FC Portugal 2004 Team: Strategic Positioning for 3D Soccer

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1. Introduction

FC Portugal 2004 3D team is strongly based on FC Portugal 2D simulation league team [1, 2, 3]. In our 2D teams, which participated in RoboCup since 2000, we have introduced several concepts and algorithms covering a broad spectrum of the soccer simulation research challenges. From coordination techniques such as Tactics, Formations, Dynamic Positioning and Role Exchange, Situation Based Strategic Positioning and Intelligent Perception to Optimization based low-level skills, Visual Debugging and Coaching, the number of research aspects FC Portugal has been working on is quite extensive [1, 3]. The research-oriented development of our team has been pushing it to be one of the most competitive over the years (World champion in 2000 and Coach champion in 2002, European champion in 2000 and 2001 and always in the top five places in all major world competitions since 2000).

FC Portugal 3D team develops on the previous 2D team in several ways. It has an identical high-level structure [1, 3], adapted to the 3D specificities and completely rewritten low-level skills, still being developed and far from being effective[1].

2. Current Status

The current status of our team is quite simple at the moment. Agent's individual behavior is focused on intercepting the ball and kicking it to the opponent goal. Team behavior is basically defined by maintaining a simple 4x3x3 formation that moves smoothly on the field depending on ball position.

2.1 Agent Behavior

Agent's individual behavior is composed by two low-level skills:

- Move_to_Point(X,Y) – Agent movement to point (X,Y) starts by accelerating the player at full speed but depending on distance to target, player velocity is decreased so that the player may arrive to its destination at a reduced speed.
- Kick_to_Point(X,Y) – When near the ball, the agent positions itself in a point that enables it to kick the ball in the right direction[2] and sends a kick command to the server.

Although our low-level skills are still quite simple, one of our agents following this approach is capable of scoring goals against the sample agent team.

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[1] Soccer Server 3D is still far from being a stable and documented platform and thus, low-level skill development is still a hard and cumbersome task.

[2] In our current binary, agent's kick the ball always to the opponent's goal.

2.2 Team Behavior

Our team keeps a strongly tied 4x3x3 formation using our SBSP – Situation Based Strategic Positioning algorithm [1, 4]. The player's abandon their strategic positioning only if they think their strategic position is the closest to the ball. This enables the team to move in a quite smooth manner, keeping the field completely covered.

3. Projected Developments

We plan to adapt our previous researched methodologies (FC Portugal 2D team), to the new 3D environment:

- Strategy for a Competition with a Team with Opposite Goals [1, 3, 4];
- Concepts of Tactics, Formations and Player Types [1, 3, 4];
- Distinction between Active and Strategic Situations [1, 4];
- Situation Based Strategic Positioning (SBSP) [1, 4];
- Dynamic Positioning and Role Exchange (DPRE) [1, 4];
- Visual Debugging and Analysis Tools [1, 3];
- Optimization based Low-Level Skills [1, 3].

Depending on the server development and competition rules, the following methodologies may also be used in our 2004 3D team:

- Intelligent Coaching based on Opponent Modeling and High Level Statistics [2, 3];
- COACH UNILANG – A Standard Language to Coach a (Robo)Soccer Team [2, 3];
- ADVCOM – Intelligent Communication using a Communicated World State [1, 3];
- Intelligent Perception using a Strategic Looking Mechanism (SLM) [1];

4. Conclusions

Our 3D team development is far from being ready. However, the first results achieved by our simple binary are very encouraging. We believe that most of our research on high-level flexible coordination methodologies may be applied directly to the new 3D league. Given that most of our research in the 2D league was on high-level coordination and the main reason for our success came from our high-level flexible approach, we are confident that we may develop a very successful 3D league team.

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References

1. Luis Paulo Reis and Nuno Lau, *FC Portugal Team Description: RoboCup 2000 Simulation League Champion*, In Peter Stone, Tucker Balch and Gerhard Kraetzschmar editors, RoboCup-2000: Robot Soccer World Cup IV, LNAI 2019, pp 29-40, Springer Verlag, Berlin, 2001
2. Luis Paulo Reis and Nuno Lau, *COACH UNILANG - A Standard Language for Coaching a (Robo)Soccer Team*, In Andreas Birk, Silvia Coradeshi, Satoshi Tadokoro editors, RoboCup-2001: Robot Soccer World Cup V, LNAI 2377, pp 183-192, Springer Verlag, Berlin, 2002
3. Nuno Lau and Luis Paulo Reis, *FC Portugal Homepage*, Http://www.ieeta.pt/robocup
4. Luis Paulo Reis, Nuno Lau and Eugénio Oliveira. *Situation Based Strategic Positioning for Coordinating a Simulated RoboSoccer Team,* in M. Hannebauer, J. Wendler and E. Pagello eds, Balancing React. and Social Delib. in MAS, Springer, LNAI, Vol. 2103, pp.175-197, Berlin, 2001