

Guy Hoffman
Fall 2003

A Reading of
Manuela Veloso, Peter Stone and Michael Bowling's
Anticipation: A Key for Collaboration in a Team of Agents

Veloso et al. describe the architecture of the 1998 CMUnited small-size and simulation league robot soccer teams. This paper deals in particular with the use of an anticipation model for passive (non-ball-holding) players in their choice of position.

In CMUnited's strategy players use a DAG-based behavior system to decide on a course of action. This behavior system is based on a decision tree taking into account the player's internal state and the positions of adversaries, teammates and the goal. For the active (charging or ball-holding) player this is translated into a choice of kicking, dribbling or passing. The question is what the other, non-ball-holding, players are to do in the meantime.

The paper describes an anticipation mechanism based on preset positions and formations that specify the movement of passive players. This is based on the principle of selecting "a new state that maximizes the probability of future collaboration."

Practically, this means a repulsion-attraction system (SPAR), based on the player's home position and limited by a set of constraints. The repulsion-attraction mechanism uses a weighted average score of the position of opponents, teammates, and the ball to determine the course of passive movement.

—

Robot soccer is a great real-world scenario for machine collaboration. Especially in a competitive environment it has the potential to put many ideas and theories into practice and under empirical scrutiny.

Yet, in this paper I felt that a lot of potential was missed out on. Anticipation, as the maximization of future collaboration is a great concept, but the extrapolation of that idea into the specific SPAR architecture does not fulfill the promise that this idea suggests.

Attraction and repulsion is a very simplistic way to model collaboration and I would even say that it hardly brings any *real* anticipation (in the defined sense) into play. I can't see how the methods used in this research would be generalized to other applications of teamwork and collaboration.

I would have much rather seen a robot soccer application of a more general theory of anticipation, instead of an extraction of a robot-soccer specific heuristic to a more general principle.

But then again, you can't argue with a world championship!