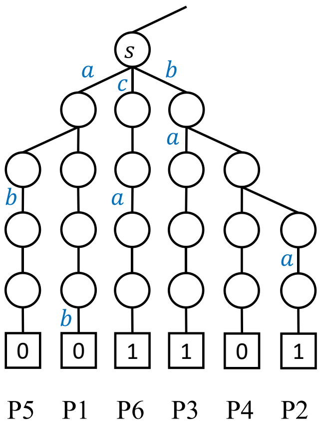
Homework #4 of the course: Theory of Computer Games.



1. For the above UCT, assume that the playout sequence is P1, P2, P3, P4, P5, P6. Calculate all the values of *Q(s,a), ~Q(s,a), N(s,a), ~N(s,a)*, after each playout. Note: *~Q(s,a)* and *~C(s,a)* are the RAVE version of *Q(s,a)* and *C(s,a)*.

	P1	P2	P3	P4	P5	P6
Q(s, a)	0/1	0/1	0/1	0/1	0/2	0/2
N(s, a)	1	1 .	1	1	2	2
~Q(s, a)	0/1	1/2	2/3	2/3	2/4	3/5
~N(s, a)	1	2	3	3	4	5

2. Calculate *Q(s,a), ~Q(s,a), N(s,a), ~N(s,a)*, again, assuming the following prior knowledge:

   H(s,a) = 0.6, *H(s,b)* = 0.55, *H(s,c)* = 0.5

   C(s,a) = 5, *C(s,b)* = 5, *C(s,c)* = 4

   ~C(s,a) = 8, *~C(s,b)* = 6, *~C(s,c)* = 6

   Note: *H(s,a)* is the initial value of *Q(s,a)* and *~Q(s,a)*, while *C(s,a)* and *~C(s,a)* are the initial values of *N(s,a)* and *~N(s,a)*,.

P1:

$Q(s,a) = \frac{0.6 \times 5 + 0}{5+1} = \frac{3}{6}$

$\tilde{Q}(s,a) = \frac{0.6 \times 8 + 0}{8+1} = \frac{4.8}{9}$

$N(s,a) = 5+1 = 6$ ✓

$\tilde{N}(s,a) = 8+1 = 9$

P2:

$Q(s,a) = \frac{3+0}{6+0} = \frac{3}{6}$

$\tilde{Q}(s,a) = \frac{4.8+1}{9+1} = \frac{5.8}{10}$

$N(s,a) = 6$ ✓

$\tilde{N}(s,a) = 9+1 = 10$

P3:

$Q(s,a) = \frac{3}{6}$

$\tilde{Q}(s,a) = \frac{5.8+1}{10+1} = \frac{6.8}{11}$

$N(s,a) = 6$ ✓

$\tilde{N}(s,a) = 10+1 = 11$

P4:

$Q(s,a) = \frac{3}{6}$

$\tilde{Q}(s,a) = \frac{6.8}{11}$

$N(s,a) = 6$ ✓

$\tilde{N}(s,a) = 11$

P5:

$Q(s,a) = \frac{3+0}{6+1} = \frac{3}{7}$

$\tilde{Q}(s,a) = \frac{6.8+0}{11+1} = \frac{6.8}{12}$ ✓

$N(s,a) = 6+1 = 7$

$\tilde{N}(s,a) = 11+1 = 12$

P6:

$Q(s,a) = \frac{3}{7}$

$\tilde{Q}(s,a) = \frac{6.8+1}{12+1} = \frac{7.8}{13}$

$N(s,a) = 7$ ✓

$\tilde{N}(s,a) = 12+1 = 13$