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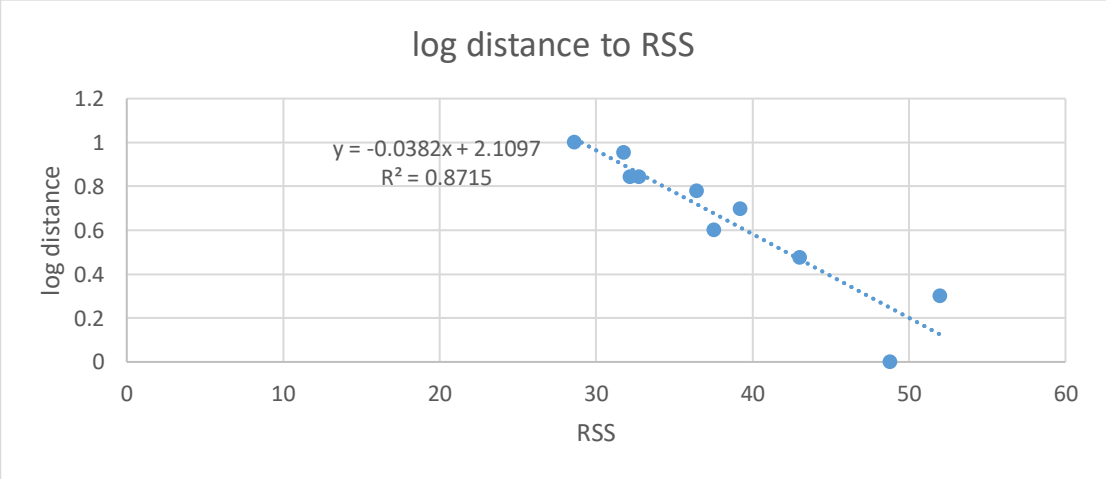
Project stage 1

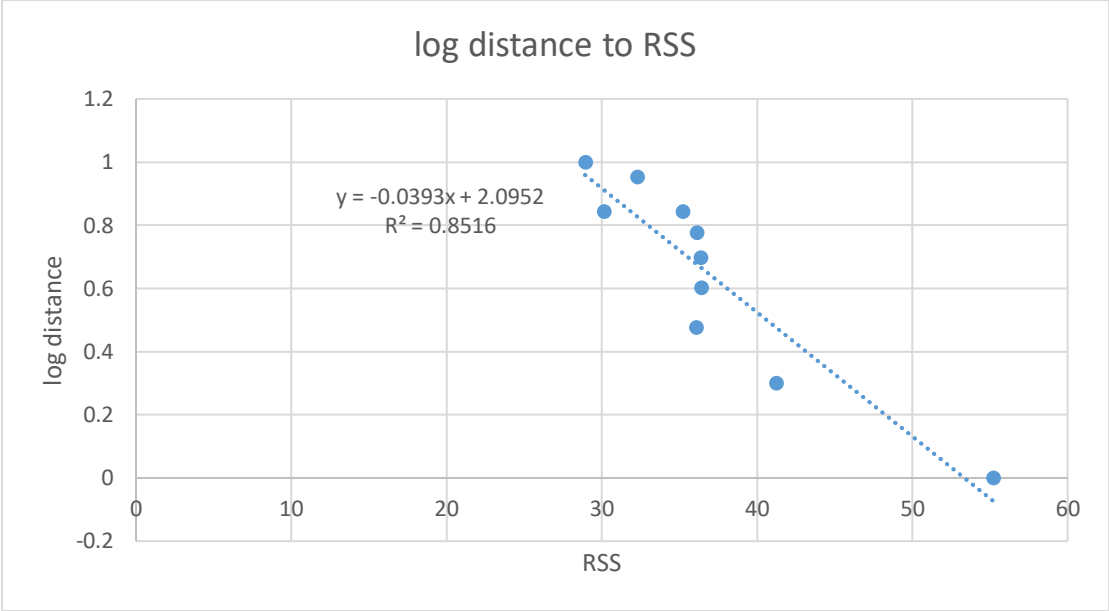
Data

The date used for stage 1 is collected by a iphone 6s plus smart phone and a asus laptop with windows system. The data are collected by using Microsoft Network Monitor. The outdoor data was collected at the aisle in front of the library and the indoor data was collected at the aisle in my apartment.

The following graphs uses the average RSS as the x axis and the log distance as the y axis, the line and the formula shown on the graph is produced by linear regression.



Graph 1. indoor average



Graph 2. outdoor average

Assume the data are in normal distribution, then the three standard deviation on either side of the average mean value will cover 99.7% possibilities of the data. Therefore, we can simply use the average mean value and the standard deviation to estimate the distance. However, since some standard deviation is large, the result cannot be accurate. But we can use this to evaluate our algorithm.

Algorithm

According to above graphs, we can see the relationship between the log distance and the RSS. Since there is a significant difference between outdoor and indoor environment, the first step of the algorithm should be check the environment and then we can decide which formula should be use.

For the second step, we can use the corresponding formula to calculate the log distance. The formula of the indoor environment is y=-0.0382x + 2.1097, the formula for the outdoor environment is y=0.0393x + 2.0952.

The third step is to calculate the distance based on the log distance.

Verification

We can randomly pick some data from the csv files to check our algorithm.

First, 30 is an RSS value collected in indoor environment, according to the indoor formula, the distance corresponding to 30 is about 9.1981 meters. Since 9.1981 meters is close to 9 meters, we can use the average mean and the standard deviation of 9 meters to check the result. The average mean of 9 meters is about 31.76 dBm, and the standard deviation is about 1.91 dBm. Therefore 30 is in the three standard deviation from the average mean, and the result is believable.

Then, assume 30 is an RSS value collected in outdoor environment, according to the outdoor formula, the distance according to 30 is about 8.2452 meters. Since 8.2452 is close to 8 meters, we can use the average mean and the standard deviation of 8 metes to check the result. The average mean of 8 meters is about 30.12 dBm and the standard deviation is about 0.7877 dBm. There fore 30 is in the three standard deviation from the average mean, and the result is believable.