

Exercise 8

To be returned on Monday, July 5, 2004

Assignment 8.1

(6 points)

This is a programming assignment.

Solve a variant of the "lost in the desert" problem (Assignment 6.1) by using value iteration. To adapt this problem to the probabilistic planning framework, introduce a new action "stay" which has no effect and gives a reward of 10 when staying at the oasis and -2 elsewhere. All other actions give a reward of -1 if the current location is adjacent to the border and a reward of -2 otherwise (it is easier to walk in the shade of the mountains).

You can use the C program

<http://www.informatik.uni-freiburg.de/~ki/lehre/ss04/aip/EX8valueiteration.c>

as a basis of your solution.

Because of the big size of the transition matrices (25×25 elements), you may want to produce them by a program instead of writing them manually.

The discount constant should be $\lambda = 0.95$, and the termination threshold should be $\epsilon = 0.001$.

To demonstrate the solution give the value function and the plan. You may want to modify the program to print the value function and the state→action mapping as a 5×5 table corresponding to the shape of the desert map.

Assignment 8.2

(4 points)

Produce as small an ADD as possible for representing the following matrix.

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 2.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 2.0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 2.0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2.0 \\ 2.0 & 0 & 0 & 0 & 0 & 0 & 1.0 & 3.0 \\ 0 & 2.0 & 0 & 0 & 0 & 0 & 0 & 1.0 \\ 0 & 0 & 2.0 & 0 & 1.0 & 3.0 & 0 & 0 \\ 0 & 0 & 0 & 2.0 & 0 & 1.0 & 0 & 7.0 \end{pmatrix}$$

You may work on these assignments and submit your results in groups of two students. Make sure to clearly indicate both names on your work. You may write your answers in English or German.