

# Reactive Cooperation of AIBO Robots

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The aim of this project is to study a problem of cooperation between AIBO robots in a soccer environment similar to the one of RoboCup. The AIBO are small robots with the appearance of a dog, designed by Sony Corporation. They have four legs for locomotion and a head that possesses a camera to perceive the environment. RoboCup is a group of robotic activities like conferences and competitions held every year and attended by different universities from all around the world. Its aim is to promote the research in robotics by making robots to play soccer. In the competition part of RoboCup there are many leagues: Simulation, Small Size, Middle Size and Four Legged. In this project the robots used and the soccer field are the same ones as the used in this last league.

When there are two robots or more interacting, and all of them work together to perform a common task, we can say that cooperation takes place. Some examples of it are: searching for objects by more than one robot, moving of objects, soccer in RoboCup. In this project the problem of passing a ball from one robot to the other was chosen as a way to study cooperation.

In order to solve the problem it was divided in three subproblems. In each one the robots assume one role: Kicker, Receiver or Searcher. The Kicker has to look for the ball, then find the other robot and pass the ball to it. The Receiver has to look for the ball too, but after finding it it will stay at a distance of around one meter to receive it from the other robot. When it is not sure which robot is the owner of the ball, that is which one is the Kicker and which the Receiver, the robot assumes the third role, Searcher. In it the robot looks for the ball and then goes to it. Because the robot will eventually be near to the ball it will become Kicker.

The roles are decided taking into account the perceptions of the environment (the distance to the ball) and some information exchanged between the robots. Depending whether information is shared or not, and which type, five different experiments were designed and four of them performed. The different experiments worked as expected, allowing the robots to decide their roles.

The solution of the problem worked reasonably well. Robots were able to look for the ball and find it, then to align them and pass the ball. The most difficult part was the kick and it is where most of the errors took place. It is because the ball is not seen by the robot in the instants previous to the kick action, and because of the irregularities of the floor.