

COMP4418, 2011 – Assignment 2

Due: Monday, September 26

Worth: $\frac{1}{6}$

1. **[25 Marks]** (Single-Player General Game Playing)
Consider the following single-player game:

```
(role you)

(opposite left right)
(opposite right left)

(init (you left))
(init (at c left))
(init (at g left))
(init (at w left))

(<= (legal you (take ?x))
    (true (you ?side))
    (true (at ?x ?side)))

(legal you (take nothing))

(<= (next (you ?new))
    (true (you ?old))
    (opposite ?new ?old))

(<= (next (at ?x ?new))
    (does you (take ?x))
    (true (at ?x ?old))
    (opposite ?new ?old))

(<= (next (at ?x ?old))
    (true (at ?x ?old))
    (not (does you (take ?x))))

(<= terminal
    good)
(<= terminal
    bad)

(<= (goal you 100)
    good)
(<= (goal you 0)
    bad)

(<= good
    (true (at c right))
    (true (at g right))
    (true (at w right)))
```

```

(<= bad
  (true (at c ?side))
  (true (at g ?side))
  (not (true (you ?side))))
(<= bad
  (true (at g ?side))
  (true (at w ?side))
  (not (true (you ?side))))

```

- (a) Determine the set of state features `?f` that hold in the initial game state and the set of legal moves `?a` that you can take in this initial state.
- (b) Select one of your legal moves in the initial state. Use the rules for `(next ?f)` to determine the set of state features `?f` are true after that action is taken in the initial state. According to the game rules, which moves are legal in this resulting state? What are their effects?
- (c) Use the knowledge you gained from answering (a) and (b) to draw the entire state transition system for the game.
- (d) Use the rules for `terminal` and `(goal you ?v)` to determine the terminal states in this game and their goal values. Find a sequence of moves that solves the game (i.e., that leads to a terminal state with goal value 100).

2. [25 Marks] (General Game Playing)

Nim is a two-player game in which players take turns removing objects from a heap. Starting with a heap of size 15, on each turn a player must remove at least 1 and at most 4 objects. The player to take the last object loses. Describe this game in GDL.

Hint: In order to test your game description you can download the GameController at

<http://www.general-game-playing.de/downloads.html#GameController>

and run a few random test matches. You can hand in a printout of your GDL description.

Late Submissions

In case of late submissions, 2% will be deducted for each day late.

No extensions will be given for any of the assignments (except in case of illness or misadventure). Read the study guide carefully for the rules regarding plagiarism.