Principles of AI Planning
Summer 2004

Institut für Informatik
Universität Freiburg
Rintanen

Exercise 1

To be returned on Monday, May 3, 2004

Assignment 1.1

Formalize the following problem in PDDL and solve it with the FF planner.

For a given graph, find a cycle that visits all nodes of the graph exactly once, except for the starting node, which is also the end node. Such a cycle is called a *Hamiltonian cycle*.

Test data and the planner are available from

```
http://www.informatik.uni-freiburg.de/~ki/lehre/ss04/aip/ex1.html
```

The planner is started as follows, assuming that the planner and the PDDL files are in the current directory.

```
./ff -o operators.pddl -f ham1.pddl
```

Two of the three graphs described in the PDDL problem files ham1.pddl, ham2.pddl and ham3.pddl contain a Hamiltonian cycle. Arcs of graphs are represented by state variables `(arc a b)`. Write a domain file (schematic operators) and complete the initial state and goal descriptions, and test that everything works correctly.

Hint: You may use the predicates

```
(current ?n - node)
(visited ?n - node)
```

for representing the current state and the states that have been visited, and for Hamiltonian cycles you may always choose to start the cycles from node A.

Assignment 1.2

Formalize the following path-planning problem in PDDL and solve it with FF. The robot can move one step north, south, west or east, and it cannot visit the cells marked with X. Starting from the location I the robot has to go to the target location G.

	0	1	2	3	4	5
1	I					
2				X		X
3			X			
4	X	X			X	
5			X		G	

Hint: You can use objects

```
c0 c1 c2 c3 c4 c5 - coord
```

for encoding coordinates, and the predicates

```
(location ?x - coord ?y - coord)
(obstacle ?x - coord ?y - coord)
```

for encoding the location of the robot and the locations of obstacles X.