

Action 0

Previous Belief state: [0.3333333333333333, 0.3333333333333333, 0, 0, 0.3333333333333333]

Action: Right

Observation: Red

STATE S1

$$\begin{aligned}\text{Sum} &= 0.11 \times 0.333333 + 0.11 \times 0.333333 + 0.0 \times 0 + 0.0 \times 0 + 0.0 \times 0.333333 + \\ &= 0.036667 + 0.036667 + 0.0 + 0.0 + 0.0 + \\ &= 0.073333\end{aligned}$$

$$\text{New belief state} = 0.8 \times 0.073333 = 0.058667$$

STATE S2

$$\begin{aligned}\text{Sum} &= 0.89 \times 0.333333 + 0.0 \times 0.333333 + 0.11 \times 0 + 0.0 \times 0 + 0.0 \times 0.333333 + \\ &= 0.296667 + 0.0 + 0.0 + 0.0 + 0.0 + \\ &= 0.296667\end{aligned}$$

$$\text{New belief state} = 0.8 \times 0.296667 = 0.237333$$

STATE S3

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.333333 + 0.89 \times 0.333333 + 0.0 \times 0 + 0.11 \times 0 + 0.0 \times 0.333333 + \\ &= 0.0 + 0.296667 + 0.0 + 0.0 + 0.0 + \\ &= 0.296667\end{aligned}$$

$$\text{New belief state} = 0.05 \times 0.296667 = 0.014833$$

STATE S4

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.333333 + 0.0 \times 0.333333 + 0.89 \times 0 + 0.0 \times 0 + 0.11 \times 0.333333 + \\ &= 0.0 + 0.0 + 0.0 + 0.0 + 0.036667 + \\ &= 0.036667\end{aligned}$$

$$\text{New belief state} = 0.05 \times 0.036667 = 0.001833$$

STATE S5

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.333333 + 0.0 \times 0.333333 + 0.0 \times 0 + 0.89 \times 0 + 0.89 \times 0.333333 + \\ &= 0.0 + 0.0 + 0.0 + 0.0 + 0.296667 + \\ &= 0.296667\end{aligned}$$

$$\text{New belief state} = 0.8 \times 0.296667 = 0.237333$$

Before normalising, [0.058667, 0.237333, 0.014833, 0.001833, 0.237333]
dividing by 0.55

After normalising, [0.106667, 0.431515, 0.02697, 0.003333, 0.431515]

Sum: 1.0

Action 1

Previous Belief state: [0.10666666666666666, 0.4315151515151515, 0.02696969696969697, 0.003333333333333333]
Action: Left
Observation: Green

STATE S1

$$\begin{aligned}\text{Sum} &= 0.89 \times 0.106667 + 0.89 \times 0.431515 + 0.0 \times 0.02697 + 0.0 \times 0.003333 + 0.0 \times 0.431515 + \\ &= 0.094933 + 0.384048 + 0.0 + 0.0 + 0.0 + \\ &= 0.478982\end{aligned}$$

$$\text{New belief state} = 0.2 \times 0.478982 = 0.095796$$

STATE S2

$$\begin{aligned}\text{Sum} &= 0.11 \times 0.106667 + 0.0 \times 0.431515 + 0.89 \times 0.02697 + 0.0 \times 0.003333 + 0.0 \times 0.431515 + \\ &= 0.011733 + 0.0 + 0.024003 + 0.0 + 0.0 + \\ &= 0.035736\end{aligned}$$

$$\text{New belief state} = 0.2 \times 0.035736 = 0.007147$$

STATE S3

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.106667 + 0.11 \times 0.431515 + 0.0 \times 0.02697 + 0.89 \times 0.003333 + 0.0 \times 0.431515 + \\ &= 0.0 + 0.047467 + 0.0 + 0.002967 + 0.0 + \\ &= 0.050433\end{aligned}$$

