

## WMN Homework 3 Bonus Report

Bonus Report:

### 1. Cell Setup

For the cell setup, I use angles to iterate through the hexagon shape and create the 19-cell structure. After I drew out the 19-cell structure, I duplicated the entire 19-cell, then used a for loop to display it surrounding the original cell, at the same time, I recorded all the base station points into two 1x133 vectors called "xCoords" and "yCoords".

Use inpolygon to generate a random/uniformly distributed 100 mobile device. First, generate 1 mobile device and see if it is in the 19-cell polygon, if yes then generate, if no then regenerate another point until there are 100 mobile devices generated. Record the mobile device's location in a 100x2 vector called "allPoints", including x and y coordinates.

### 2. Initialize

Initialize a "distance" 100x133 double that will store the distance from each mobile(100) to each base station (133), and here we use two for loops.

Use "distance" to get path loss, received power, and SINR(100x133).  $SINR = S/(I+N)$  Interference(I) is the total received power of all others except it's own received power. Since it is uplink, it would be affected by all other mobile devices.

Initialize all the given values, such as minSpeed, maxSpeed, minT, etc..

Initialize the currentTime to 0, current location to "allPoints"(all mobile location), and currentCell to record the cell they are in.

### 3. Function

There's a function written at the end of my code called "checkCell". It use SINR to determine which cell it is in, which is the biggest SINR's corresponding cell. The largest SINR means the distance between it is short, which gives a higher gd(path loss), which in turn gives a higher received power and SINR.

$$\text{Received Power} = g(d) * P_t * G_t * G_r \text{ where } g(d) = (h_t * h_r)^2 / d^4$$

For the outside duplicated 19-cell, just use mapping to get the corresponding ID.

#### 4. Main/While Loop

We use while current time < total time of 900s. Update current location and distance from every mobile to every base station due to random direction and random velocity. The random time would be the same for all the mobile device for default. Then continue to update path loss, received power, interference, and SINR. Use “checkCell” function to determine cell; update cell and time

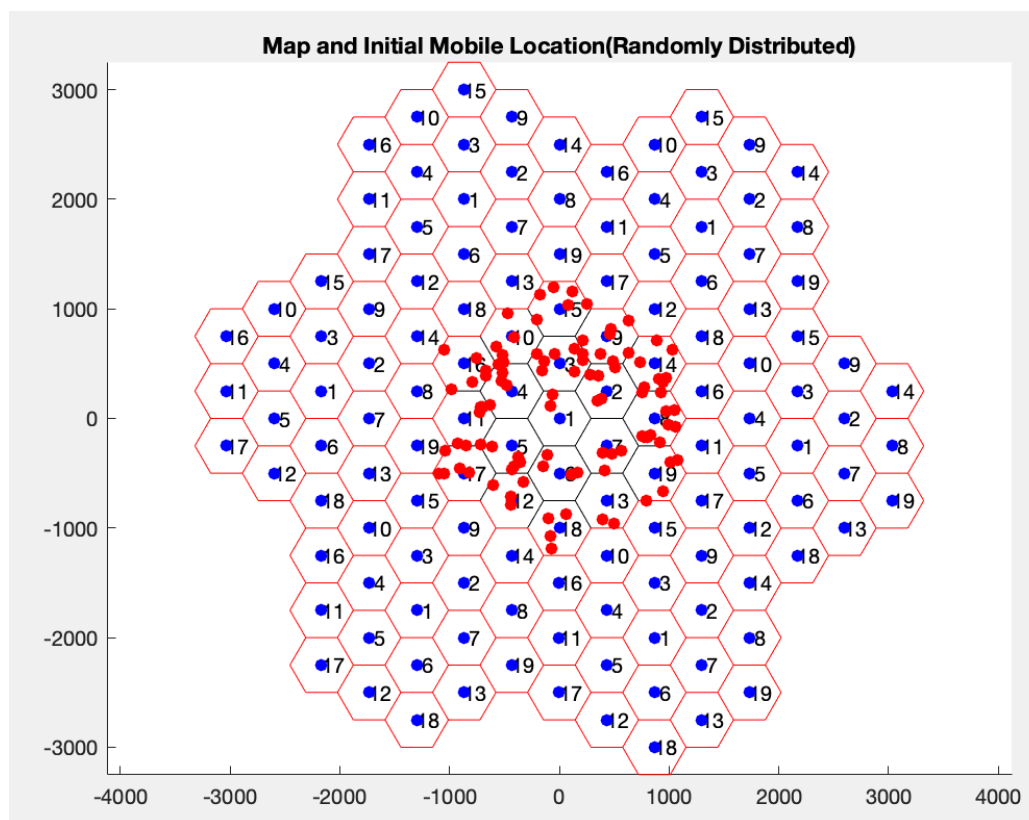


Figure 1: Initial Mobile Location at the 19-cell