United-2002 Coach Description

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Note: New permanent affiliation will be known prior to the tournament. Please allow me to revise before publication.

United-2002 is a successor of the CMUnited and ATTUnited teams: CMUnited-97, CMUnited-98, CMUnited-99, ATT-CMUnited-2000, and ATTUnited-2001. It is built mainly upon CMUnited-99. It also incorporates the team action architecture from ATT-CMUnited-2000and the heterogeneous player management from ATTUnited-2001. The main research foci of United-2002 are as follows:

- Scaling up temporal difference reinforcement learning;
- On-line learning of opponent player types by the on-line coach;
- Task decomposition with heterogeneous agents; and
- Single-channel, limited-bandwidth communication.

Of these four issues, the second and third are related to the on-line coach.

Our main focus for the coach competition will be learning to identify opponent player types from observation. Due to the short time-scale of simulation league games, past opportunities for on-line learning have been extremely limited. With the introduction of heterogeneous players, the opportunity arises for the on-line coach to attempt to deduce the opponent player types from observing their movements on the field. Since the players are drawn from a pool of just 7 player types, the problem reduces to a 7-way classification problem with constraints (e.g. no more than 3 players of any given type). The coach will either transmit player types to its team members and expect them to self-organize, or actively assign team members to roles so as to best counteract/exploit the opponents' capabilities.

The introduction of heterogeneous players into the RoboCup simulator introduces several challenges, including (i) the need to select a team from a pool of players; (ii) the need to organize the players based on their differing capabilities; and (iii) the opportunity to exploit/counteract the opponents' heterogeneous capabilities. Building on our research regarding the relative merits of different heterogeneous player types last year [1], we aim to address these challenges and to investigate and quantify the potential benefits of heterogeneous teams over homogeneous teams. We will incorporate this line of research both into our team and into our coach entry.

References

1. Peter Stone. ATTUnited-2001: Using heterogeneous players. In Andreas Birk, Silvia Coradeschi, and Satoshi Tadokoro, editors, *RoboCup-2001: Robot Soccer World Cup V*. Springer Verlag, Berlin, 2002. To appear.