Assignment 3

Maxime CHAMBREUIL
maxime.chambreuil@mail.mcgill.ca

Contents

1 Planning

1.1 STRIPS description of actions

1.1.1 MoveShakeyAndBoxA2B()

- Pre-conditions: At(Shakey,A) $\wedge$ IsBoxes(n,A) $\wedge$ IsBoxes (m,B) with n $\geq$ 1 and m $\geq$ 0
- Post-conditions: At(Shakey,B) $\wedge$ IsBoxes(n-1,A) $\wedge$ IsBoxes(m+1,B)

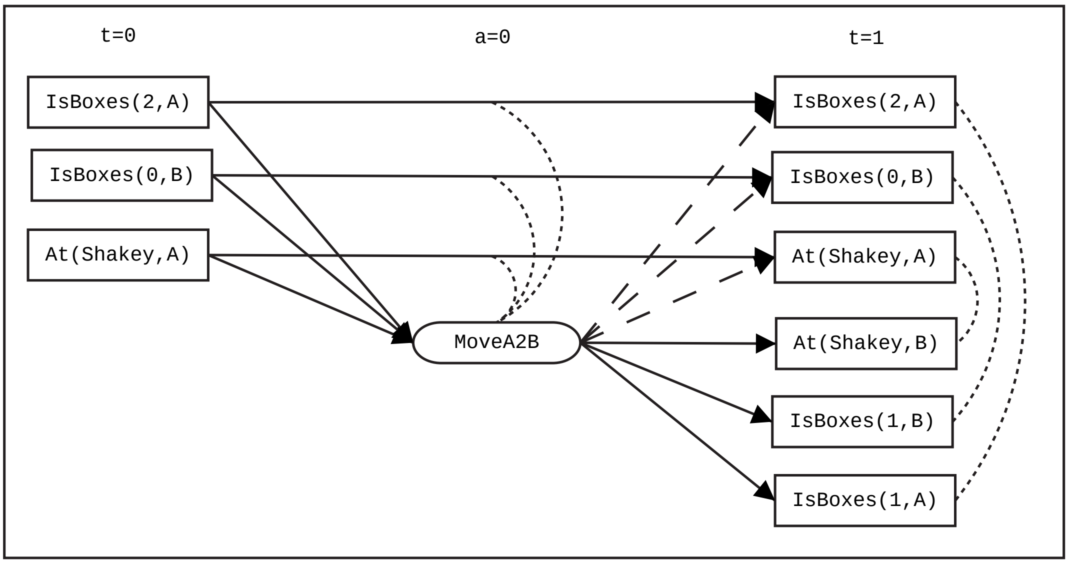
1.1.2 MoveShakeyB2A()

- Pre-condition: At(Shakey,B)
- Post-condition: At(Shakey,A)

1.1.3 Goal

At(Shakey,A) $\wedge$ IsBoxes(0,A) $\wedge$ IsBoxes(# boxes,B)

1.2 Planning graph with 2 boxes



To reach the goal with 1 boxes, Shakey should come back to B (3+2=5th level), move the last box to B (5+2=7th level) and come back again to A (7+2=9th level).

1.3 Planning graph with n boxes

With 1 box, we would need 5 levels and we have shown that for every additionnal box, Shakey has to take it to B and come back, that means adding 4 levels.

