COMP9336 – Mobile Data Networking

Lab 3

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Note:

- Due to the Driver issue or Hardware issue, the WIFI packets capture's Signal Strength are positive, already discuss this with Rui Li (Tutor).
- Due to the Driver issue or Hardware issue, the software cannot be able to obtain the SSID from the WIFI packet. I used "ip.dst" to filter out the packet that send to devices (My laptop).
- In this experiment, I use two chairs for two different devices to keep them at the same height. And measure the distance before performing the experiment to ensure accuracy. But I have to personally control the Receiver (laptop) to perform the packet capture that potentially blocks the antennas that may affect the result. But I made sure that the Receiver and Sender (Hotspot) is line-of-sight.

Task 1: RSS Data Capture:

According to the requirements, the Indoor and outdoor RSS data Capture must be Line-Of-Sight (LOS) and need to have a constant distance increment then we can be able to obtain the Signal Strength decrease as distance increases.

- **Indoor RSS Data Capture**

There are 10 RSS data captured indoors with a distance of 1 meter of each packet capture. This experiment is done in the hallway which may have less signal strength loss due to the electrical magnetic wave transmission within a narrow hallway (close area) compared to an open area. Further discussion will be shown below with the experiment outcome image. The ID is an abbreviation of Indoor, which means that "ID_1m.csv" means the packet capture is performed indoors with a distance of 1 meter.

Distance	Signal strength (dBm)
1	3419
2	4751
3	3878
4	4204
5	5763
6	7494
7	5325
8	5320
9	4957
10	8120

RSS data Capture Count
(For each Distance)

Distance	Signal strength (dBm)	log_Distance
1	32.420883	0.000000
2	31.911387	0.301030
3	32.370036	0.477121
4	32.986679	0.602060
5	29.667534	0.698970
6	29.530691	0.778151
7	31.999061	0.845098
8	27.446429	0.903090
9	28.838814	0.954243
10	26.788916	1.000000

RSS data average Signal Strength
(For each distance)

- **Outdoor RSS Data Capture**

There are 10 RSS data captured outdoor with a distance of 1 meter of each packet capture. This experiment is done in an open area. The WIFI signal is broadcast around the area with less reflection, unlike Indoor environments. The experience result will be provided below for a demonstration. The OD is an abbreviation of Outdoor, which means that "OD_1m.csv" means the packet capture is performed outdoor with a distance of 1 meter.

Distance	Signal strength (dBm)
1	6117
2	2591
3	4982
4	6847
5	6852
6	5649
7	5694
8	5245
9	5641
10	6976

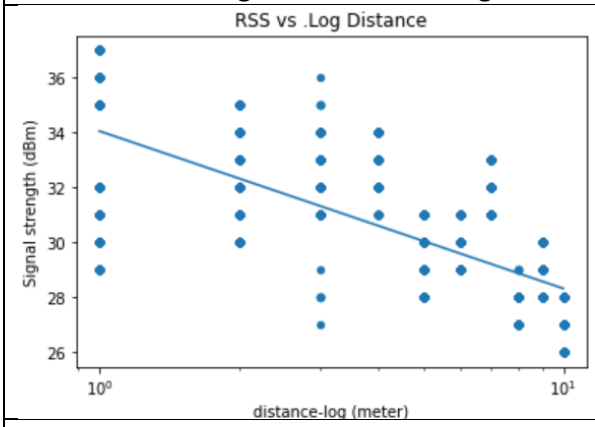
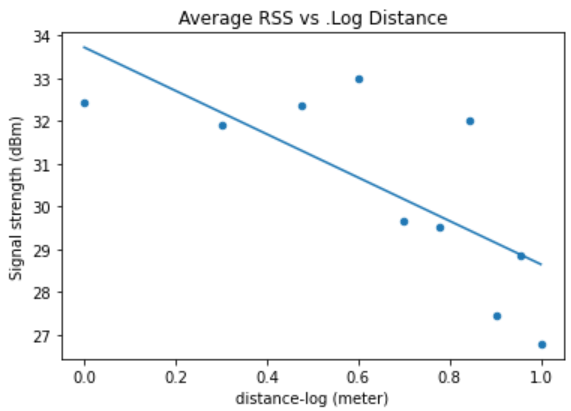
RSS data Capture Count
(For each Distance)

