Computer Networks I

Homework 2

(Due: 18th Feb, 2024)

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Step1: Finding the Path Loss Exponent (20 points)

The purpose of this step is to find out the path loss exponent of an unknown environment. Use any programming language/tools to solve your problem. Describe the outcomes in a report while submitting.

- First open the spreadsheet named HW2_part1.csv; the spreadsheet consists of 13 RSSI (signal strength) values from columns B-N in dBm, with different distances in meters (in column A). So in the same location, the RSSI values are slightly different for different measurements.
- Plot all these points in a graph where the RSSI values are in y-axis (dBm), and the distances are in x-axis (in log scale)
- Draw a best fit straight line corresponding to this log-log plot. Find out the slope of this line, divide it by 10 and take the absolute value, which is your path loss exponent.
- Also find out the variance of these RSSI samples, w.r.t. the best fit line.

Step 2: Range Estimation (20 points)

The purpose of this step is to find out the distance/range from the path loss exponent that you have found in the last step. Use any programming language/tools to solve your problem. Describe the outcomes in a report while submitting.

- Now use the obtained path loss exponent for estimating some distances, using the following formula (I have ignored the noise term). Use HW2_part2.csv: column A is the distance in meters and columns B-P are the RSSI measurements at those distances. Assume d_0 as 1 meter, and find $P_r(d_0)$ by averaging columns B1-P1. Assume that column A is unknown, which you want to estimate based on the measurements of columns B-P.
- However, due to the noise there will be some errors in range/distance estimation. So, calculate the distance error by comparing with the actual distance. Repeat this experiment for 5 different distances (rows 2-6) that are given in the spreadsheet, and report the average error.

$$P_r(d)[dBm] = P_t(d)[dBm] - [P_L(d_0)]dB - 10n\log_{10}\left(\frac{d}{d_0}\right)$$

$$= P_r(d_0)[dBm] - 10n\log_{10}\left(\frac{d}{d_0}\right)$$