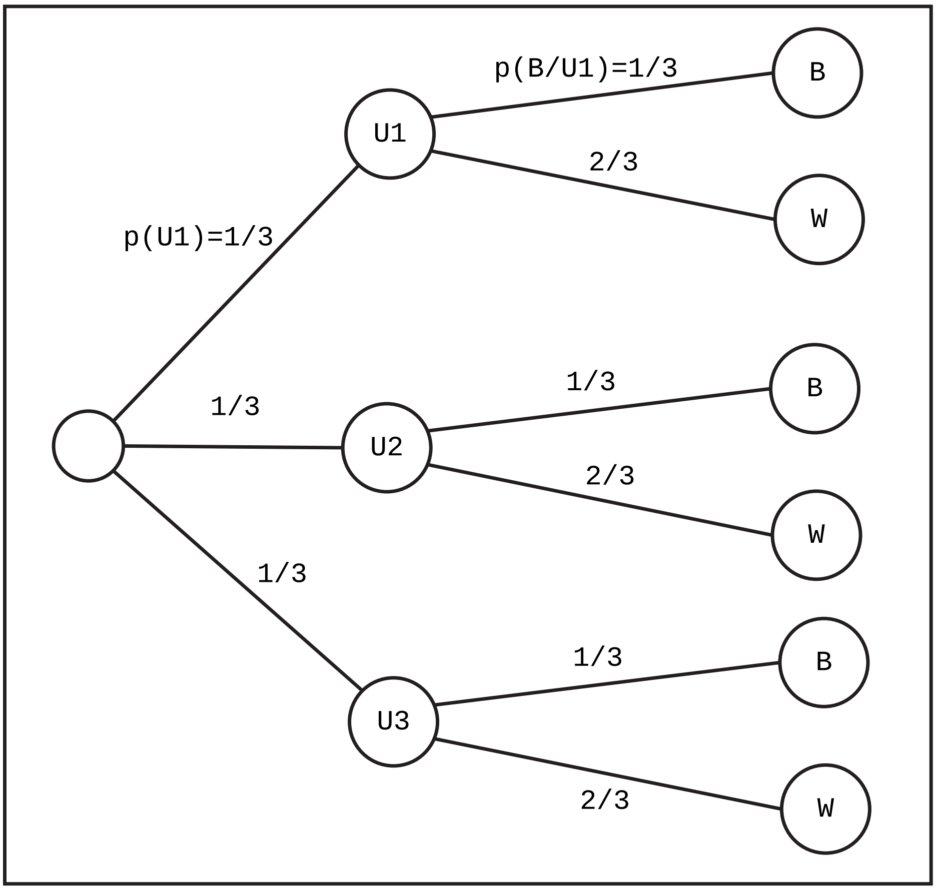
We can conclude that the goal for n boxes would be reached in the level $5 + 4 \times (n - 1) = 4n + 1$

Concerning mutex at P_1, it does not change anything to my schema to have n boxes instead of 2 : mutex stay the same.

2 Route planning

3 Urns and balls

Next is the schema modelling the game, with all probabilities given by the exercise :



3.1 $U_2 \wedge B$

$$p(U_2 \wedge B) = p(U_2) \times p(B/U_2) = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$$

3.2 B

$$p(B) = \sum_{i=1}^{3} p(U_i) \times p(B/U_i) = \frac{1}{3} \times \frac{1}{3} + \frac{1}{3} \times \frac{1}{3} + \frac{1}{3} \times \frac{1}{3} = \frac{1}{3}$$

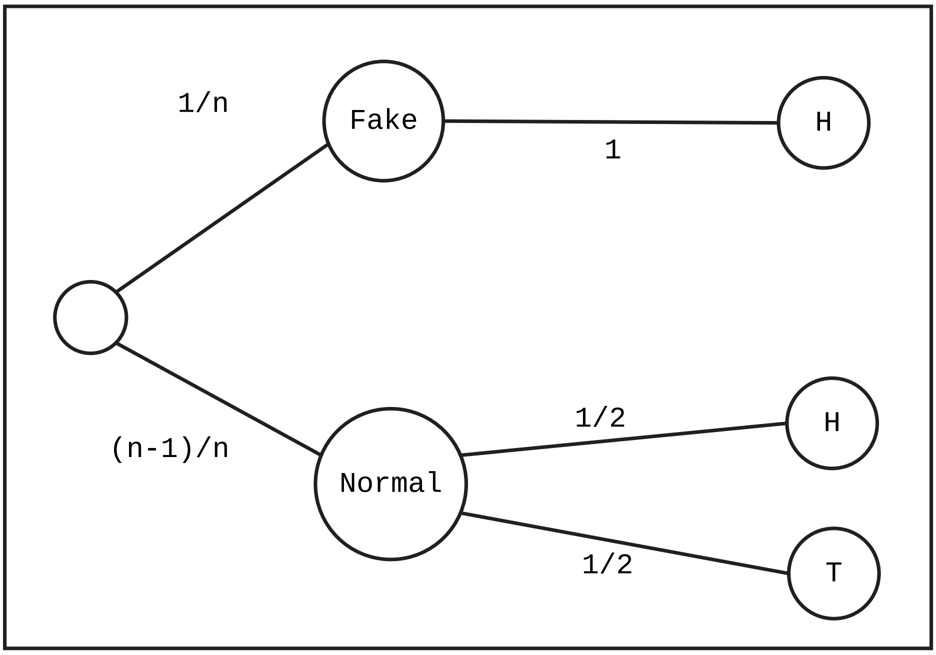
3.3 U_2 / B

$$p(U_2/B) = \frac{p(U_2 \wedge B)}{p(B)} = \frac{\frac{1}{9}}{\frac{1}{3}} = \frac{1}{3}$$

