National Taiwan Normal University
Department of Computer Science and Information Engineering

CSC0056 - Data Communication

Homework 2

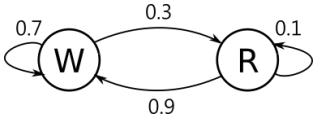
(Four questions in total; due on 10/27/2019 11:55 p.m.; submit your answer via Moodle)

1. (30 points) Draw three possible scenarios using the stop-and-wait ARQ to successfully send and receive packets with seq. number from 0 to 2 eventually, in face of possible errors in between. 10 points for each scenario.

2. (30 points) Answer two questions for the selective repeat ARQ with the following conditions: the starting seq. number=0, window size=3, and suppose that the only error throughout your scenario occurred in the very first transmission of packet with seq. number=1.
   2a. (15 points) Draw one example scenario where the selective repeat ARQ indeed saves some re-transmissions compared with the go-back-N ARQ.
   2b. (15 points) Draw one example scenario where the selective repeat ARQ *does not* save re-transmissions compared with the go-back-N ARQ (Hint: Consider the examples I gave in the lecture note).

3. (10 points) Look up online for one example of Little's Theorem. Summarize your finding *in your words* in no more than five English sentences, and also provide the reference html link.

4. (30 points) Given the following Markov chain, answer two questions:



   4a. (15 points) Create the transition probability matrix accordingly, and apply matrix multiplication repeatedly to estimate the stationary distribution for each state. Show the resulting matrix after each matrix multiplication.
   4b. (15 points) Instead, compute the stationary distribution using (M=2) $\vec{\pi} \cdot \mathcal{P} = \vec{\pi}$ and $\sum_{i=0}^{M-1} \pi_i = 1$

Finally, in the following I selected some queueing problems from the textbook for you to exercise (no need to submit and do not count for homework score). The answers for them can be found on the author's webpage (http://web.mit.edu/dimitrib/www/datanets.html). These exercises should further help you in learning to apply the concepts taught in class: Chapter 3: Problem 3.1, Problem 3.2, Problem 3.5, Problem 3.6.