Assignment: 3

Roll nos: 2019101084, 2019101105

Initial belief states:

$$\left[\frac{1}{3}, 0, \frac{1}{3}, 0, 0, \frac{1}{3}\right]$$

(a) Action: Right Observed: Green

$$b'(s') = \alpha P('e'|s') \sum_s P(s'|s,a)\, b(s)$$

$$b'(s1) = \alpha\, 0.1 * [P(s1|s1,R)\, b(s1) + P(s1|s2,R)\, b(s2) + P(s1|s3,R)\, b(s3) + \dots]$$

$b'(s1) = \alpha\, 0.1 * [\ 0.086666\ ] = 0.008666\alpha$

$b'(s2) = \alpha\, 0.85 * [\ 0.33333\ ] = 0.28333\alpha$

$b'(s3) = \alpha\, 0.1 * [\ 0.0\ ] = 0$

$b'(s4) = \alpha\, 0.85 * [\ 0.24666\ ] = 0.209666\alpha$

$b'(s5) = \alpha\, 0.85 * [\ 0.08666\ ] = 0.073666\alpha$

$b'(s6) = \alpha\, 0.1 * [\ 0.24666\ ] = 0.024666\alpha$

So, $b' = [0.0144, 0.4722, 0.0, 0.3494, 0.1227, 0.0411]$

after dividing by the sum to get α. multiplied with

(b) Initial $b = [0.0144, 0.4722, 0.0, 0.3494, 0.1227, 0.0411]$

Action: Left Observation: Red

$b'(s1) = \alpha\, 0.9\, [0.36014] = 0.324132\alpha$

$b'(s2) = \alpha\, 0.15\, [0.00375] = 0.000563\alpha$

$b'(s3) = \alpha\, 0.9\, [0.38136] = 0.34323\alpha$

$b'(s4) = \alpha\, 0.15\, [0.09085] = 0.013628\alpha$

$b'(s5) = \alpha\, 0.15\, [0.12127] = 0.018191\alpha$

$b'(s6) = \alpha\, 0.9\, [0.04281] = 0.038529\alpha$

So, $b = [0.43971 \quad 0.0007 \quad 0.46450, \quad]$

$0.01844, \quad 0.02426, \quad 0.05299$

(c) Action: Left, observation: Green

Initial belief states = $[0.43971, \quad 0.0007, \quad 0.46450,$

$0.01844, \quad 0.02426, \quad 0.05299]$

$$b'(s1) = \alpha\, 0.1 \left[\begin{array}{l} P(s1 \mid s1, \text{Left})\, b(s1) \\ P(s1 \mid s2, \text{Left})\, b(s2) \\ + P(s1 \mid s3, \text{Left})\, b(s3) \\ + P(s1 \mid s4, \text{Left})\, b(s4) \\ + P(s1 \mid s5, \text{Left})\, b(s5) \\ + P(s1 \mid s6, \text{Left})\, b(s6) \end{array} \right]$$

$b'(s1) = \alpha\, 0.1\, [0.32552] = 0.032552\alpha$

$b'(s2) = \alpha\, 0.85\, [0.45829] = 0.389555\alpha$

$b'(s3) = \alpha\, 0.1\, [0.013862] = 0.0013862\alpha$

$b'(s4) = \alpha\, 0.85\, [0.13914] = 0.118274\alpha$

$b'(s5) = \alpha\, 0.85\, [0.04325] = 0.036776\alpha$

$b'(56) = \alpha 0.1\ [0.01991] = 0.001991\ \alpha$

So, $b = [0.0560, 0.6710, 0.0023, 0.2037,$
$0.0633, 0.0034]$