



# MASSim: Multi-Agent Systems Simulation Platform

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## 1. MASSim: Simulator overview

MASSim, a Multi-Agent Systems simulation platform serves as a test-bed for testing, evaluating and benchmarking *coordination* and *cooperation* approaches in small-scale multi-agent systems.

### Features:

- *simulation scenario independent infrastructure*:
  - discrete time game simulations
  - plug-in architecture for simulation logic
  - simulation module realizes an environment for MAS simulations
- *independent on the agent team implementation technologies*:
  - agents connect and communicate via Internet
  - communication among agents in a team is client-side and arbitrary according to participants' needs
- *public real-time tournament monitoring*
- *off-line recordings of game visualizations*
- *MASSim is a robust platform*:
  - tournaments normally run continuously for several days

## 2. Technical infrastructure

MASSim platform features a modular architecture with limited capabilities to run in a distributed fashion on several servers.

**MASSim core server:** (Java)

- serves as the central component of the infrastructure
- facilitates interaction and cooperation of all the elements of the platform
- implements the tournament scheduling

**Simulation plug-in:** (Java class)

- discrete, step-based game
- implements the logic and the functionality of the MAS environment

**Agent-2-Server Communication:**

- TCP/IP socket connection
- XML messages
- MASSim provides a ping interface to test the link quality

**Agent teams:**

- run on participant's infrastructure
- no constraints on implementation technology
- no constraints on communication and coordination approach used

**Visualization library:**

- produces game recordings: series of SVG frames with JavaScript animation
- platform independent recordings: viewable by any SVG+JavaScript enabled browser → preferred MSIE+Adobe SVG Plug-In

**Web-interface:** (Apache/Tomcat, Java Server Pages)

- runs independently of the MASSim core server
- displays the current state of the tournament and collects results and statistics of the tournament
- provides a chat facility for participants
- Java RMI communication with the MASSim core server

**Debug monitor:**

- remote debug information retrieval
- Java RMI communication with the MASSim core server

## 3. Agent Contest

*Multi-Agent Systems Programming Contest* is an attempt to stimulate research in the area of multi-agent systems development and programming by

1. identifying key problems and
2. collecting suitable benchmarks

that can serve as milestones for testing multi-agent programming languages, platforms and tools.

