

Oulu99 Team

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*Jarkko Kemppainen, Janne Räsänen, Jouko Kylmäoja,
Ville Voutilainen*

JK, JR, JK, VV: University of Oulu, Finland

Abstract. *Oulu 99 RoboCup simulation team is a simple, rule-based client which aims to play as effective soccer as possible without requiring the use of complex artificial intelligence. The tactical decision making of the client is based on simple rules which are determined by the player's position on the field and the locations of the other players and the ball. By adding a weighted random noise factor to rule-based decision, complex and variable game can be achieved although the basic rules are kept simple. This results in code clarity and efficiency. In addition, the system can be relatively easily enhanced to be, for example, an adaptive system by replacing the current weighted random choice, which has fixed weights, with some more versatile algorithm while the basic decision rules stay the same.*

1 General Goals of the Project

The original idea behind the team was to create a SoccerServer client that is as simple as possible while still being able to play formidable soccer. Since the project team consists of students with two to six years of academic experience, the complexity of the client is inherently limited. Therefore it was desirable to not use complicated artificial intelligence technics, but rather build the client with simple rule-based programming. When done properly, a simple approach can be later enhanced to deploy more advanced techniques in cooperation with the rule-based engine.

2 System overview

The system is divided into three main functional modules. These modules handle position information, basic movement and kicking, and tactical decisions. In addition to these modules, the system has a simple communication module which dispatches socket messages from the client to the server and vice versa.

2.1 Location information module

The client keeps track of the locations of the player himself, the ball and zero to three closest players for both opposite and own players. The system basically uses visual information as long as possible, and estimates the locations if visual information seems to be somehow invalid. An example of such case would be when a player runs in between the client player and the ball and the ball is thus unseen, although its location can still be determined.

The visual information part uses the possibility to turn the player's neck to obtain a larger angle of view. The actual view angle of the client is kept at the default setting, the only possible exception being the goalie.

In addition to visual information, clients use audio messages to try and communicate with each other. Given the uncertainties with which the audio information is transferred, audio information plays a much lesser role in location tracking.

2.2 Basic movement module

The movement module works as an actuator which takes care of calculating the desired movement and kicking commands for the player. The module is capable of dribbling with the ball, passing the ball with an optimized-length kick, kicking the ball as hard as possible when desired, intercepting the ball by running directly to the projected position of the ball and also controls player stamina when the player moves around the field.

2.3 Tactical decision module

The system makes offensive tactical decisions by finding a few closest players and determining the best possible candidate for a pass. This decision is mostly based on whether the pass receiving player has opponents near him. If a suitable candidate is not found, area play is selected instead. In addition to the locations of other players, the location of the dribbling player plays a role in the decision making. The player always attempts to play safely and avoid any possibility to lose possession of the ball to the opposite team. In practise this mainly involves ruling out certain types of passes, such as those that give goal-scoring opportunity to the opponent if intercepted.

Defensive play is handled by trying to guard the closest opposite player and by intercepting passes whenever possible. The intensity of defensive man-to-man game also varies depending on the location on the field; players defend more aggressively on the opponent side of the field. This might seem illogical at first, but it is much safer to play this way because a well dribbling player can simply dribble around too aggressive defenders and get a scoring opportunity. Therefore the defense model mainly tries to cover shooting angle when the ball is close to the own goal. Pass interceptions are still performed whenever possible, only the actual man-to-man play against the dribbling player is adapted to the location on the field.

The whole decision making process is simply rule-based, using weighted random choice. This randomness leads to more flexibility even with a rule based-model as the final action can not be known beforehand. Currently

the weights of the different choices are fixed, but it is simple to modify the system to support more advanced dynamic weight decision techniques.