum number of states a SayItem can have which is constant for all said messages. Code is the current value of that SayItem that we want to send to other players.

$$SayMessage = \sum_{i=1}^{n} (code_i * \prod_{k=1}^{i-1} base_k)$$

And of course:

$$SayMessageBase = \prod_{i=1}^{n} base_i$$

The decoding system in this approach includes the simliar steps.

3 Defense System

The main strategy of our defense system is based on a complicated central system of communications. In this system each player decision is relied on what gets decided in the center.

3.1 Defensive Roles

For the better organization of the defending mechanism in this system, the players taking part in the process were divided into two groups: guardians and markers. The central system determines Each defender's role.

The guardians.

As a main role of the guardian we can notify taking positions to break the passes and blocking the opponent in his offensive action. **Blocking** means approaching the opponent and trying to intercept the ball directly or press the opponent away from the penalty area and force him to make incorrect pass or other error.

The markers.

Marking consists of behaviors and actions that an agent must perform in order to take proportionally the best position to the target opponent's position in order to limit him and break the incoming passes.

3.2 Center-Based Defense

In this system a commander, who should have almost a complete vision of our defenders and dangerous areas, is selected based on both of the ball and the players positions in dangerous situations. This commander determines the main task of each defender per each cycle and agents get aware of their duty using say facility.
After indicating dangerous opponents, the commander makes a bipartite graph including our defenders at one side and the attackers on the other one as the nodes. Then a weight is given for each edge according to distance , last markers, marker staminas and ball position, noticeably we use the **point to** feature for spreading out informations about player's staminas in our team. Thereafter he matches our defenders to a proportional opponent. The matched defender to the ball owner is the blocker and also defenders without pairs may help the blocker to limit the ball owner or may take a proper position to get ready for his probable next task.

Refreshing Commander's Vision

The commander says the mark-table only if his vision of our defender is complete. In order to refresh the commander vision, one of our mid-fielders updates 4 players' positions for him per each cycle using the say facility. These players are whom may be invisible to commander at time. This is done by various mid-fielders who have different visions of the field in different cycle.

Considering that a goalie with a better vision of our penalty area can perform much better, vision of our goalie gets refreshed by different Defenders per each cycle using the same method.

Internal Communications

Our Defender's dialogues with each other for clearing their task's details is the other part of our central system. These part is limited to a few communications by now. Working on this part is one of our future plans.

3.3 Regional Mark System

In spite of our players efforts for refreshing commander's vision, the commander may be sometimes disable to reach an efficient vision. So, the defenders will have to take an individual decision in that time. In first step each defender defines an area according to the voronoi diagram consisting our defenders positions in the team formation as its points, his and ball's position. They keep

their position until an opponent gets in their area, at this moment the defender starts marking him.

4 Offense System

4.1 Pass

In summary our pass system include three main parts: Direct pass, Indirect pass and Breaker.

Breaker

Whenever a proportional **Breaker pass** is found, the ball owner inform the receiver about it using say facility. He holds the ball until the receiver gets to the appropriate position (beside opponent offside line). Thereafter he kicks the ball with the velocity and direction he had informed receiver about, to cause an opportunity for the receiver to intercept the ball behind the opponent defenders.

Enhance Possible Passes By Positioning

Each offenders in our team has a regional area achieved based on the team formation and tries to find the most proportional position in that area for receiving pass by evaluating possible passes that can be made for him.
Whenever the ball owner wants to pass he sends information about the pass details to players using say ability, so, the offenders will be able to predict our pass receiver's ball getting point. Therefore, they can find a suitable position to that point and they can go to the appropriate position while the ball is traveling its way. So, when our teammate receives ball other players will be in suitable positions by time.

5 Summary

In this paper some of our efforts in the 2D soccer simulation field as Sepanta team is briefly described. We focused on our communication system, our center-based defense and pass skill.

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6 References

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