

Exercise for the lecture
Algorithms for Radio Networks
Winter 2011/12
Sheet 4

EXERCISE 4:

Select at least one of the following two exercises:

1. Handoff algorithm

Create a simulation of the Handoff scheme from the lecture: A cell phone user walks through town using his cell phone at various locations.

- Three base stations are given at the locations $(-0.5, -0.6)$, $(0.6, 0.15)$, and $(-0.1, 0.9)$.
- The cell phone user passes seven points during his walk, which are $(-1.0, 0.1)$, $(-0.3, 0.6)$, $(0.2, 0.7)$, $(0.8, 0.1)$, $(0.2, -0.4)$, $(-0.5, 0.0)$, and $(-0.7, 0.7)$. They are connected by a path of straight lines in the given order. Hint: The line between two points A and B is expressed by $f(t) = A + t(B - A)$ where $t \in [0, 1]$.
- Now calculate the signal strength of every base station using the formula in the lecture slides *03-B-Handover*, slide 7. Use $\mu = 30$ and $\eta = 10$. Use the normal distribution $\mathcal{N}(0, 1)$ location independent for $Z(d)$.
- Mark all points in the signal strength representation where a handoff between base stations takes place. Do not forget to choose a proper hysteresis.

2. Simulation of MAC algorithms

Simulate the following four MAC algorithms:

- (a) Aloha
- (b) Slotted Aloha
- (c) CSMA
Assume the signal needs 0.1 frames in length to arrive at other participants.
- (d) CSMA over long distance
Assume the signal needs 1 frame in length to arrive at other participants.

To simulate this use a random number generator to create timestamps for packets to be sent. Vary the number of timestamps generated to create different loads. Assume an infinite number of participants, so no participant ever sends two packets during the simulated time.

Create a diagram using the gathered data for the throughput with respect to the load as seen in the lecture.

Note: Exercise 4.2 will be discussed on December, 6th.