4 Uncertainty

5 Flipping a coin

Next is the schema modelling the game, with all probabilities given by the exercise :



5.1 Fake / H

$$p(H) = \frac{1}{n} + \frac{1}{2} \times \frac{n-1}{n} = \frac{n+1}{2n}$$

$$p(Fake/H) = \frac{p(Fake \wedge H)}{p(H)} = \frac{\frac{1}{n}}{\frac{n+1}{2n}} = \frac{2}{n+1}$$

5.2 Fake / H^k

$$p(H^k) = \frac{1}{n} + \frac{1}{2^k} \times \frac{n-1}{n} = \frac{2^k + n - 1}{2^k n}$$

$$p(Fake/H^k) = \frac{p(Fake \wedge H^k)}{p(H^k)} = \frac{\frac{1}{n}}{\frac{2^k+n-1}{2^k n}} = \frac{2^k}{2^k + n - 1}$$

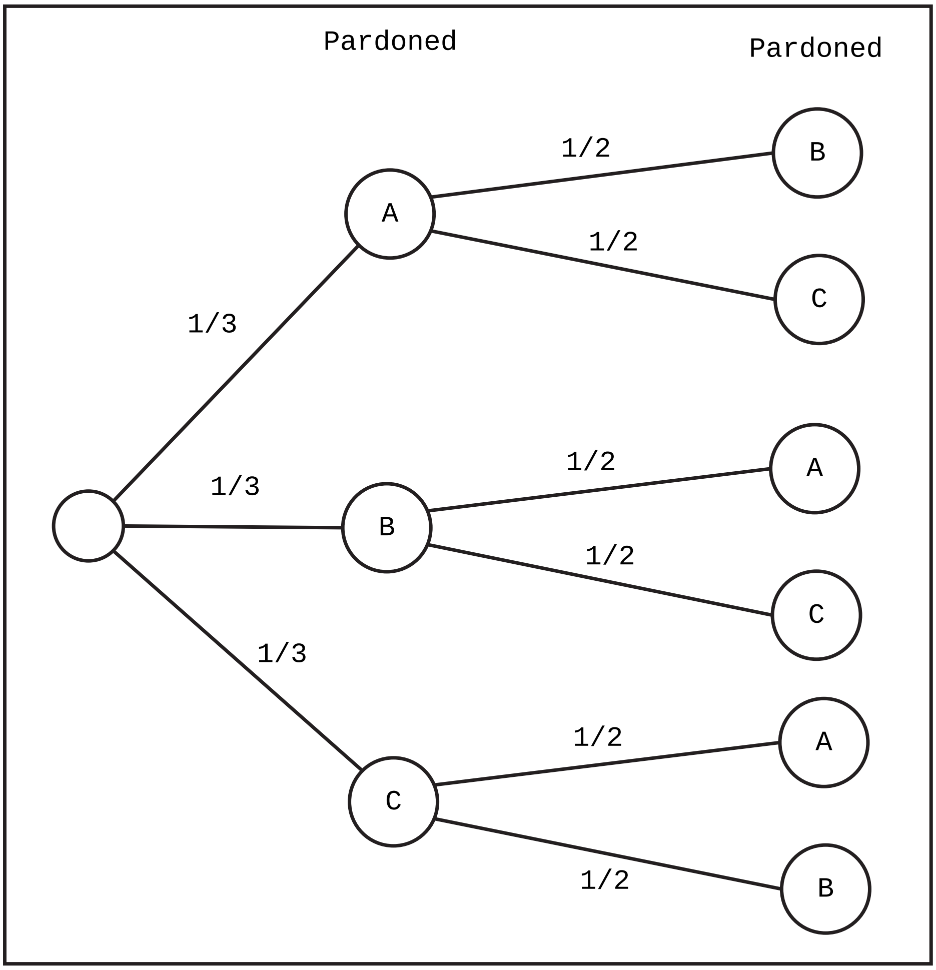
5.3 $Normal \wedge H^k$

The rule makes an error when we pick the normal coin and get a head k times.

$$p(Normal \wedge H^k) = p(Normal) \times (p(H/Normal))^k = \frac{n-1}{n} \times \frac{1}{2^k}$$

6 Prisoner's problem

Next is the schema modelling the problem :



Given the fact that B is pardoned, A has a one chance over 2 to be executed.