Lab 1 - Assignment 2 - Characterizing the variation of Received Signal Strength Indication with Distance

Group 12: Pallavi Santosh (psanthos), Lucas Bruder (lbruder), Jeremy Xiao (jiamingx)

INTRODUCTION

This report quantitatively describes the variation of received signal strength indication (RSSI) with increasing distance. The distance between two FireFly nodes was varied to determine the rate of falling off of signal strength with distance. One node continually transmits signals while the second node receives these signals. The RSSI at the receiving end is indicated on 4 on-board LEDs.

DATA

[Fix RSSI1 = 25dB and d1 = 1m]

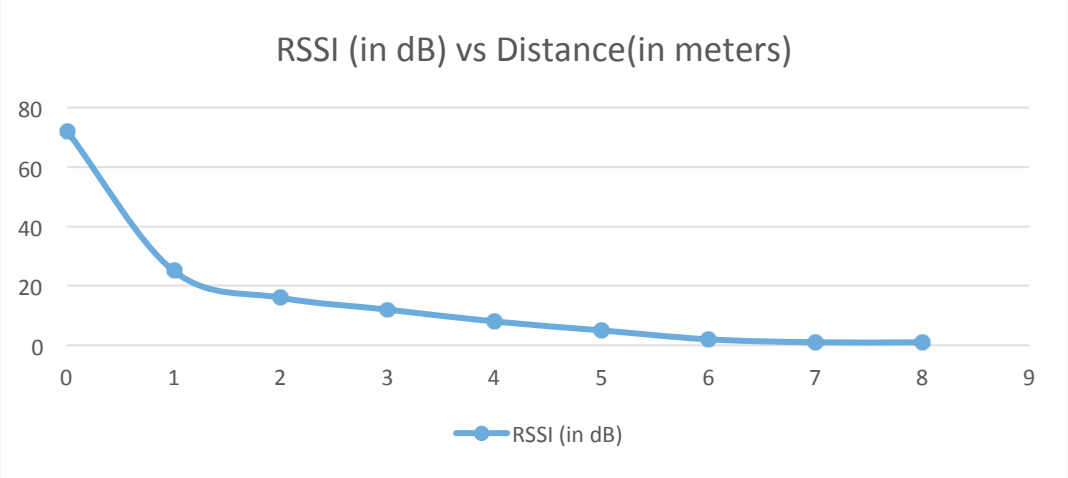
DISTANCE (in meters)	RSSI (in dB)	LED Status(R,G,O,B)	L2 – L1	10log(d2/d1)	n
0	72	1100	47	-infinity	0
1	25	0100	0	0	Undefined
2	16	0011	-9	3.01	-2.99
3	12	0010	-13	4.77	-2.72
4	8	0001	-17	6.02	-2.82
5	5	0001	-20	6.99	-2.86
6	2	0000	-23	7.78	-2.95
7	1	0000	-24	8.45	-2.84
8	1	0000	-24	9.03	-2.66

Mean value of path loss exponent = -2.83

Standard Deviation = 0.12

Variance = 0.014

GRAPHICAL REPRESENTATION



OBSERVATIONS

1. With increasing distance, the RSSI decreases exponentially.
2. With increasing distance, the number of packets that are lost also increases.

Jeremy Xiao, Lucas Bruder, and Pallavi Santosh
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Result & Analysis:

Part 1

For the first part with the following properties:

- Task 1 – Period: 1s, Priority: 1
- Task 2 – Period: 2s, Priority: 2

We get the following results from our python script:

-> Task 1 max response time = 0.601562808
-> Task 1 avg response time = 0.417007659797

-> Task 2 max response time = 0.299804841
-> Task 2 avg response time = 0.262902596727

Part 2

For the second part with the following properties:

- Task 1 – Period: 1s, Priority: 2
- Task 2 – Period: 2s, Priority: 1

We get the following results from our python script:

-> Task 1 max response time = 0.298828278
-> Task 1 avg response time = 0.263832341239

-> Task 2 max response time = 0.601562808
-> Task 2 avg response time = 0.564630970909

Discussion

As discussed in the Nano-RK Task Management Page (http://www.nanork.org/projects/nanork/wiki/Nrk-api-task-management), the higher the nrk_task_type.prio variable, the higher priority of the task. In a preemptive operating system like Nano-RK, tasks with higher priorities can preempt lower priority tasks. Therefore, a task with a higher priority can interrupt a task currently running in order to complete, contradictory to a cooperative operating system, which allows a task to complete before passing control to the next task.

Understanding the above, it's evident that our numbers above make sense. For part 1, task 2 has higher priority. Therefore, when 2 seconds has passed and it's time for task 2 to run, it will run immediately if task 1 isn't currently running, or will interrupt task 1, run task 2, then complete task 1. Since task 1 can be interrupted, it makes sense that it has a higher max and average response time. Task 2 has the higher priority, so it makes sense that its response time is less than task 1.

We can apply the same logic derived above to part 2. Task 1 has the higher priority, so its task reponse time is less than that of task 2.