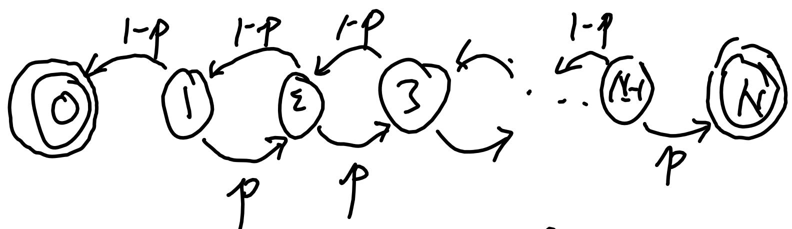

$$P_i = p \cdot P_{i+1} + q \cdot P_{i-1}$$

$P_0 = 0 \qquad P_N = 1$

$$\begin{cases} P_1 = pP_2 \\ P_2 = pP_3 + qP_1 \\ \vdots \\ P_{N-1} = pP_N + qP_{N-2} = p + qP_{N-2} \end{cases}$$

$\rightarrow$ N-1 linear equations for N-1 variables

$X_n = \{0, 1, 2, 3\}$

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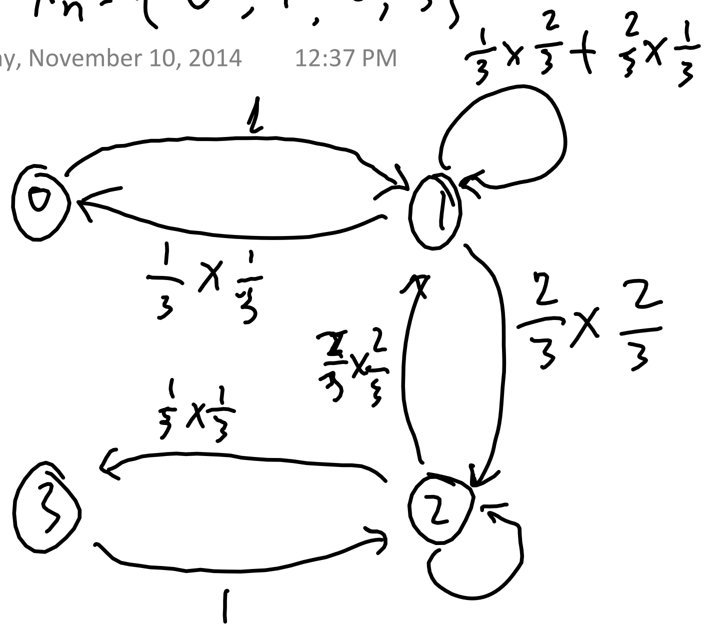
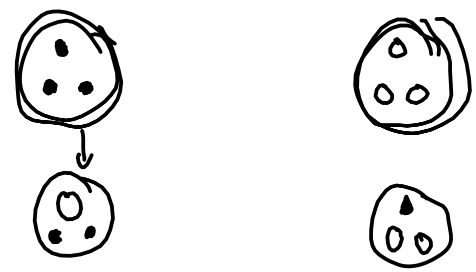
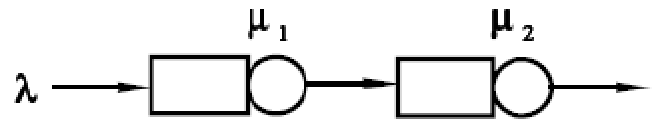




P

$$\begin{cases} \pi P = \pi \\ \pi \mathbf{1} = 1 \end{cases}$$

$$P = \begin{array}{c} \\ 0 \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{cccc} 0 & 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1/9 & 4/9 & 4/9 & 0 \\ & & 4/9 & \\ & & & 0 \end{bmatrix} \end{array}$$



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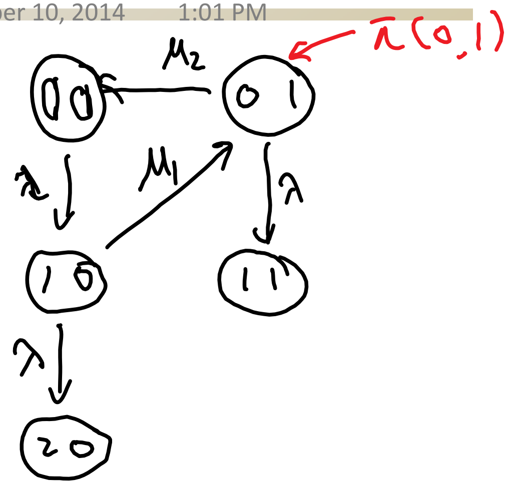
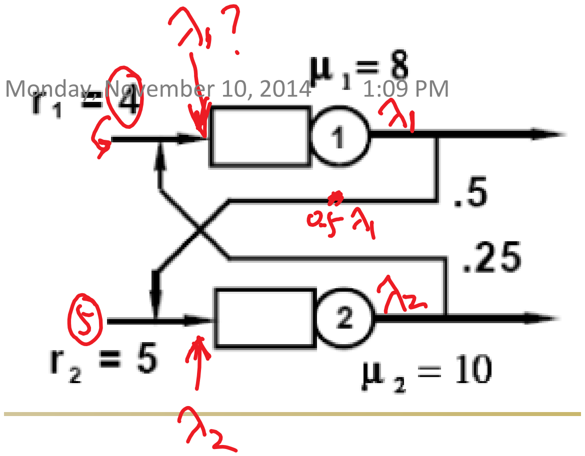


$$P(N_1 = n_1, N_2 = n_2, \ldots, N_k = n_k) = \prod_{i=1}^{k} (1-\rho_i)\rho_i^{n_i},$$

$$\rho_i = \frac{\lambda}{\mu_i}$$

$$\pi(i,j) = (1-\rho_1)\rho_1^i (1-\rho_2)\rho_2^j \quad i,j \geq 0$$



$$\begin{cases} \lambda_1 = 4 + 0.25 \cdot \lambda_2 \\ \lambda_2 = 5 + 0.5 \cdot \lambda_1 \end{cases} \Rightarrow \lambda_1 = 6,\ \lambda_2 = 8$$

$$\rho_1 = \frac{\lambda_1}{\mu_1} = \frac{3}{4}$$

$$\rho_2 = \frac{\lambda_2}{\mu_2} = \frac{4}{5}$$

$$\pi(n_1, n_2) = \frac{1}{4}\left(\frac{3}{4}\right)^{n_1} \frac{1}{5}\left(\frac{4}{5}\right)^{n_2}$$