

Introduction to Multi-Agent-Programming

B. Nebel, A. Kleiner
C. Dornhege, D. Zhang
Winter Semester 2008/2009

University of Freiburg
Department of Computer Science

Exercise Sheet 8

Due: January 11th, 2010

Exercise 8.1 (Coalition Structure Formation (3pt, programming))

Consider the Fire Extinguishing task in the Rescue domain. It can be observed that burning houses appear in clusters. The task is to write a FireStation agent that assigns coalitions to fire clusters.

- (a) Write an algorithm to determine the fire clusters (i.e. which houses are in it) and important parameters (position, size, threat to the map). Two houses belong to the same fire cluster, if
 - both are burning
 - both are not too far apart
- (b) Write an algorithm for coalition structure formation. Assume that you don't need to differentiate between heterogeneous agents (i.e. just determine the size of each coalition).

Only one coalition can be assigned to a cluster, but not each cluster necessarily needs to be assigned to a coalition! Evaluate using a simple heuristic function that relates the parameters determined before with the size of a coalition to evaluate the success of extinguishing a cluster. The valuation of a coalition structure assignment is the best distribution of the agents to the clusters. Choose the maximal coalition structure assignment and tell the agents to which coalition they belong and which cluster they are assigned to.

You can reuse IDListToken for this task. Use an efficient representation when sending a cluster (sending all house ids might be too big for a message).

Write a short documentation stating the algorithms you used to determine clusters, how you evaluate clusters, and how you send out coalition structures and represent clusters.

Exercise 8.2 (Fire Brigade Agents (3pt, programming))

As in Ex07 the agents should execute their role as "Leader" or "Follower".

- (a) Agent implementation (2pt).

The leader should choose only houses of the assigned cluster to extinguish. The leader should choose a viable house to extinguish. Only choose border

houses (i.e., burning houses, that have a nearby house that is not burning) as in Ex07. Additionally determine “important” border houses. Define a heuristic to find those houses (e.g. houses at the center are better than towards the edges of a map). Send the id of this house to the other agents (use an IdToken).

A follower should receive houses to extinguish for his coalition and extinguish them as in Ex07. Followers should model a pro-active agent, i.e., they should always choose the best action, especially when they cannot execute their assignment.

Write a short documentation of how a leader chooses a viable house and how followers react to these orders.

(b) Agent performance (1pt).

The agents should be given well performing parameters. This pertains to the whole fire brigade system. The task is to perform significantly better than the sample agents on test maps. A score of 20% above the sample agents is one sufficient criterion.