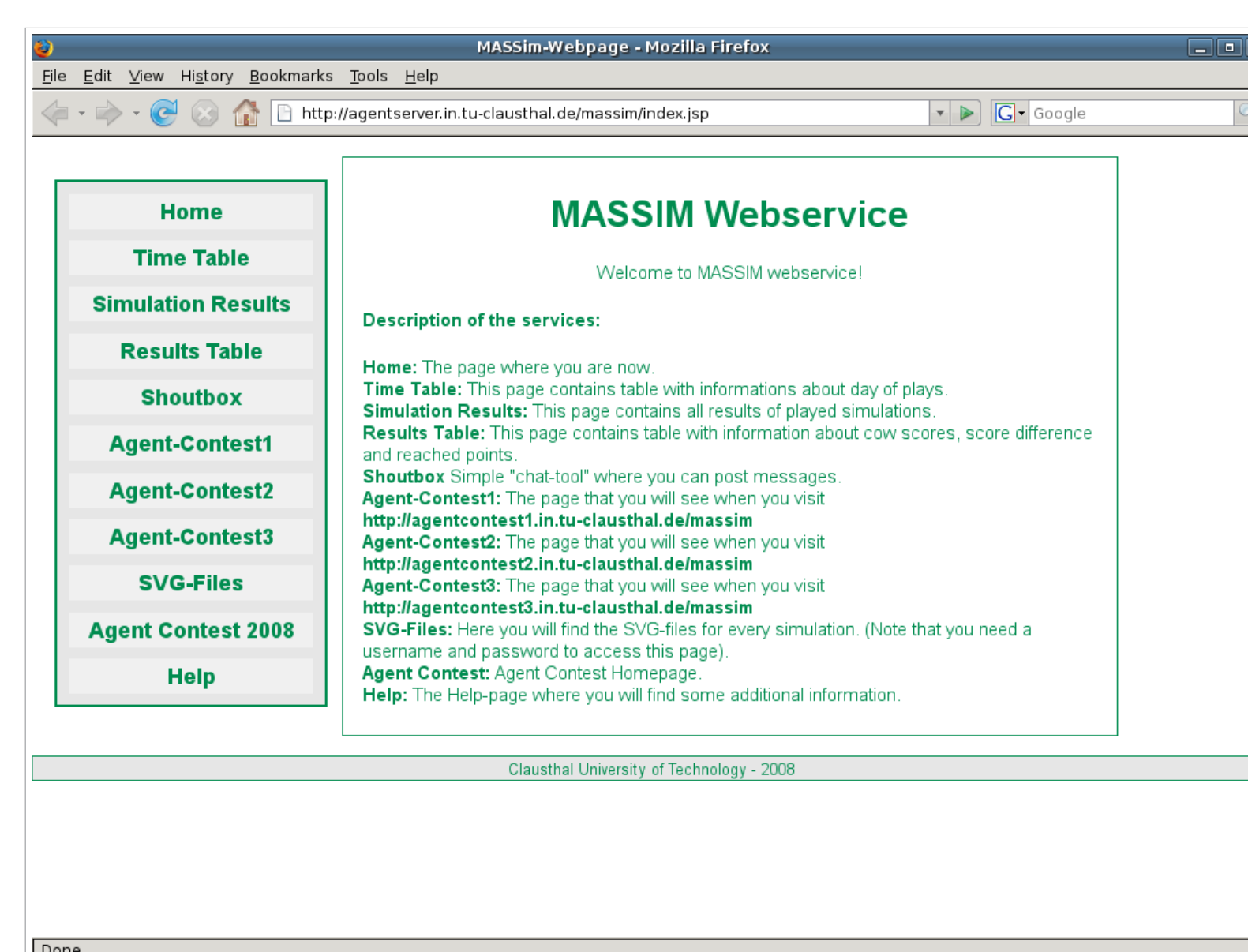
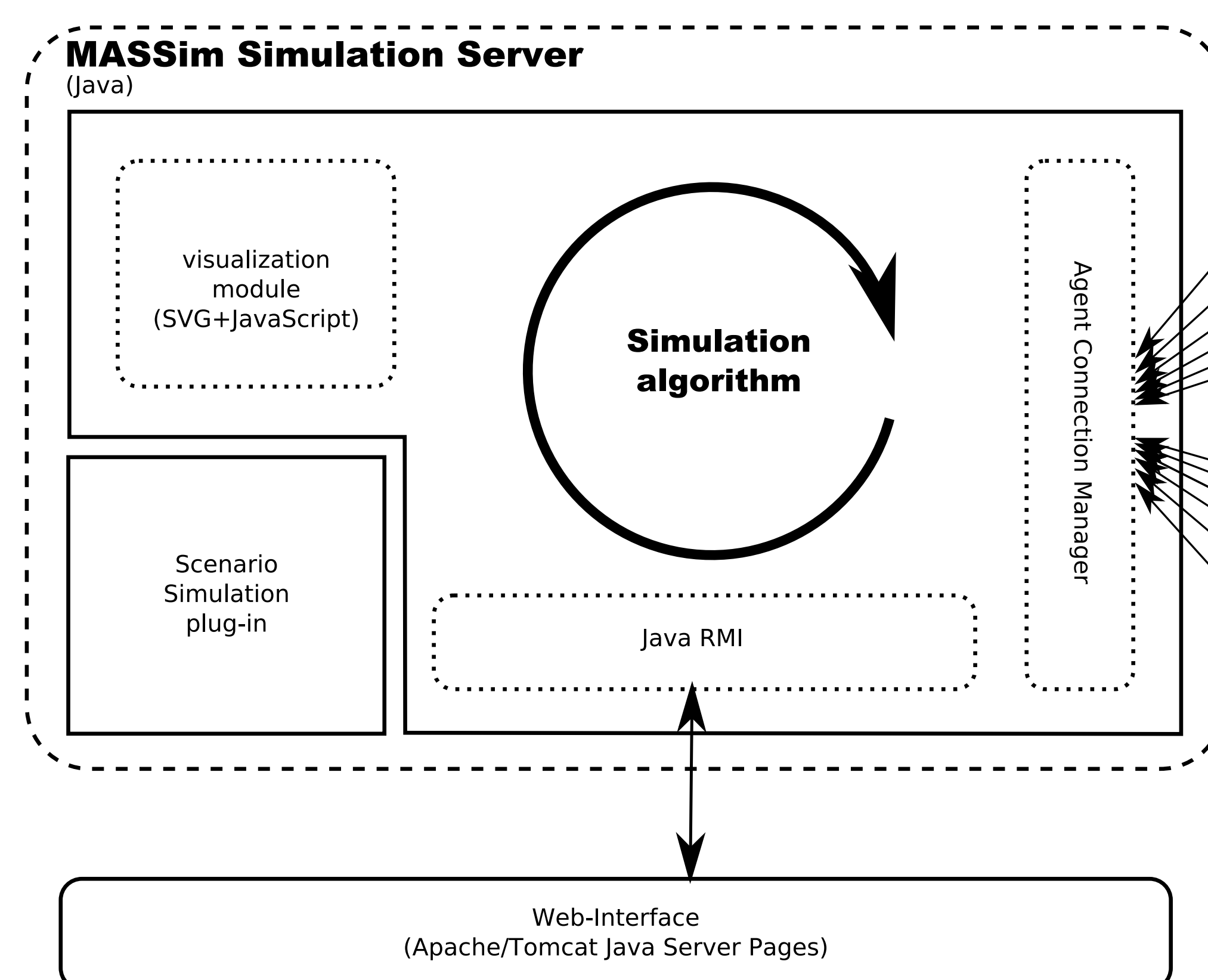
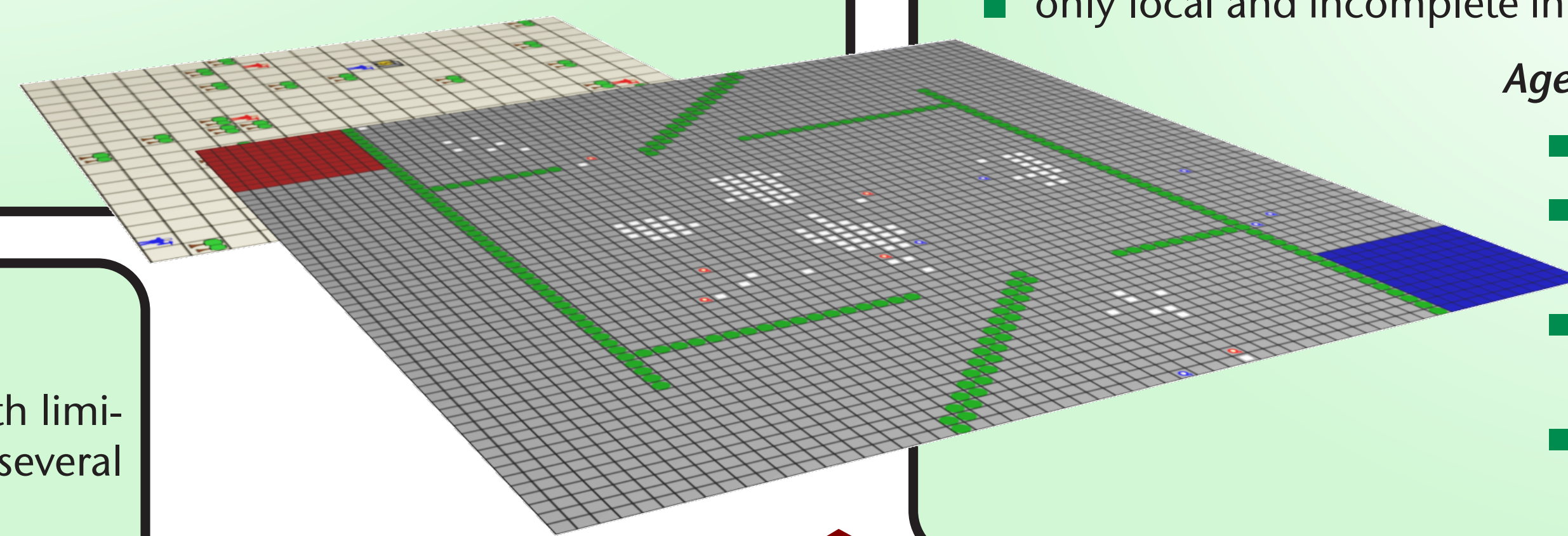
Unlike other similar competitions, the Agent Contest does not handicap deliberative approaches based on computational logic, symbolic reasoning, or planning.

