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MDL Assignment 3 Part 2 Question 2

Initial utilities:

0	−1	+1
0	0	0
0	Wall	0
0	0	0

We use the formula

$$U_{t+1}(I) = \max_A \left[C(I,A) + \gamma \sum_J P(J|I,A) U_t(J) \right]$$

$$\implies = -0.04 + \frac{0.95}{\ast} \max_A \left[\sum_J P(J|I,A) U_t(J) \right]$$

with $\rho = 0.7$

Iteration 1

(0,0) up: $-0.04 + 0.95(0.7 \times 0 + 0.15(-1) + 0.15 \times 0)$
$= -0.1825$

dam: $-0.04 + 0.95(0.7 \times 0 + 0.15 \times -1 + 0.15) = -0.1825$

right $= -0.04 + 0.95(0.7 \times -1 + 0.15 \times 0 + 0.15 \times 0) = -0.705$

left $= -0.04 + 0.95(0.7 \times 0 + 0.15 \times 0 + 0.15 \times 0) = -0.04$

max $= -0.04$

(1,0) up: $-0.04 + 0.95(0.7 \times 0 + 0.15 \times 0 + 0.15 \times 0) = -0.04$

dam: $-0.04 + 0.95 \cdot (0.7 \times 0 + 0.15 \times 0 + 0.15 \times 0) = -0.04$

right $= $
left $= $ $= -0.04$
$= -0.04$

max $= -0.04$

$(1,1)$ & up: $-0.04 + 0.95 \, (0.7 \times 1 + 0.15 \times 0 + 0.15 \times 0) = -0.705$

down: $-0.04 + 0.95 (0.7 \times 0 + 0.15 \times 0 + 0.1 \times 0) = -0.04$

ryght $= -0.04 + 0.95 \times (0.7 \times 0 + 0.15 \times -1 + 0.15 \times 0) = -0.1825$

left $= -0.04 + 0.95 \, (0.7 \times 0 + 0.15 \times -1 + 0.15 \times 0) = -0.1825$

max $= -0.04$

$(1,2)$ up: $-0.04 + 0.95 \, (0.7 + 0 + 0) = 0.625$

down: $-0.04 + 0.95 (0 + 0 + 0) = -0.04$

ryght $= -0.04 + 0.95 (0 + 0.15 + 0) = 0.1025$

left $= -0.04 + 0.95 (0 + 0.15 + 0) = 0.1025$

max $= 0.625$

$(2,0)$ up: $-0.04 + 0.95 (0 + 0 + 0) = -0.04$

down: $\qquad = -0.04$

ryght: $\qquad = -0.04$

left: $\qquad = -0.04$

max $= -0.04$

$(2,2)$ up $= -0.04$

down $= -0.04$

ryght $= -0.04$

left $= -0.04$

max $= -0.04$

$(3,0), (3,1), (3,2)$: up $= -0.04$

down $= -0.04$

ryght $= -0.04$

left $= -0.04$

max $= -0.04$

-0.04	-1	$+1$
-0.04	-0.04	0.625
-0.04	Wall	-0.04
-0.04	-0.04	-0.04

Iteration 2

(0,0) up $= -0.04 + 0.95(0.7 \times -0.04 + 0.15 \times -0.04 + 0.15 \times -0.04) = -0.214$

down: (((? ((($= -0.214$

right: $-0.04 + 0.95(0.7 \times -1 + 0.15 \times -0.04 + 0.15 \times -0.04) = -0.7165$

left: $-0.04 + 0.95(0.7 \times -0.04 + 0.15 \times -0.04 + 0.15 \times -0.04) = -0.078$

max $= -0.078$

(1,0) up: $-0.04 + 0.95(0.7 \times -0.04 + 0.15 \times -0.04 + 0.15 \times -0.04) = -0.078$

down: " " $= -0.078$

right' " " $= -0.078$

left " " $= -0.078$

Max $= -0.078$

(1,1) up: $-0.04 + 0.95(0.7 \times -1 + 0.15 \times -0.04 + 0.15 \times -0.04) = -0.7165$

down: $-0.04 + 0.95(0.7 \times -0.04 + 0.15 \times -0.04 + 0.15 \times -0.04) = -0.078$

right $= -0.04 + 0.95(0.7 \times 0.625 + 0.15 \times -1 + 0.15 \times -0.04) = 0.227425$

left $= -0.04 + 0.95(0.7 \times -0.04 + 0.15 \times -1 + 0.15 \times -0.04) = -0.2149$

max $= 0.227425$

(1,2) up $= -0.04 + 0.95(0.7 + 0.15 \times -0.04 + 0.15 \times 0.628) = 0.9083625$

down: $-0.04 + 0.95(0.7 \times -0.04 + 0.15 \times -0.04 + 0.15 \times 0.625) = 0.0167625$

right: $-0.04 + 0.95(0.7 \times 0.625 + 0.15 + 0.15 \times -0.04) = 0.5123423$

left: $-0.04 + 0.95(0.7 \times -0.04 + 0.15 + 0.15 \times 0.04) = 0.0702$

max $= 0.9083625$

(2,0) up: $-0.04 + 0.95(0.7 \times -0.04 + 0.15 \times -0.04 + 0.15 \times -0.04) = -0.078$

down: " " , , ? , ? , , $= -0.078$

right: , , , , ? , , $= -0.078$

left: , , , , , , $= -0.078$

(2,2) up: $-0.04 + 0.95(0.7 \times 0.625 + 0.15 \times -0.04 + 0.15 \times -0.04) = 0.364225$

down: $-0.04 + 0.95(0.7 \times -0.04 + 0.15 \times -0.04 + 0.15 \times -0.04) = -0.078$

right: $-0.04 + 0.95(0.7 \times -0.04 + 0.15 \times 0.625 + 0.15 \times -0.04) = 0.0167625$

left $=$ " " " " , , " $= 0.016762$

Max: 0.364225

$(0), (3, 1), (3, 2)$

up = $-0.04 + 0.95(0.7 \times 0.04 + 0.15x \cdot 0.04 + 0.15x \cdot 0.05)$
= -0.078

down: 1   1   2   2   1 = -0.078
right: 1   2   1 = -0.078
left =   1   2   1   1   1 = -0.078
max = -0.078

-0.078	-1	1
-0.078	0.227	0.708
-0.078	Wall	0.365
-0.078	-0.078	-0.073

These values match the output from code.