MASSACHUSETTS INSTITUTE OF TECHNOLOGY Department of Electrical Engineering & Computer Science 6.041/6.431: Probabilistic Systems Analysis (Spring 2006)

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- 1. Example 6.3 in text, page 316
- 2. parts (a) and (b) Problem 6.3 in text, page 354 (c) the *n*-step transition probabilities can be generated by the recursive formula

$$r_{ij}(n) = \sum_{k=0}^{2} r_{ik}(n-1)p_{kj}$$
 for $n > 1$, and all i, j

starting with $r_{ij}(1) = p_{ij}$ where

$$[p_{ij}] = \begin{bmatrix} 1 & 0 & 0 \\ 0.4 & 0.6 & 0 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$

Plugging into the above formula gives:

$$[r_{ij}(2)] = \begin{bmatrix} 1 & 0 & 0 \\ 0.64 & 0.36 & 0 \\ 0.55 & 0.36 & 0.09 \end{bmatrix}$$

Similarly

$$[r_{ij}(3)] = \begin{bmatrix} 1 & 0 & 0 \\ 0.784 & 0.216 & 0 \\ 0.721 & 0.252 & 0.027 \end{bmatrix}, \ [r_{ij}(5)] = \begin{bmatrix} 1 & 0 & 0 \\ 0.922 & 0.078 & 0 \\ 0.897 & 0.100 & 0.003 \end{bmatrix}, \ [r_{ij}(10)] = \begin{bmatrix} 1 & 0 & 0 \\ 0.994 & 0.006 & 0 \\ 0.992 & 0.008 & 0 \end{bmatrix}$$

Eventually the spider will catch the fly, thus:

$$\lim_{n \to \infty} [r_{ij}(n)] = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

3. Problem 6.4 in text, page 354