EE 597 Spring 2020
Assignment 2

Assigned: January 29, 2020
Due: Feb 5, 2020, in class

1 Outage Probability as a function of distance for Log-Normal Shadowing

For the simple path loss with log-normal shadowing model, plot the outage probability as a function of distance, assuming $P_t = 30$dBm, the path loss at a reference distance of 1m is -30dB, the path loss exponent is 2.5, the standard deviation of the log-normal fading is 3dB, the noise level is -100dBm, and the SNR threshold for acceptable error rate is deemed to be 10dB. Now vary the path loss exponent and the standard deviation of the log-normal fading to different values. Plot and comment on how they affect the outage probability as a function of distance

2 Rate Adaptation

Browse thorough the following paper: Goodput Analysis and Link Adaptation for IEEE 802.11a Wireless LANs, by Daji Qiao, Sunghyun Choi, and Kang G. Shin

Consider a simple path loss model without shadowing. Use figure 8a from this paper, which relates throughput to the SNR. Assuming a transmit power of 23dBm, received power at a reference distance of 1m being -10dBm, and receiver noise of -90dBm, plot the goodput of 802.11a as a function of distance for path loss exponents 2 and 4.

3 MATLAB Simulation

Read Simulation Of Flat Fading Using MATLAB For Classroom Instruction by Prabhu and Shankar.

Now download and play with the matlab code for Rayleigh fading (raygen.m) provided at this link.

For each choice of mobile speed from $[0, 5, 10, 15, 20, 25]$, generate the `power_ray` series. Use a threshold size of `pow(3)` (corresponding to about 3.25dBm) to discretize this series into two channel states (1 if above threshold, 0 if below). Model the corresponding series as a two-state Markov chain and estimate the parameters p_{01} and p_{10} for each case.