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 9

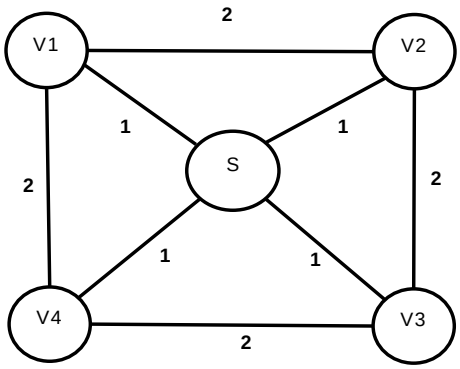
Due: January 21th, 2009

Exercise 9.1 (Voting (0.5pt, written))

There are two alternative drinks for a pary, wine or beer. 66 participants voted for the drinks. The results was calculated according to Borda protocol, in which the prefered drink gets 2 points, the other gets 1 point. Consequently, wine gets 94 points; beer gets 104 points. What are the results if the voting is counted by binary and plurality protocols? Why?

Exercise 9.2 (Ambulance-Agents)

(a) **Coalition formation for rescue operations (1pt, written)**



Four victims are trapped in the collapse. Their positions are given as the nodes $V1, V2, V3, V4$ in the map above. Each victim has two properties as shown in the table below, the time of surviving, and the costs (of time) for rescuing the victim.

	$V1$	$V2$	$V3$	$V4$
surviving	3	12	13	3
buriedness	5	21	4	1

There are three ambulences starting at node s. Path costs are shown with each road in the map. To evaluate a coalition structure, you need to know how victims are assigned to agents. A simple heuristic algorithm is given in the exercise slides.
Choose the optimal coalition structure formation to rescue most civilians.

(b) **Communication (0.5pt, programming)** Implement two new tokens:

- Civilian Update: Contains a list of <Civilian id, hp, damage, buriedness, timestep>
- Coalition Assignment: Contains a list of coalitions, one for each civilian to be rescued as: <civid, agentid1, agentid2, ... > defining which agents are assigned to rescue a certain civilian

Sending in your ambulance agents: Everytime a civilian update is seen, a civilianupdate token is send to the center.
Receiving in the center: Everytime a civilianupdate token is received, integrate the new information in the Memory, if the timestep is higher, than the Civilian's.

(c) **Ambulance Agents (1pt, programming)** Implement simple ambulance agents executing the following behavior:

- First explore only (use blackboard-system with the tokens implemented in your communication system)
- When every target is explored, just listen to coalition assignments. If the own id is contained in a coalition, rescue that civilian, otherwise rescue the nearest.

For the Ambulance center execute the following:
Use blackboard system until every target is explored, then:
Send coalition assignment as the grand coalition for just one civilian, which is chosen to be the civilian with the least buriedness > 0 in a non burning building.

Please send your solution to dornhege and zhangd @informatik.uni-freiburg.de
*Note: We encourage you to submit the written solution in a **pdf** file. The latex template is available at the exercise web page.*