Homework No. 2

Simulation of the Unconstrained OPC Algorithm

In this homework the OPC algorithm is applied to a simple single-cell and a two-cell wireless network. The following parameters are fixed for both cases:

- Background noise power $\sigma^2 = 10^{-10}$
- OPC constant $\eta = 0.05$
- Path gain $h_i = 0.1d^{-3}$

1 Single-Cell Networks

Simulate the system under the above conditions, for 5 number of users and cell radius of $250m$. The users should be uniformly distributed in the cell.

- Plot SINR and power of each user versus the number of iterations (a measure of time).
- Which users transmit at high power levels? Does it depend on initial transmit power vector?
- Increase or decrease the OPC constant and see its impact on performance of the OPC algorithm.

2 Two-Cell Networks

To study how OPC works when users move, assume a two-cell wireless network with 9 users as shown in Fig. 1 (see next page). Suppose that users 1 to 6, 8, and 9 are fixed, and user 7 at $t = 0$ starts moving from its starting point in cell No. 2 towards cell No. 1 along the line in Fig. 7 at a uniform speed of 20 m/s (72 km/h). The movement of user 7 from the starting point to the end point lasts 20 seconds. Each user updates its transmit power every 1 ms (1 KHz) employing OPC. When user 7 enters cell No. 1, i.e. at $t = 10$, base-station 1 is assigned to it. Excluding the moving user 7, note that user 2 in cell No.

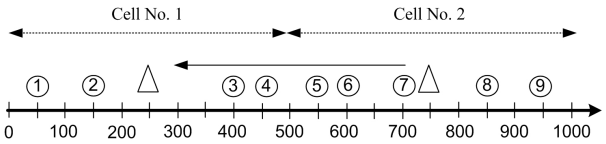

Figure 1: Distribution of users and base stations in a two-cell wireless network. Users are marked by "◯", and base stations are marked by "△". Users 1 to 6, 8 and 9 are fixed, and user 7 at $t = 0$ starts moving from the starting-point $x = 700$ m in cell No. 2 towards the end-point $x = 300$ in cell No. 1 along the illustrated line at a uniform speed of 20 m/s (72 km/h).

1, and user 8 in cell No. 2 are the closest users to the base station in their corresponding cells.

- Plot the transmit-power levels and the received SIRs versus time for users 2, 7, and 8.
- Discuss and interpret the results.

Please note that you should upload your HW in a zipped folder named 'HW3 your student number'. This folder must include 1- your code files (ending in .m) and 2- your report file containing your plots and answers to different parts of HW.