

# Radian 2D Soccer Simulation Team Description Paper

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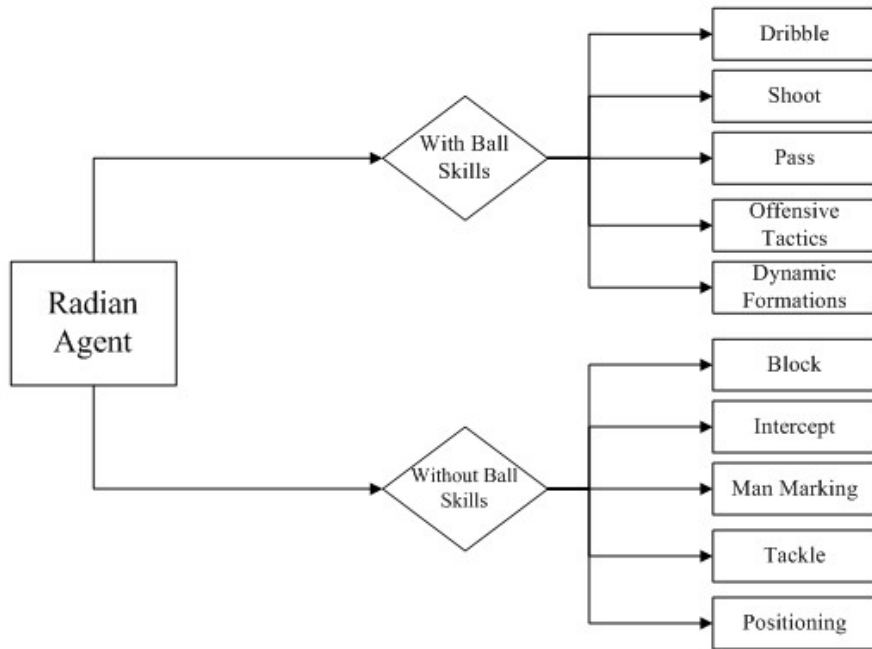
<http://www.radian2d.ir>

**Abstract.** This paper describes main skills of Radian 2D soccer simulation team 2009 this includes the module tactics in attacking and defensive and with ball and without ball skills. Radian with ball skills include shoot , dribble, pass, and attacking tactics and without ball includes block , man marking, intercept and dynamic positioning for defensive tactics.

## 1 Introduction

Radian 2D soccer simulation team was established in 2007 at *Allame Tabatabaei high school (ATCCE)*. Through the following years, Radian developed its skills and tested some algorithms and we are using newer algorithms in comparison with our previous versions. This team use the code of agent 2D base as a base code with good low-level foundations and continuous project activities now. Radian architecture is a combination of two major categories; skills with ball and skills without ball.

Radian has two source codes of agent 2D for developing because we think it is neater for programming, in fact we divided in to two subgroups ,one works on defensive skills and the other one work on offensive skills, so we have 2 binaries Radian\_defensive and Radian\_offensive; by the way we write a new shell script for running our binaries, in this way: player 1 (goalie) and player 2 to 5 are running from Radian\_defensive and players 6 to 11 are running from Radian\_offensive and then coach is on. We implemented some algorithms for shoot, pass, dribble attacking tactics, and block. In figure 1, the high-level structure of the team is presented that is described in following team description.



**Fig. 1.** High Level of Radian 2009

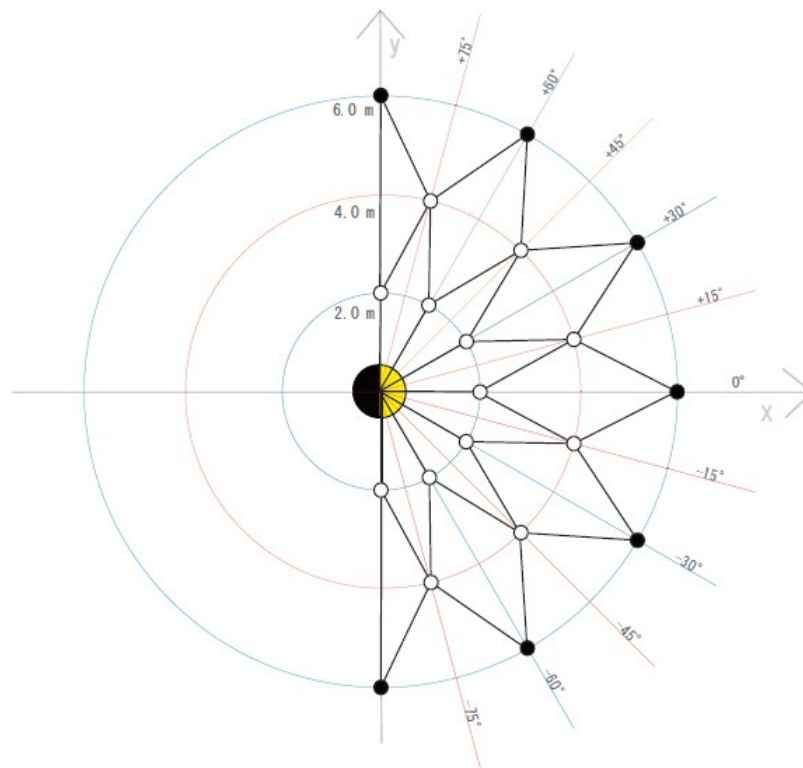
## 2 With Ball Skills

These skills are the most completed development in Radian, we use two algorithms for pass, first algorithm is checking spots and the second is viewing the ability of teammate for passing, check spots used for shoot and Circle-Lozenges for dribble. With ball situation is when “isBallInOurPosition” and “isBallKickable” are true.