Distance	Signal strength (dBm)	log_Distance
1	35.027137	0.000000
2	33.009649	0.301030
3	33.466881	0.477121
4	29.993574	0.602060
5	28.578955	0.698970
6	27.532838	0.778151
7	25.417457	0.845098
8	20.127359	0.903090
9	25.214856	0.954243
10	23.968033	1.000000

RSS data average Signal Strength
(For each distance)

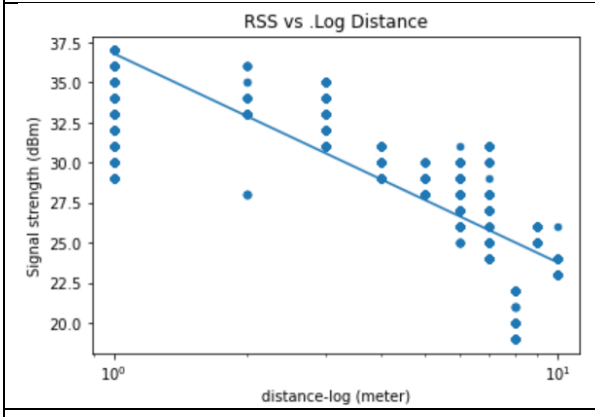
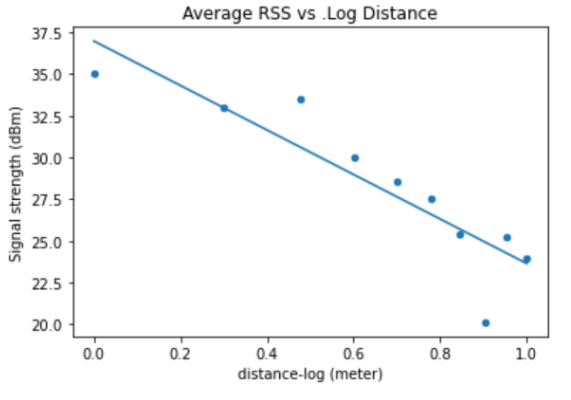
Task 2: Path Loss exponent estimation:

Indoor Raw RSS data against distance in *Log Scale* & Average RSS values per location.

Raw RSS data against distance in log scale	**Average RSS against distance in log scale**
	
y=-5.739175270590295x + 34.057628373908486	y=-5.0728790870984435x + 33.72373156846025

According to the experience result above with large numbers of RSS data, the signal strength value spread around the diagram instead of mainly located in one area. There are two reasons that I can think of. The first reason is that I use my phone as a hotspot, meanwhile, there are 2 to 3 WIFI within the area and a microwave (2.4GHz) that potentially affects the receiver to detect the signal strength. The second reason is that I block the antennas of the laptop which affect the detection. But overall, I use two chairs to maintain the same height of the two devices and measured the increment distance before the experiment in a result we can conclude that as the distance increase between the receiver and the Access Point, the signal strength will decrease.

Outdoor Raw RSS data against distance in *Log Scale* & Average RSS values per location.

Raw RSS data against distance in log scale	**Average RSS against distance in log scale**
	
y=-13.021784996375436x + 36.79979809403509	y=-13.328322558911717x + 36.976737634198464

According to the experiment result above, the values lay on the diagram close to my expectation. Even on the Raw RSS data diagram, the value may spread on multiple Signal strengths in one location (especially on 1m), but the overall trend shows that the signal strength decreases as the distance increase. The Average RSS data Diagram can clearly prove my thought.

By comparing both the indoor and outdoor diagrams and the equation of the straight line, we can see that the signal strength of the outdoor decrease rapidly compared to the Indoor. My guess is because in the Indoor area (Line-of-sight), the space is relatively small, and the electrical magnetic wave is trapped in a small space. But in the outdoor area, the electrical magnetic wave is free to broadcast around, without the supporting beamforming, the signal will be lost faster.