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# Wireless Sensor Network Simulation

The program simulates a WSN within a 20m x 20m area, divided into 16 uniform clusters, with each cluster being 5m x 5m in size. The program operates in two modes: Random Mode and User Mode, allowing users to either randomly generate nodes between 10- 100 or input node characteristics via a input.txt file. It outputs network and routing information for both random and user mode .

## Project Overview

This project simulates a clustered WSN, allowing users to simulate different network structures and routing strategies. The network is divided into 16 clusters, and each node is assigned to a cluster based on its coordinates. In each cluster, one node is elected as the clusterhead based on a formula.

**1)Cluster Assignment**

Each node is assigned to a cluster based on its coordinates. If a node falls on the border of multiple clusters, it is assigned to one of the neighboring clusters.

2) **Clusterhead Election**

For each cluster, a clusterhead is elected based on a formula that considers the node’s radio range (R), energy (E), and processing power (P). The formula used is F = 0.4R + 0.4E + 0.2P. The node with the highest F value is elected as the clusterhead. If multiple nodes have the same F value, the node closest to the center of the cluster is elected**.**

**3) Greedy Routing**

The routing technique used in the program is a greedy algorithm. A node will route packets to the nearest neighbor within its radio range that is closest to the destination node. This continues until the destination is reached.

**Type of modes :**

**1)Random Mode**

In Random Mode, the program generates a random number of nodes (between 10 and 100). Each node is assigned random coordinates (x, y), radio range (R), energy level (E), and processing power (P).

2) **User Mode**

In User Mode, the program reads node characteristics from an input file called 'input.txt'. The file follows a specific format with the first line indicating the number of nodes and the subsequent lines providing the characteristics of each node.

### Input File Format

Number of nodes n  
x1 y1 R1 E1 P1  
x2 y2 R2 E2 P2

For instance,

3

3 1 4 40 30

2 7 5 99 55

13 14 4 45 80

**Output File Format**

The program outputs the network structure to 'network.txt' or 'network\_random.txt' depending on the mode. The file includes the following information:

* Node characteristics (position, radio range, energy, processing power)
* Cluster membership
* Elected clusterhead for each cluster

A screenshot of a computer

Description automatically generated