### 2.1 Dribble

We used an algorithm for dribbling that is very useful between teammates; in this algorithm we have 3 circles, in the first one 7 spots are located on the circle environment, (spots have same distance from each other on every circle) on the second circle 6 spots are located and there are 7 spots on the last one, at last we find that the angel between every two spots on the last circle is 30 degree. Each spot on the first circle is linked to 2 spots on the second circle. And it is happening the same on the circle 2 and 3, it means each spots of the second circle linked to 2 spots on the

third one. In fact the tactic that we used in this algorithm is, when an opponent locates in one of the lozenges between the circles, if the lozenge been deleted, beside lozenges to the agent will be deleted as well so the paths to that lozenge will be deleted too. For finding the best lozenge, agent checks some factors for dribble such as which lozenges get lower number of dash action for join, how many opponents are near every lozenge and some other situations. This algorithm will be change in every state of the field, for example if team is attacking, the back area of the agent will be off for checking. Figure 2 show the algorithm better.

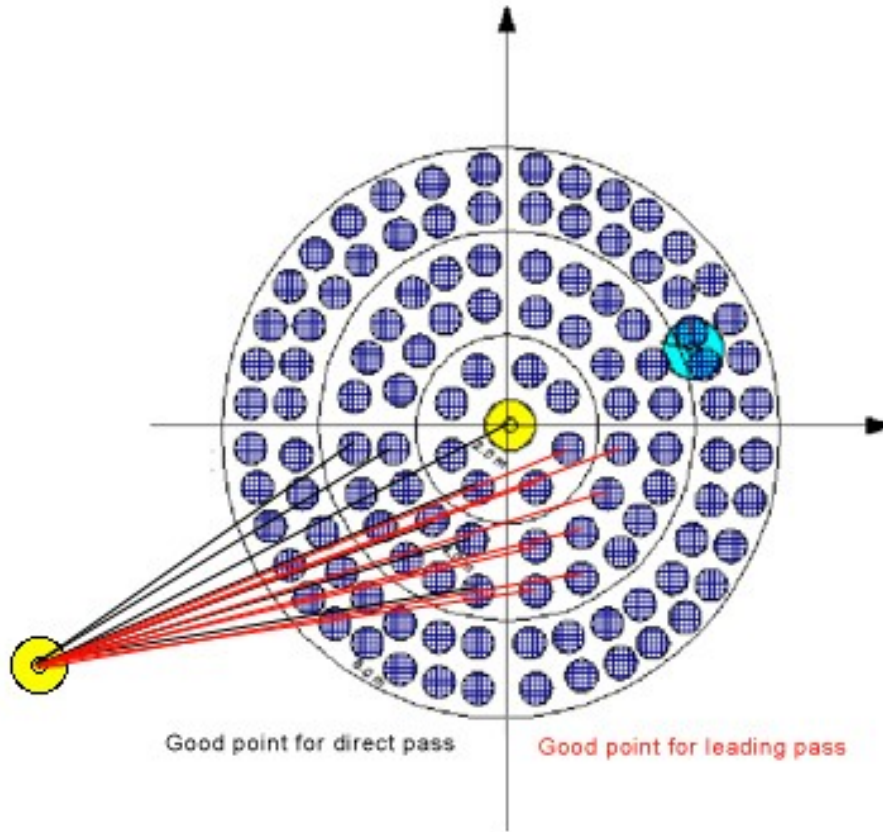


**Fig. 2.** Radian Dribble [1]

## 2.2 Pass

Pass is one of the most crucial skills applied in Radian that holds the duty of guiding the strikers, exciting the ball from the defense domains and reaching it to the penalty area of the rival's land and keeping the ball [2].

we use two algorithms for passing; algorithm one is checking the spots that are on a polar coordinates ( with teammate origin ) , in this algorithm we have many points within the 0.5 meter distance which are stored in a 2d array that are divided to 12 groups by a polar coordinate and 3 circles; for better observation refer to figure 3. Evert spots will be check with some factors , like distance from the opponents, velocity of opponents, body angel of opponents relative to agent and some others .