**Agent Contest 2005-2007: gold miners**

- gold miners cooperatively search for gold in woods
- the team with the most collected gold nuggets wins
- only local and incomplete information, unreliable actions

**Agent Contest 2008: cows & cowboys**

- cowboys cooperate to push herds of cows into a corral
- cows have an independent behaviour: flocking, dispersion, cowboys aversion
- requires cooperation and coordination of agents in a team
- again, only local and incomplete information, possibility of action failure



<http://cig.in.tu-clausthal.de/agentcontest/>

## 4. AC & MAS Community

First organized with CLIMA workshop series, since 2007 collocated with ProMAS. Attracted a significant attention in the MAS community:

**2005:** (CLIMA VI, London UK)

- 4 teams: UK, Spain, Japan, UK/Brazil

**2006:** (CLIMA VII, Hakodate, Japan)

- 3 teams: UK/Brazil, Spain, Germany

**2007:** (ProMAS'07, Honolulu, Hawaii, USA)

- 6 teams: 3×Germany, UK/Brazil, Netherlands, Australia

**2008:** (ProMAS'08, Estoril, Portugal)

- 9 teams: 4×Germany, UK/France, Iran, Ireland, Turkey, Australia

## 5. Publications

AC05 Mehdi Dastani, Jürgen Dix and Peter Novák: *The First Contest on Multi-agent Systems Based on Computational Logic*, Proceedings of 6th International Workshop on Computational Logic in Multi-Agent Systems (CLIMA VI), LNCS 3900, Springer 2005

AC06 Mehdi Dastani, Jürgen Dix, Peter Novák: *The Second Contest on Multi-Agent Systems based on Computational Logic*, Proceedings of Seventh Workshop on Computational Logic in Multi-Agent Systems (CLIMA VII), LNAI 4371, Springer 2006

AC07 Mehdi Dastani, Jürgen Dix and Peter Novák: *Agent Contest Competition - 3rd edition* Proceedings of Fifth International Workshop on Programming Multi-Agent Systems, ProMAS'07, LNAI 4908, Springer 2007

AC08 Tristan M. Behrens, Mehdi Dastani, Jürgen Dix, Peter Novák: *The Agent Contest 2008*, Proceedings of Sixth International Workshop on Programming Multi-Agent Systems, ProMAS 2008, to appear