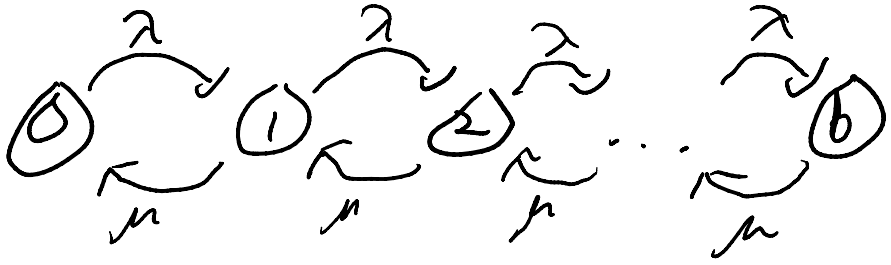
Markov Challenge Project

Friday, December 11, 2020 1:27 PM

M/M/1/b queue



$\pi_1 = \frac{\lambda}{\mu}\pi_0$

$\pi_2 = \left(\frac{\lambda}{\mu}\right)^2 \pi_0$

$\vdots$

$\pi_b = \left(\frac{\lambda}{\mu}\right)^b \pi_0$

$\pi_k = U^k\left(\frac{1-U}{1-U^b}\right)$ for $0 \le k \le b$

$\sum_{i=0}^{b} \pi_i = 1$

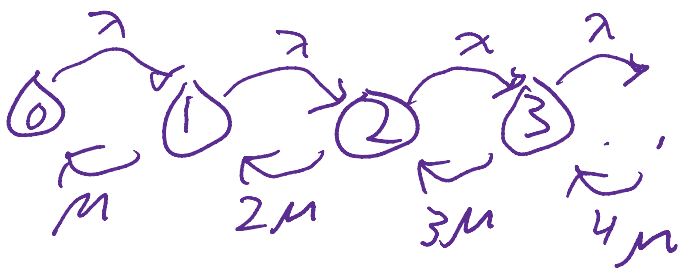
$\pi_0 \sum_{i=0}^{b} \left(\frac{\lambda}{\mu}\right)^i = 1$

$\pi_0 \left(\frac{1-\left(\frac{\lambda}{\mu}\right)^b}{1-\frac{\lambda}{\mu}}\right) = 1$

$\frac{1}{\pi_0} = \frac{1-\left(\frac{\lambda}{\mu}\right)^b}{1-\frac{\lambda}{\mu}}$

$\pi_0 = \frac{1-\frac{\lambda}{\mu}}{1-\left(\frac{\lambda}{\mu}\right)^b} = \frac{1-U}{1-U^b}$

$M/M/\infty$ queue



$$\pi_1 = \frac{\lambda}{\mu}\pi_0$$

$$\pi_2 = \left(\frac{\lambda}{\mu}\right)^2 \frac{\pi_0}{2!}$$

$$\pi_3 = \left(\frac{\lambda}{\mu}\right)^3 \frac{\pi_0}{3!}$$

$$\pi_k = \left(\frac{\lambda}{\mu}\right)^k \frac{\pi_0}{k!}$$

$$\sum_{i=0}^{\infty} \pi_i = 1$$

$$\pi_0 \sum_{i=0}^{\infty} \frac{\left(\frac{\lambda}{\mu}\right)^i}{i!} = 1$$

$$\pi_0 e^{\frac{\lambda}{\mu}} = 1$$

$$\pi_0 = \frac{1}{e^{-\frac{\lambda}{\mu}}} = \frac{1}{e^{a}}$$

$$\pi_k = \frac{a^k}{e^a k!}$$