

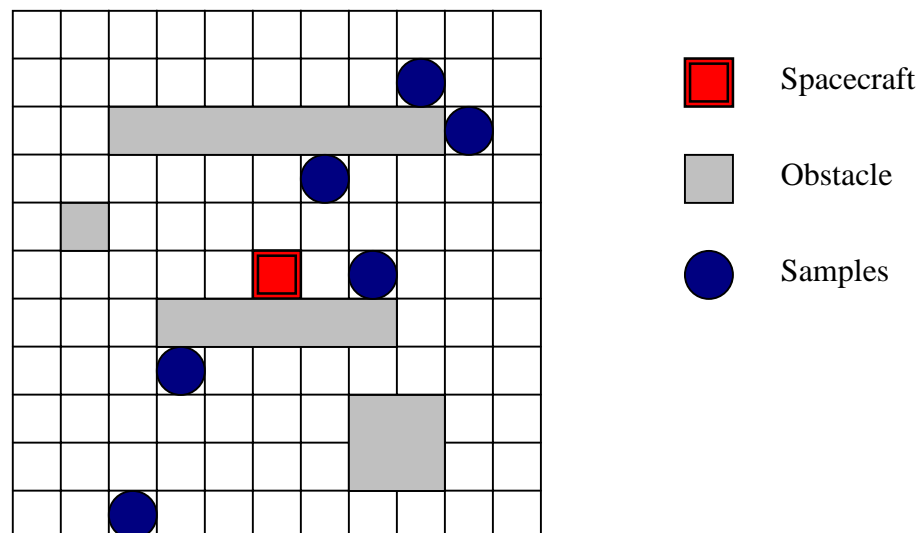
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SCENARIO:

The scenario adopted for this practical is the following: “A spacecraft is landed in a distant planet and carries an agent which aims to collect samples and bring them back to the spacecraft. The terrain is full of obstacles which the agent should avoid. The agent uses a simple set of reactive rules, as suggested by Brooks, arranged in a subsumption hierarchy. The agent knows nothing about the terrain and can identify obstacles and samples only when it stumbles across them. The spacecraft is transmitting a signal, so that the agent, having collected some samples, can direct itself to the spacecraft”.

The assumptions made for this practical are the following:

- ☐ The terrain is partitioned in a grid.
- ☐ The spacecraft is at (0,0) coordinates.
- ☐ The agent is originally at (0,0).
- ☐ The agent can move towards four directions (west, east, north, and south)
- ☐ The terrain is shown in the following figure.



The rules arranged in order of importance are:

```
if detect_obstacle then change_direction.  
if carrying_samples and at_the_base then drop_samples.  
if carrying_samples and not(at_the_base) then travel_up_gradient.  
if detect_samples and not(at_the_base) then pick_up_samples.  
if true then move_randomly.
```

PREPARATION:

Study the Prolog code provided, especially the parts concerned with:

- ☐ The coding of condition-action rules,
- ☐ The meta-interpreter for the condition part of the rules,
- ☐ The action coding

Try the query:

```
?- run.
```

in order to see that the samples are all collected though the use of 5 simple rules.

PRACTICAL WORK:

- ❑ As it stands for the moment the code is for one agent only. Do whatever modifications you think in order to make it work for any number of agents. Assume that in the spacecraft there are four agents, namely mike, jeff, ralf and jack. Assume no communication at all between them.

Hint: For start, rewrite the rules that they take as argument the agent and the number of the rule, for example:

```
1-A : if detect_obstacle(A) then change_direction(A).
```

- ❑ The correctness of the code, that is, the most important rule will fire, is based on Prolog's execution strategy (the first found will fire). Make the appropriate modifications so that the conflict resolution strategy is based on the number of the rule and not in the order listed.

QUESTIONS:

A way to improve the problem solving is suggested: *“The agents carry radioactive crumbs which can be dropped and detected by other agents. The assumption for cooperation comes from the fact that samples may be in clusters, i.e. many in a specific location. While travelling up the gradient and carrying samples, an agent can drop 2 crumbs in each position. If an agent stumbles across a crumb it picks it up and follows the trail built up by another. Thus, the trail faints (instead of having two crumbs, it now has one), and therefore it will cease to exist if there are no more samples. On the other hand, the trail will be reinforced while the second agent passes over it in order to return to the spaceship.”*

The above behaviour can be described by the rules:

```
if detect_obstacle then change_direction.  
if carrying_samples and at_the_base then drop_samples.  
if carrying_samples and not(at_the_base) then drop_2_crums and travel_up_gradient.  
if detect_samples and not(at_the_base) then pick_up_samples.  
if sense_crums then pick_1_crumb and travel_down_gradient.  
if true then move_randomly.
```

What modifications are needed in your code in order to be able to work with the new behaviours?