

SFB/TR 8 Spatial Cognition / IQN Video Conference

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Director of the IIIA**

**"Beyond individualism: Action selection in cooperative robot soccer
using case-based reasoning"**

Designing coordinated robot behaviors in uncertain, dynamic, real-time, adversarial environments, such as in robot soccer, is very challenging. In this work we present a case-based reasoning approach for cooperative action selection, which relies on the storage, retrieval, and adaptation of example cases. We focus on cases of coordinated attacking passes between robots in the presence of the defending opponent robots. We present the case representation explicitly distinguishing between controllable and uncontrollable indexing features, corresponding to the positions of the team members and opponent robots, respectively. We use the symmetric properties of the domain to automatically augment the case library. We introduce a retrieval technique that weights the similarity of a situation in terms of the continuous ball positional features, the uncontrollable features, and the cost of moving the robots from the current situation to match the case controllable features. The case adaptation includes a best match between the positions of the robots in the past case and in the new situation. The robots are assigned an adapted position to which they move to maximize the match to the retrieved case. Case retrieval and reuse are achieved within the distributed team of robots through communication and sharing of own internal states and actions. We evaluate our approach, both in simulation and with real robots, in laboratory scenarios with two attacking robots versus two defending robots as well as versus a defender and a goalie. We show that we achieve the desired coordinated passing behavior, and also outperform a reactive action selection approach.

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