ECE 3656 Mobile and Wireless Networks
Spring 2002

Homework 1: Due in class Mon April 8 2002

- This test contains 1 problem. It allow you to earn 100 points.
- The solution to this problem should be a hard copy of the required program and also a floppy disk containing the C/C++ code. Show your work, as partial credit can be given. You will be graded not only on the correctness of your answer, but also on the clarity with which you express it. **Be neat**.
- **No late submissions will be accepted.**
- Only homework returned in a letter size envelope will be accepted. Please, write your name and the class name (ECE 1320) on the envelope (write clearly, please). Also, write your name and the class name in the floppy disk.

Write your name here: _____

Problem # 1 [100 points]. You are supposed to write a program that simulates the generation of wireless networks. These networks should be connected, namely, there has to be possible to find a multi-hop route between any pair of nodes.

Generating a wireless network means that you have to place n nodes in 2D and in 3D *randomly and uniformly* (for the generation of the nodes' coordinates you can use the C++ class rstream that provides a pseudo-random number generator. It is available from the class web page).

As customary in wireless networks, two nodes are *neighbors* if their (Euclidean) distance is less than the smaller of their transmission radii. In this homework and for the project we consider all nodes to have the same transmission radius r.

The resulting graph is called a *topology*. You should only consider *connected* topologies (this will affect the size of the geographic area you are disseminating your nodes on). Once the topology is generated you should write code for checking whether that topology is connected or not.

The sides on the geographic area and the transmission radius of a node should be expressed in meters. We consider squares (2D) or cubes (3D) of side L. Also, consider to choose the transmission radius r of a node between the following two: 250m (IEEE 802.11) and 10m (Bluetooth).

Hint to a possible solution: A way to approach the problem is to fix the number n or nodes, say $n = 100$, and to also fix the transmission radius r of each node (for instance $r = 10$). Then the problem is that of finding a suitable L so that most ($> 90\%$) of the generated topologies are connected. This will help greatly in the final project.