CSE6344 – Homework (Due: October 24th, 2008 before 11:59pm)

Submit all your source files (and scripts if you have any) and your pdf document in a zip or gzip archive to Stella Choe (choe@cse.uta.edu). Please do not submit object or executable files (no core files either).

Create a DE simulation tool to simulate a *p*-persistent CSMA radio network. The simulation studies will concentrate on the useful utilization and access delay of the network (percentage of total throughput and the channel capacity*simulation time). Assume load is generated according to a Poisson point process. Make enough experiments for each simulation run so that you can claim a 95% confidence that your error is less than 5% (make at least 15 runs with different seeds for each setup). Assume that each node has a transmission range of exactly r meters. Do not forget to show metrics on your axes.

1st study: assume a fully connected network.

1.1. Vary the load in a reasonable range and show the useful utilization for 2, 10, and 100 nodes on the same figure. (Show useful utilization [in percentage] vs. total network load [in percentage].) For this experiment choose a static *p* value – make sure you explain why you have chosen that value. Keep total network load for different populations the same!

1.2. Fix the network population (number of nodes) to a value chosen by you. (Make sure you argue about why you have chosen that value.) Show in a 3D surface graph the access delay vs. total network load and *p*. Make sure you select representative values for *p*. (Suggestion: use Matlab to show your results.)

2nd study: Extend your simulator to be able to deal with ad hoc (multihop) network; add the capability to deal with propagation delays. Fix the number of nodes at 100, choose a static *p* value. Place nodes uniform randomly in a 1000m side square area. Vary the density (e.g., average nodal degree) of the network in a reasonable range.

2.1 a. Show a graph of nodal degree versus transmission radius.

2.1 b. Show a graph of "connectedness" vs. density. (If you generate many random networks with that given density, in what percentage of the cases is the network connected.)

2.2 Show a 3D surface graph of the useful utilization vs. load (similarly as before) and density (use your own reasonable metric).

Required Documentation (in publication style): The document you need to turn in should have 3 (4) sections:

- section 1: description of your simulator. (1 page)
- section 2: description of scenario 1, your assumptions, results, and discussion of results.
- section 3: description of scenario 2, your assumptions, results, and discussion of results.
- (section 4: optional - any other resources used - references)