EE 450

Project

Due Monday, December 2, 2013 at 5:00 p.m.

Important Note: This project consists of two parts and is to be an individual effort. You may not consult other students or anyone else except your TA and professor. Your report should be typed and well organized. You should print out a hard copy and hand it in at the beginning of lecture on the due date shown above. You should include in an appendix any source code you write (Matlab, C, C++, etc.).

Part 1. Slotted ALOHA.

Suppose we have $N = 10$ nodes and each node has an unlimited number of frames to transmit. A time slot is exactly equal to the tranmission time of a frame. The frames in each of the nodes are all the same length. At time slot 1 assume all nodes try to transmit and thus the frames collide. Each node then independently tries a retransmission of the frame with probability p at the next time slot as discussed in class. When a node successfully transmits a frame it immediately tries to transmit its next frame in the next time slot. **Simulate** this slotted ALOHA with p varying from 0.025 to 0.7 with a step size of 0.025. For each value of p determine the **efficiency** of this multiple access protocol using your simulation. For each value of p determine the **mean** and **standard deviation** of the wait time for successful transmission of a frame (if a frame is transmitted immediately then the wait time is zero, otherwise the wait time is the number of slots that pass by before the frame is transmitted). To be confident that you have run your simulation long enough you should **compute** the efficiency as you are running your simulation at time slot 10, 20, 30, ..., n, where n is the number of time slots you are using and see if the efficiencies you compute approach a constant depending on p. You should **present** using a table in your report the values for the mean, standard deviation and efficiencies that you found. Let p^* denote the value of p that resulted in the maximum efficiency. You should **plot** using p^* your efficiency numbers vs. t for $t = 10, 20, 30, ..., n$, where t denotes the time slot. If your plot levels off then you can assume you have run your simulation long enough for p^*. Also, **plot** the efficiencies vs. t for $\max(0.025, p^* - .15)$ and $\min(0.7, p^* + .15)$ to show they leveled off.

Finally, determine the **expression for the maximum efficiency** and solve the equation for the value of $p = p^*$ that maximizes this expression.

Part 2. Pure ALOHA.

Repeat Part 1 using Pure ALOHA. In this algorithm the nodes are not synchronized so each of your 10 nodes should have a random start of transmission time relative to the other nodes.