Introduction to Wireless and Mobile Networking

Homework 3 Report

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1. 1 moving mobile device, downlink

   1-1. Please give a figure to describe how you arrange cell IDs to Fig. 1.

The following figure illustrate the assignment of cell IDs. The ID of the central BS is 1, and the 6 BSs around the central BS are assigned 2 to 7, in counterclockwise direction. The same rule applies to the outermost BSs, which are assigned 8 to 19.

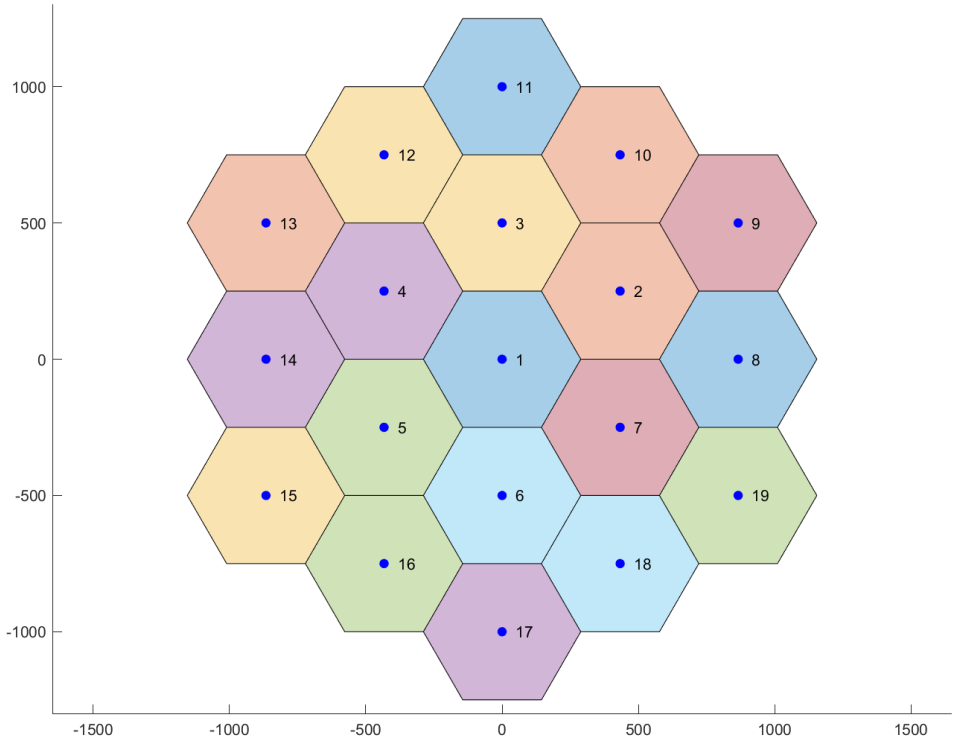

Figure 1.1.1 The arrangement of the base stations.

1-2. Bases on 1-1, please list all the time when the handoff event occurs and the related cell ID following the below format:

Time	Source cell ID	Destination cell ID
3s	1	2

It means at the 3rd second, the mobile device moves from cell 1 to 2.

To simplify the simulation, we treat the service area of each base station as a circle of radius $500/\sqrt{3}$. The criterion of handoff is based on the "distance" to the base station. For example, assume a user is initially at cell A, and the distance to the base station is r. When $r > 500/\sqrt{3}$, a handoff event occurs, and the user will be served by another cell B which is of the closest proximity to the user.

What if the user is at cell 8 ~ 19 and the user moves outward? The user will be out of the service area of the original base station. Due to symmetry, the user will appear on the opposite side with the same moving direction. For example, if the user is at cell 13 and moves outward, it will move to cell 19 after crossing the border of cell 13.

We set the simulation time to 900 seconds, and each time step is 0.1 second. During each time step, we find the position of the user and the distances to each base station. Then, we check whether a handoff is needed. The following table is the result of a simulation. (To make sure the random walk mobility model walks, the mode of the random number generator is set to "shuffle".)

Time	Source cell ID	Destination cell ID
8.00 s	1	7
8.50 s	7	2
10.60 s	2	7
320.20 s	7	2
574.10 s	2	6

Table 1.2.1 The list of handoff events

(Results may vary for different simulation time and time step)

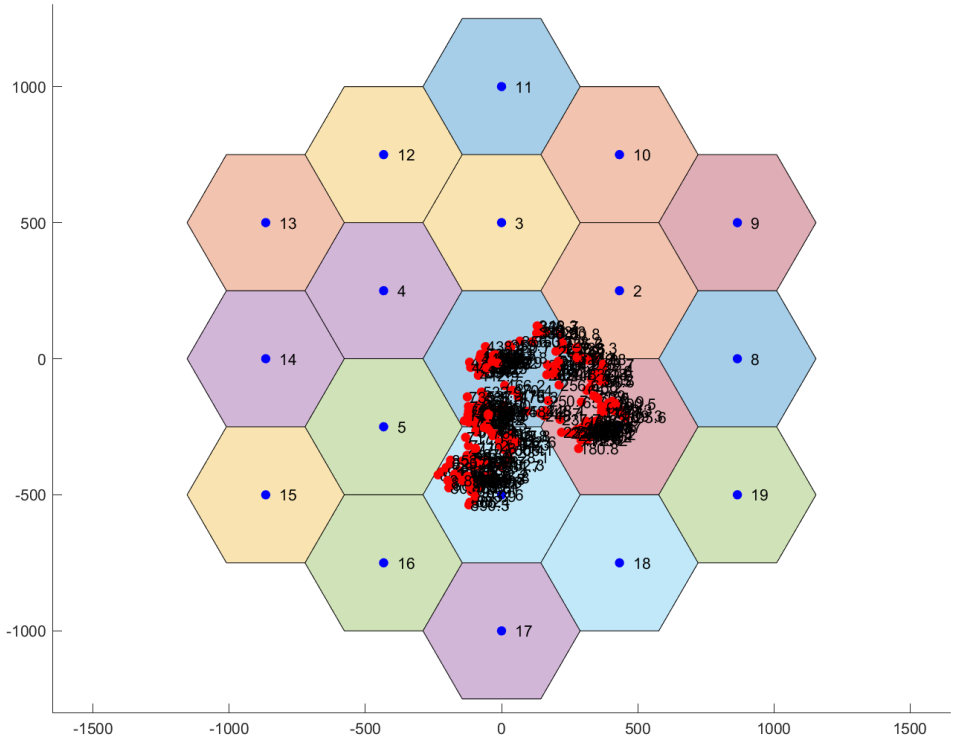

Table 1.2.1 The movement of the user in the cluster, shown in red points. (The numbers next to the red points are time stamps.)

1-3. How many handoff events happen during the total simulation time?

As shown in table 1.2.1, there are 5 handoff events. Since we didn't calculate SINR of the signals, the durations between the first 3 handoff events are very short. This is a good observation of ping-pong effect. To improve the performance of simulation, we should design handoff events based on SINR.