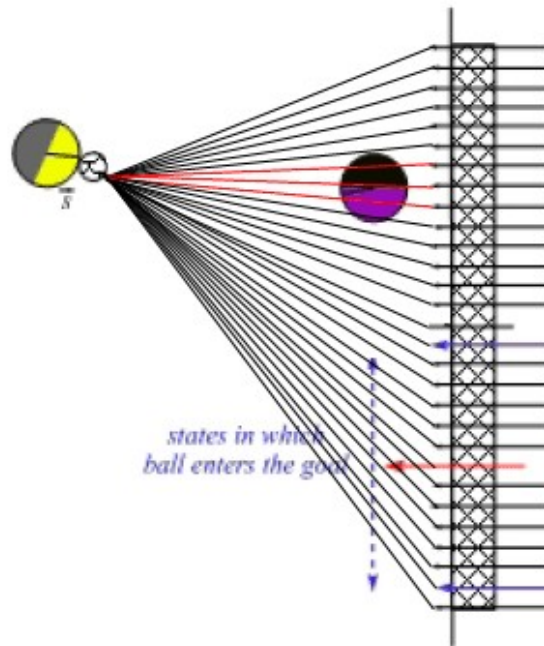
**Fig. 3.** Check Spots in pass algorithm

All the points with the remarked factors are checked and scored; finally the point with the highest score will be the best qualified point for passing. Algorithm two is apparently as a teammate is viewable in a cone and if prediction of having ball for the teammate in next the cycles will be true and the cone will be empty, teammate is a good choice for direct pass.

### 2.3 Shoot

There are a lot of shoot algorithms in 2d soccer simulation and in fact all of them are good for use, but we use an algorithm that is very computational. In this algorithm we have 29 points on goals [4] that are linked form agent to every spot.

We have some cones that are matched every line that are linked from agent to points. So we have some factors that the agents mostly check them for shooting like predicting ball to the points, if anybody is on the line and cone, if line is in catchable margin of goalie and some other factors. The highest scored point is the best choice for shooting. Figure 4 show the system of the algorithm.



**Fig. 4.** Radian Shoot, Check for best shoot point [4]

## **2.4 Dynamic Formation**

In fact in agent2d there are some ANN formations like BackPropagation Network and Delaunay Triangulation, but we use our own special formation, we have a dynamic formation before kickoff, defensive, goal kick for opponents, goal kick for our team and offensive. Our dynamic formations depend on ball position. Our normal formation is 4-3-3, if the ball position is below the line -20, team uses 5-2-3 formation [3]. In attacking, team formation changes to 2-3-2-3. This structure works when ball position is above +20 line; And between -20 and +20, team formation is 4-3-3 in normal.

## **2.5 Offense System**

In offensive system we first lean to our dribble skill. In fact we use total points that make team to attack in depth. It is so good for teams which have defend line. By the way leading pass and move forward is the best choices for beginning attacks. Another important subject that is intentional in offense system is dynamic positioning. It means when team start attacking, formation system changes to 2-3-2-3; in this formation we have 3 mid-attackers which support the offensive players in attacking movements.

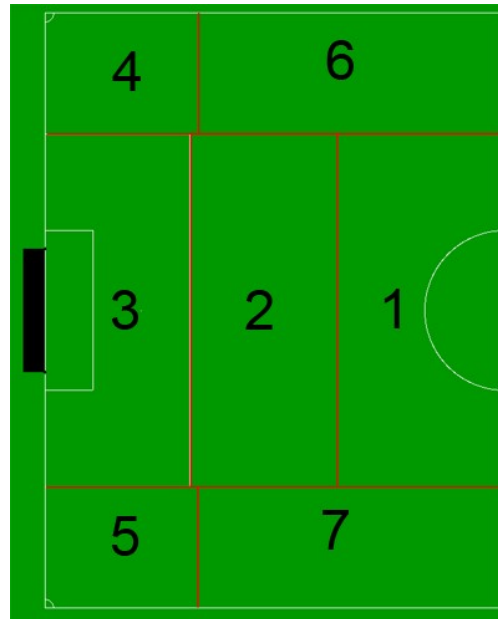
## **3 Without Ball Skills**

Here, the most developed skill is defensive positioning; most of our tactics in without ball are focused on dynamic positioning. Without ball skills are intercept, blocks, man marking, tackle and positioning.

### **3.1 Defensive Positioning**

Defensive positioning is one of the most important things in “without ball” skills, for defensive positioning we used 5-3-2 normal formation, but we divide our goal kick and our field, it means that every state ( figure 5 ) has a especial formation, for example “Danger State” or “Part 3” occurred when the ball is not in our position and is not kickable and it’s in our penalty kick area, as it is mentioned before we have three midfielders and three strikers. in danger mode, one of these 3 midfielders changes its type and join, the defenders ( the movement area is almost between -48.0 to -40.0 ) and the two left midfielders just change their movement area to -40.0 to -25.0 at the same time one of the attackers sets back and gets placed in the mentioned

area for the two midfielders. Meanwhile the two left attackers locate in counter strike position. the formation will be 5-3-2.



**Fig. 5.** Dividing our field for defending

#### **4 Future Research Programs**

In this paper we have simply described the main features of Radian team. This Team Description Paper shows that Radian is now a computational team and also we are researching on Markov Process Discussion ( MDP ) and Kohonen Neural Network ( KNN ).

#### **References**

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