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**Introduction to Artificial Intelligence**, Winter Term 2017
**Problem Set 1**

*Discussion: September 16 to September 18*

**Exercise 1-1**

You would like to design a mine-sweeper agent. The agent's task is to go into a field which contains unexploded ordnance in addition to other objects (possibly exploded ordnance). It should search the field for unexploded ordnance, collect them all in a designated drop-off zone, and return safely to a home station as fast as possible.

Here are some details about the agent and the environment:

- The agent is battery-operated. It should sense whenever its battery goes low and immediately head for the home station to recharge.

- The amount of time it takes a full battery to go low is proportional to the amount of time the agent has been moving, the average speed of its movement, and whether it is carrying something or not.

- If the agent steps on, stumbles into, or topples over while holding, an unexploded mine; they will both explode.

- Unexploded ordnance are metallic objects with relatively high electro-magnetic radiation levels.

- The field is rectangular, demarcated by a barbed-wire fence.

- The drop-off zone is a circular area, painted red, at the center of the field.

- The home station is situated at the bottom left corner of the field.

a) What kind of agent is suitable for this task: simple reflex, simple reflex with state, goal-based, or utility-based?

b) Define each of the following for your mine-sweeper agent:

  1. Performance measure.
  2. Percepts.
  3. Actions.

**Exercise 1-2**

Suppose that the coffee-delivery agent discussed in Lecture 1 has no sensors whatsoever. It knows nothing about where it initially is and which direction it is facing. However, the agent knows the effects of all its actions, and it knows that it should deliver coffee to R8. Devise a shortest sequence of actions that this agent can perform so that, at some point, it would be in R8 for at least three time units. (A time unit is the time taken by the agent to perform a single action.)