GK 1
2009

1) min: $\hat{U}(s) = \frac{1.\,út + 2.\,út}{2} = \frac{+1-1}{2} = 0$

$U(s') = \frac{-1}{1} = -1$

IK: $U(s) \leftarrow U(s) + \alpha(R(s) + U(s') - U(s))$

1. út $U(start) = 0 + 0{,}1\cdot(0+0-0) = 0$

$U(s_1) = 0 + 0{,}1\cdot(0+0-0) = 0$

$U(s_5) = 0 + 0{,}1\cdot(0+1-0) = 0{,}1$

2. út $U(s_4) = 0 + 0{,}1\cdot(0+0{,}1-0) = 0{,}01$ 4→5 megfigyeltem

$U(s_5) = 0{,}1 + 0{,}1\cdot(0+0-0{,}1) = 0{,}09$ 5→6 megfigyeltem

$U(s_6) = 0 + 0{,}1(0 + -1 - 0) = -0{,}1$

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2) ① U = E{végállapotig nyert összjutalom} $U(s) = R(s) + \sum_{s'} T \cdot U(s')$

U = 1 adjunk −0,1 büntetést

3) Bellmann: $U(s) = R(s) + \sum_{s'} T(s,s')\cdot U(s')$

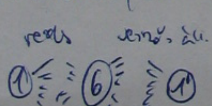
IK: s → s' : $U(s) \leftarrow U(s) + \alpha(R(s) + U(s') - U(s))$ ha $T(s,s') = 1$

$U(s) \leftarrow U(s) + \alpha\left(R(s) + \sum_{s'} T(s,s')\cdot U(s')\right)$ helyette Bellmann

T(s,s') karbantartása

s → s' esetén $N(s,s') \leftarrow N(s,s') + 1$ $T(s,s') = \frac{N(s,s')}{\sum_{s''} N(s,s'')}$

4) Változik, ha a startot elmozgatom, ill. ha a célt elmozgatom

5) 

Ahol −1, s'-ben +100 a jutalom s': végállapot, s: startállapot

6/ ADP:
$$\begin{bmatrix} U(s_1) \\ \vdots \\ U(s_N) \end{bmatrix} = \begin{bmatrix} R(s_1) \\ \vdots \\ R(s_N) \end{bmatrix} + \begin{bmatrix} T(1,1) & T(1,2) & \dots & T(1,N) \\ & & & \\ T(N,1) & T(N,2) & \dots & T(N,N) \end{bmatrix} \cdot \begin{bmatrix} U(s_1) \\ \vdots \\ U(s_N) \end{bmatrix}$$

+5	10	9	8
		7 6	5
	4	3 2	1

$\underline{U} = \underline{R} + \underline{\underline{T}} \cdot \underline{U}$ $\qquad \underline{U} - \underline{\underline{T}} \cdot \underline{U} = \underline{R}$ $\qquad (\underline{\underline{E}} - \underline{\underline{T}}) \cdot \underline{U} = \underline{R}$

$\underline{U} =$ ~~$\underline{R} \cdot (\underline{\underline{E}} - \underline{\underline{T}})$~~ $(\underline{\underline{E}} - \underline{\underline{T}})^{-1} \cdot \underline{R}$ $\qquad \underline{\underline{T}} = ? \qquad \underline{R} = ?$

$\underline{\underline{T}} =$

	1	2	3	4	5	6	7	8	9	10
1	0	$\frac{1}{2}$	0	0	$\frac{1}{2}$	0	0	0	0	0
2	$\frac{1}{3}$	0	$\frac{1}{3}$	0	0	$\frac{1}{3}$	0	0	0	0
3	0	$\frac{1}{3}$	0	$\frac{1}{3}$	0	0	$\frac{1}{3}$	0	0	0
4	0									0
5	$\frac{1}{3}$					$\frac{1}{3}$	$\frac{1}{3}$			
6		$\frac{1}{3}$			$\frac{1}{3}$		$\frac{1}{3}$			
7			$\frac{1}{3}$			$\frac{1}{3}$		$\frac{1}{3}$		
8	0	—	—	—				0		
9						$\frac{1}{2}$		$\frac{1}{2}$		
10							1			

$\underline{R} = \begin{bmatrix} -1 \\ -1 \\ -1 \\ +99 \\ -1 \\ -1 \\ -1 \\ +99 \\ -1 \\ +4 \end{bmatrix}$

$M_{ij} = T(i, a, s')$

7/

1.		2.	3.
5	▨	+10	−10
4	5	6	7

$f(U,N) = \begin{cases} +20 & \text{ha } N < 20 \\ U & \text{ha } N \geq 20 \end{cases}$

$U^+(6) = R(6) + \max_a f\left(\sum_{s'} M^a_{ij} U^+(s'), N(a,6)\right)$ $\quad i=s,\ j=s'$

$\to$ ha $a = A \quad f = ? \qquad T(s,a,s') = T(6, A, \begin{smallmatrix} 2 \\ 7 \\ 5 \end{smallmatrix}) \qquad N(a,6) = N_{A(6)}$

$T(6, A, s') = \frac{1}{3} \qquad \sum M \cdot U^+ = \frac{1}{3}(U^+(2) + U^+(5) + U^+(7)) = \frac{1}{3}(10 + 19{,}8 + 10) = 13{,}24$

$f(13{,}24, 112) = 13{,}24 \qquad N(A,6) = \frac{2}{3} \cdot 168 = 112$

$\to$ ha $a = B \quad T(6, B, \begin{smallmatrix} 2 \\ 7 \end{smallmatrix}) \quad N(B,6) = \frac{1}{6} \cdot 168 = 28 \qquad \sum M \cdot U^+ = ? = \frac{1}{4} \cdot U^+(5) + \frac{1}{4} \cdot U^+(2) + \frac{2}{4} \cdot U^+(7)$

$= 2{,}5 + 2{,}5 + 9{,}9$

$f(14{,}9, 28) = 14{,}9 \qquad = 14{,}9$

$\to$ ha $a = C \quad N(C,6) = \frac{1}{6} \cdot 168 = 28 \qquad \sum M U^+ = \frac{1}{4} \cdot 10 + \frac{2}{4} \cdot 10 + \frac{1}{4} \cdot 19{,}8$

$= 2{,}5 +$ ~~2,5~~ $5 + 4{,}95 = 12{,}45$

7/ felt   ha $a = A$ $f = 13,27$ $\max_a f = 14,9 \quad a = B$
$a = B$ $f = 14,9$
$a = C$ $f = 12,45$

$u^*(6) = -0,2 + 14,9 = 14,7$

GK2 2010

1/ TK $s \to s'$ $u(s) \leftarrow u(s) + \alpha(R(s) + u(s') - u(s))$ (α = learn 0,1)

$1 \to 9$ $u(1) \leftarrow -4 + 0,1 \cdot (-0,1 + -6 - -4) = -4,21$

$9 \to 10$ $u(9) \leftarrow -6 + 0,1(-0,1 + -5 - -6) = -5,91$

$10 \to 11$ $u(10) \leftarrow \ldots$

$11 \to 19$ $u(11) \leftarrow -4 + 0,1(-0,1 + 2 - -4) = -3,41$

2/ Naiv $\gamma = 1$

$11 \to 19$	$r = -0,1$
$19 \to 20$	$-0,1$
$20 \to 27$	$-0,1 + -5 = -5,1$
$27 \to 28$	$-0,1$
$28 \to 36$	$-0,1 + 50 = 49,9$

$\hat{u}(11) = \Sigma r = 3 \cdot -0,1 - 5,1 + 49,9 = 44,5$

3/