BahiaRT 2016 Free/Scientific: A Dynamic Defensive System for 3D Soccer Simulation League*

Emmanuel Argollo, Marco A C Simões, Claudia Elizabete Ramos, Sérgio Souza Jr., Josemar Rodrigues de Souza and Diego Frias

With the development of the 3D Simulation league and its improvements both in motion behaviours and high level artificial intelligence, strategies for passing the ball between players began to emerge. With that in mind, our previous defense, which reacted only to the player with possession of the ball, was not as effective as before. This paper will present BahiaRT's new stage for the cooperative defensive module, which will be responsible for marking high-risk opponents without the ball, to avoid a passing advantage for the opposing team.

The BahiaRT's agents previously had four behavioral states defined from the state's analysis, direction and agent's position, allies, opponents and ball's position. Every behavior has a defined goal:

1) **Limited**: Retrieve your ability to participate in the game.
2) **Active**: Gain or maintain possession of the ball.
3) **Cooperative**: Take a strategic position according with the formation of the team.
4) **Active Marker**: Support the active player in marking the opponent with the ball.

The defense module[1] developed during RoboCup 2014 created a behavioral state now named *active marker*. Whenever the opponent team has possession of the ball, the defensive module chooses an agent between the ones currently behaving as cooperative to assist the active player in gaining possession of the ball. The new state, *passive marker*, will evaluate the current state of the field, searching for high-risk opponents and assigning the player to one of them, if it is available. This process occurs in three stages:

1 - Opponent Risk Assessment

During the first stage, the model will analyse each opponent's position in the field, distance to the closest ally, amount of allies between that player and the goal, within other factors. Taking all these into account, it will assign each player a *risk* value, indicating how likely that player is, if it receives the ball, to make a goal.

2 - Ally Availability Assessment

The second stage is responsible for checking each ally's *availability* to leave its strategic position and mark a risky opponent. This calculation takes into consideration the player's position in the field, the amount of opponents near, the likability of that player to become an *active marker* and so on. Similarly to the *risk*, an *availability* value will be assigned to each player.

3 - Target Assignation

Once both *risk* and *availability* have been assigned to all players, the model must decide which adversary the current player will mark, if any at all. To do that, it orders the opponents by risk, and if the risk is similar, by distance to the agent. For each opponent, it will check if there's a closer *available* ally to mark that player, in case there isn't and the agent's own availability and the opponent's risk are high enough, that player will be assigned as the target. If no target is found, the player will remain in the cooperative state.

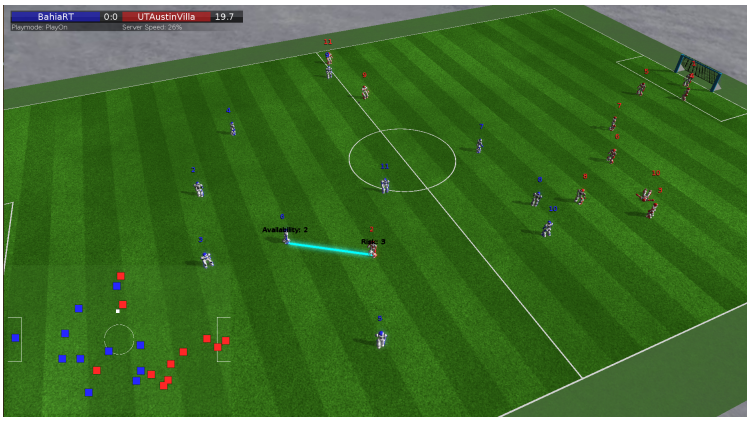

Fig. 1. Player 6 moving to mark agent 2 from the opposing team, risk and availability for both players are also shown.

Once the target has been set, the model will calculate a marking point, positioned between the target and the goal, near the target. As most passing strategies kick the ball a little further from the target, for it to get the ball and run towards the goal. To avoid committing charging fouls, we place the target far enough from the opponent to avoid collisions.

*State of Bahia University (UNEB/DCET-I/ACSO), Salvador, BA, Brazil

References

[1] Camila Laranjeira, Alan Soares, Emmanuel Argollo, Diego Frias, Marco A C Simões, and Josemar Rodrigues de Souza. Uma abordagem multiagentes para sistema defensivo em um time de futebol de robôs bípedes. *Revista de Sistemas e Computação - RSC*, 5(1):38–49, Jan–Jun 2015.