

## Introduction to Multi-Agent-Programming

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### Exercise Sheet 6

**Due: December 7th, 2009**

#### Exercise 6.1 (Kalman Filter)

The temperature of a victim is measured by three agents  $(a_1, a_2, a_3)$ . Each of them is equipped with a temperature sensor. The measurements are guided by three independent Gaussians with covariances  $(\sigma_{a_1}^2, \sigma_{a_2}^2, \sigma_{a_3}^2) = (1, 2, 3)$ .

(a) **Integrate the measurements (0.5pt, written)**

The agents get the measurements  $(m_{a_1}, m_{a_2}, m_{a_3}) = (34, 30, 40)$ . If these measurements are integrated in a Kalman filter, what is the result?

(b) **Explain the results (0.5pt, written)**

The temperature of a victim should be 37.5 if one is conscious, or 33.0 if one is unconscious. What is most possible status (conscious?) of the victim, and why?

#### Exercise 6.2 (Joint World Model)

(a) **Observation Communication (1 pt; programming)**

Use the explorationCivilian list in BaseExplorationAgent to receive temperature information as given in the thermalValue and thermalSigma in ExplorationCivilian. Call super.sense() in your BaseExplorationAgent subclass's sense() function for this to work.

Implement a ComObject subclass to send information about a probabilistic sensing of a ExplorationCivilian containing:

- The id of the civilian (int)
- The actual Value and Sigma (2x float)

Send this information to the Center, each time you have *new* information about a civilian (i.e. compare the lastSeenTime and the agent's actual timeStep).

Provide an agent implementation, where the agents actually stay five rounds at a certain target to get more than one reading.

Note: To convert floats to the byte[], please look at the "intBits" type-functions in the Float class.

(b) **Joint World model (1 pt; programming)**

Implement a Center, that listens to the sensing information from the agents.

Collect the estimated *thermalValue* and *thermalSigma* for each civilian, that has been seen.

If information for the same civilian is sensed multiple times use the Kalman Filter fusion to merge multiple sensings.

Print out the estimates for each civilian in each round.