

Master Thesis proposal

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Research group: RIVI – Robòtica i Visió Intel·ligents

Title: RoboCup-Rescue Simulation Project: Evaluation and Strategies.

Studies: Artificial Intelligence Master

Description:

The Intelligent Robotics and Computer Vision (RIVI) group of the URV has participated in the past years in the RoboCup competition as a member of the only Spanish team in the competition. Its goal is to foster artificial intelligence and robotics research by providing a standard problem where a wide range of technologies can be examined and integrated. RoboCup-Rescue Simulation Project [Kitano, 1999] is a new practical domain of RoboCup. Its main purpose is to provide emergency decision support by integration of disaster information, prediction, planning, and human interface [Tadokoro, 2000].

A generic urban disaster simulation environment is constructed on network computers. Heterogeneous intelligent agents in the hostile environment, such as fire fighters, commanders, victims, volunteers, etc. conduct search and rescue activities in this virtual disaster world. This challenging problem introduces researchers into advanced and interdisciplinary Artificial Intelligence and robotics research themes, such as multi-agent planning, real-time/anytime planning, heterogeneity of agents, robust planning, mixed-initiative planning. For disaster researchers, RoboCup-Rescue works as a standard basis in order to develop practical comprehensive simulators adding necessary disaster modules.

The intention of the RoboCup-Rescue project is to promote research and development in this socially significant domain at various levels involving multi-agent team work coordination [Alnajar, 2009] [Takahashi, 2008], physical robotic agents for search and rescue, information infrastructures, personal digital assistants, a standard simulator and decision support systems, evaluation benchmarks for rescue strategies and robotic systems.

This Master Thesis is oriented to evaluate recent RoboCup-Rescue Simulation Project proposals and study possible improvements focused on collaborative strategies.

The specific goals of this Master Thesis are:

1. Summarize the state of the art of the RoboCup-Rescue Simulation Project.
2. Study both the main strong points and drawbacks of the available simulators for RoboCup-Rescue.
3. Propose new strategies that allow a team of heterogeneous agents to deploy collaboratively in order to reduce the mean waiting time in case of disaster.
4. Evaluate the previous proposed strategy in scenarios wherein agents can lose communication.
5. Study different code optimization levels in order to increase the efficiency of the implementations previously proposed.
6. Finally, if it is possible, the work developed in this Master Thesis will be published in some related conference or journal.

References:

- [Tadokoro, 2000] S. Tadokoro et al. Investigation Report of the Rescue Problem at Hanshin-Awaji Earthquake in Kobe. Proceedings of 2000 IEEE/RSJ International Conference on Intelligent Systems and Robots (IROS2000), Japan, October 2000.
- [Kitano, 1999] H. Kitano et al. Investigation RoboCup Rescue: Search and Rescue in Large-Scale Disasters as a Domain for Autonomous Agents Research. Proceedings IEEE Intl. Conf. on Systems, Man and Cybernetics, Vol. VI, pp. 739-743, October, Tokyo, 1999.
- [Alnajar, 2009] F. Alnajar, H. Nijhuis and A. Visser. Coordinated Action in a Heterogeneous Rescue Team. RoboCup2009, Graz, Austria, 2009.
- [Takahashi, 2008] T. Takahashi. Analysis Methods of Agent Behavior and its Interpretation in a case of Rescue Simulations. RoboCup2008, Suzhou, China, 2008.