$$\text{New belief state} = 0.95 \times 0.050433 = 0.047912$$

STATE S4

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.106667 + 0.0 \times 0.431515 + 0.11 \times 0.02697 + 0.0 \times 0.003333 + 0.89 \times 0.431515 + \\ &= 0.0 + 0.0 + 0.002967 + 0.0 + 0.384048 + \\ &= 0.387015\end{aligned}$$

$$\text{New belief state} = 0.95 \times 0.387015 = 0.367664$$

STATE S5

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.106667 + 0.0 \times 0.431515 + 0.0 \times 0.02697 + 0.11 \times 0.003333 + 0.11 \times 0.431515 + \\ &= 0.0 + 0.0 + 0.0 + 0.000367 + 0.047467 + \\ &= 0.047833\end{aligned}$$

$$\text{New belief state} = 0.2 \times 0.047833 = 0.009567$$

Before normalising, [0.095796, 0.007147, 0.047912, 0.367664, 0.009567]
dividing by 0.528086
After normalising, [0.181403, 0.013534, 0.090727, 0.69622, 0.018116]
Sum: 0.9999999999999998

Action 2

Previous Belief state: [0.18140283528004197, 0.01353428760791537, 0.09072695294904125, 0.69622020043783, 0.018116]
Action: Left

Observation: Green

STATE S1

$$\begin{aligned}\text{Sum} &= 0.89 \times 0.181403 + 0.89 \times 0.013534 + 0.0 \times 0.090727 + 0.0 \times 0.69622 + 0.0 \times 0.018116 + \\ &= 0.161449 + 0.012046 + 0.0 + 0.0 + 0.0 + \\ &= 0.173494\end{aligned}$$

$$\text{New belief state} = 0.2 \times 0.173494 = 0.034699$$

STATE S2

$$\begin{aligned}\text{Sum} &= 0.11 \times 0.181403 + 0.0 \times 0.013534 + 0.89 \times 0.090727 + 0.0 \times 0.69622 + 0.0 \times 0.018116 + \\ &= 0.019954 + 0.0 + 0.080747 + 0.0 + 0.0 + \\ &= 0.100701\end{aligned}$$

$$\text{New belief state} = 0.2 \times 0.100701 = 0.02014$$

STATE S3

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.181403 + 0.11 \times 0.013534 + 0.0 \times 0.090727 + 0.89 \times 0.69622 + 0.0 \times 0.018116 + \\ &= 0.0 + 0.001489 + 0.0 + 0.619636 + 0.0 + \\ &= 0.621125\end{aligned}$$

$$\text{New belief state} = 0.95 \times 0.621125 = 0.590069$$

STATE S4

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.181403 + 0.0 \times 0.013534 + 0.11 \times 0.090727 + 0.0 \times 0.69622 + 0.89 \times 0.018116 + \\ &= 0.0 + 0.0 + 0.00998 + 0.0 + 0.016123 + \\ &= 0.026103\end{aligned}$$

$$\text{New belief state} = 0.95 \times 0.026103 = 0.024798$$

STATE S5

$$\begin{aligned}\text{Sum} &= 0.0 \times 0.181403 + 0.0 \times 0.013534 + 0.0 \times 0.090727 + 0.11 \times 0.69622 + 0.11 \times 0.018116 + \\ &= 0.0 + 0.0 + 0.0 + 0.076584 + 0.001993 + \\ &= 0.078577\end{aligned}$$

$$\text{New belief state} = 0.2 \times 0.078577 = 0.015715$$

Before normalising, [0.034699, 0.02014, 0.590069, 0.024798, 0.015715]
dividing by 0.685421

After normalising, [0.050624, 0.029384, 0.860885, 0.036179, 0.022928]

Sum: 1.0

Beliefs after each action: [[0.106667, 0.431515, 0.02697, 0.003333, 0.431515], [0.181403, 0.013534, 0.090727, 0.69622, 0.018116]]