

# COSC 6357 Wireless Sensor Networks

## Fall 2024

### Assignment 1

#### Objectives

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1. To reinforce the basic concepts of wireless sensor networks.
2. To simulate a clustered WSN.
3. To work with basic routing in WSN.

#### Basic Information

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**Due:** Saturday, Sept. 14<sup>th</sup>, 2024

**Team Work:** You can work in groups of 2 members max

**Grading:**

	Points
Program Correctness	75
Program Design	15
Style and Documentation	10
Misc	
Total	100

#### Problem Statement

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In this assignment, you are simulating the operation of a WSN. The network covers a 20mx20m square area divided into uniform predetermined clusters of 5mx5m (i.e. total of 16 clusters). Your program will operate in two modes; random mode and user mode. In the random mode, the program will generate a random number of nodes between 10-100. If in the random mode, every node will have the following randomly generated characteristics:

- 1) (x,y) coordinates;  $x=0-20$  and  $y=0-20$
- 2) Radio range  $R$ ;  $R=1-8$  m
- 3) Energy level  $E$ ;  $E=1-100$
- 4) Processing Power  $P$ ;  $P=1-100$

According to the coordinates, every node is assigned to one of the predetermined clusters that includes these coordinates (i.e. in case of a coordinate on the border of some clusters, randomly assign this node to any of the neighboring clusters). A clusterhead out of the residents of the cluster is elected based on the following formula;  $F = 0.4R + 0.4E + 0.2P$ , the node with the largest  $F$  is the clusterhead. In the case of a tie, elect the nearest node to the center of the cluster.

Your simulation should allow a GREEDY intuitive routing. A node will always route packets to the nearest node, within its radio range, to the destination.

Your program will interact with the user via the command line. The user should choose between user mode and random mode. If user mode is chosen, then the program reads the number of nodes and their corresponding characteristics from input.txt that is organized in the following manner:

```
Number of nodes n
x1 y1 R1 E1 P1
x2 y2 R2 E2 P2
.
.
.
xn yn Rn En Pn
```

For example  
3  
3 1 4 40 30  
2 7 5 99 55  
13 14 4 45 80

This means that there is 3 nodes with node 1 having (3,1) coordinates, R=4, E=40, and P=30; similarly for the other nodes.

If the user chooses the random mode, then your program will randomly generate the number and characteristics of nodes.

In either mode, the program will output the characteristics of the network to output file network.txt following the same format of input.txt. In addition, the program will output to the screen and to network.txt the residency of every cluster (i.e. which nodes belong to the cluster) and its elected clusterhead. Use your own simple but easily readable format.

After choosing the mode of operation, the user should be able to enter a source and a destination for the program to route using the aforementioned routing technique. The resulted route should be output to the screen as a series of hops using the id of the node. The input menu should be displayed until the user chooses to quit. With every run, your program should use a clean copy of network.txt.

## Deliverables

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Working software program including all source files and **readme file**. Do not include input.txt in your submission as I will be using a script to test your program. Note that you can use C, C++, Java, or Python as your programming language in this assignment.