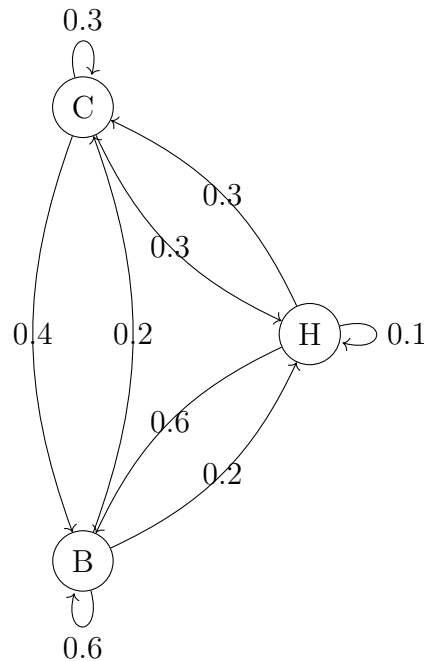


Exercise 1**(a)**

Transition matrix with row order (top to bottom) and column order (left to right) $H - B - C$:

$$Q := \begin{bmatrix} 0.1 & 0.6 & 0.3 \\ 0.2 & 0.6 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$

(b)

$$\begin{aligned} \sum_{a \in H, C, B} q_{Ha} \cdot q_{aB} &= q_{HH} \cdot q_{HB} + q_{HB} \cdot q_{BB} + q_{HC} \cdot q_{CB} \\ &= 0.1 \cdot 0.6 + 0.6 \cdot 0.6 + 0.3 \cdot 0.4 \\ &= 0.06 + 0.36 + 0.12 \\ &= 0.54 \end{aligned}$$

(c)

We have the following equations (also since π is a left Eigenvector of Q with Eigenvalue 1):

$$\pi_1 + \pi_2 + \pi_3 = 1 \quad (1)$$

$$\pi \cdot Q = \pi \quad (2)$$

Thus, we have the following equation system:

$$\begin{aligned} \pi_1 + \pi_2 + \pi_3 &= 1 \\ 0.1 \cdot \pi_1 + 0.2 \cdot \pi_2 + 0.3 \cdot \pi_3 &= \pi_1 \\ 0.6 \cdot \pi_1 + 0.6 \cdot \pi_2 + 0.4 \cdot \pi_3 &= \pi_2 \\ 0.3 \cdot \pi_1 + 0.2 \cdot \pi_2 + 0.3 \cdot \pi_3 &= \pi_3 \end{aligned}$$

Solving this, we get:

$$\pi \simeq (0.204082, 0.55101, 0.244897)$$

Exercise 2

(a)

(b)

Exercise 3

(a)

(b)

Exercise 4

(a)

(b)

Exercise 5

(a)

(b)

(c)

Appendix