Technical Challenges for the RoboCup 2011
Standard Platform League Competition

Dutch Nao Team

1 Objective

Our objective is to use zone blocking as a defensive strategy. Zone blocking is achieved when a Nao blocks the path of a Nao of the opposing team towards the goal. It is a defensive strategy to prevent the opponent from scoring. Our idea is to implement this in two phases. The first will be to shield the goal by lining the Naos up in a circle around the goal. The second will be the detection of the opponents and stay on the line between the opponent and our goal. This means that the opponent has to make a passing motion before it can shoot at the goal. Essential in this approach is the coOrdination between the defenders.

2 Approach

As mentioned before, we will use two phases to achieve our goal.

The First Phase

During this phase we aim to position our Naos on an ideal defensive circle around our goal. The Naos should also know their position relative to one another, so they can each assume their proper role in the defensive line.
This phase will consist of a series of steps:
- Determining the ideal area around the goal on which to set up a defensive line.
- Positioning the Naos at strategic locations on this circle using relative positioning to our own goal, while facing the opposing goal.
- Determining the relative position of each Nao to the other defending Naos (left, middle or right).
- Following these steps we will have our Naos placed on the ideal defensive circle while knowing their relative positions, after which they may start the second phase, actively blocking specific attackers.

The Second Phase

This phase starts when the Naos are positioned on their defensive circle facing the opponent goal. During this phase we aim to block the line between an attacking Nao and the goal. In order to achieve this we follow the following steps:
- Figuring out the relative position to the opponents. For each defending Nao, we will select the closest unguarded opposing Nao to block.
- Moving in line with the selected opposing Nao, while staying between this Nao and our goal.

3 Scientific contribution

In this challenge there are several issues that have to be solved:

Relative positioning: the ideal defensive circle could be reached by relying on absolute localization. Yet, without coloured landmarks it is difficult to maintain a robust and accurate location estimate. Instead, for this challenge it is chosen to orient each Nao with relative measurements; range and bearing towards the two goal posts and towards the two teammates.

Opponent detection: to be able to orient itself relative towards the opponent, an algorithm to recognize a Nao with coloured waistband is developed.

Indirect estimates: to stay between an opposing Nao and the own goal, the relative position of that goal has to maintained. Unfortunately, the goal is in the second phase behind the defending Nao, which means that the estimate has to be maintained with motion updates and observations of the opponents goal and lines from the middle circle.