

# Team Description of TsinghuAeolus

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**Abstract.** TsinghuAeolus, a RoboCup simulation team, is developed by the Tsinghua RoboCup Research Group who interests cover both education and research. After winning the champion of RoboCup2001 Simulation League in Seattle, RoboCup2002 Simulation League in Fukuka, and runner-up of RoboCup2003 Simulation League in Padova, TsinghuAeolus is making yet more improvement in the year 2004. In this paper we discuss recent advancements of our team, including a new advice-taking mechanism that has improved the decision-making of autonomous agents.

## 1 Introduction

TsinghuAeolus2004 is developed on the basis of our team in Padova. The complete team, which was finished last July, showed impressive agent skills and powerful attacking ability. The overall design features a reactive agent architecture with a decision-making mechanism composed of action generator, evaluator and mediator. We started building an advice-taking mechanism which can be attached to an existing autonomous agent last year. It works somewhat like the case-based architecture. Recently we have new progress in improving the advice-taking mechanism, and we shall be able to demonstrate its effects in TsinghuAeolus2004.

In the next section, we explain more about the advice-taking mechanism, and in section 3 we conclude with problems and our plan for future work.

## 2 Advice-taking Mechanism

Adaptability has always been a desirable property for autonomous agents. In some complex environments where it is hard for an autonomous agent to improve through unsupervised learning, taking external advice becomes an effective and practical measure toward adaptability. Though we have not yet found a way to evaluate which action, in the sequence of hundreds of joint actions, is the key to the final suc-

cess or failure, we believe and prove by experiment that improving individual scene actions can lead to better overall outcome.

There're two ways for agents to take advice in RoboCup Simulation. First, an online coach acts as an advice-giving agent. Second, a domain expert can give the advice to autonomous agents.

In our mechanism, the expert's advice is used more frequently. We define an advising-language to standardize the expert's advice so that the agents can understand. The advising-language is an expansion of CLang, with more flexible variable usage.

Our coach also advises online, based on simple opponent modeling. The coach learns the formation and pass routes of the opponent, then gives that information to the agents on the ground. Strictly speaking, this is more of information than advice, but it apparently improves the adaptability of autonomous agent.

### **3 Conclusion**

In this paper we mainly discuss how to achieve adjustable autonomy in TsinghuAeolus through advice-taking. While our approach has been proved effective in practice, there is still much room for improvement. Firstly, the expert's advice is given before the match, and the agents currently give no feedback; Secondly, what the coach gives is raw information, so the agents can rarely make use of it. We started our research on adjustable autonomy in 2002. Until now, we have made much progress. We plan to further improve our advice-taking mechanism with respect to the aforementioned limitations. Our ultimate goal is to develop a learning machine based on adjustable autonomy.

### **References**

1. Jinyi Yao, Ni Lao, Fan Yang, Yunpeng Cai and Zengqi Sun, Technical solutions of TsinghuAeolus, in RoboCup Symposium 2003, Padova, Italy