EE/CprE/SE 491 WEEKLY REPORT 04

9/25/17 – 9/29/17

Group number: 11

Project title: RFRD Phase II

Client &/Advisor: Dr. Daji Qiao and Dr. Nathan Neihart

Team Members/Role:

Bailey Akers - Facilitator/RFRD Tag Design/Fabrication Engineer
Colin Sunderman - RFRD Tag Design/Fabrication Engineer
Lyle Bishop - Principal Antenna Engineer
Pengyu Que – Antenna/Power Harvesting Engineer
Nathan Mulbrook - RFRD Wireless Communications Engineer

o Past week accomplishments

Team Member 1: Bailey Akers
Developed capacitance measuring relaxation oscillator design using IEEE article. Gave presentation on using relaxation oscillators to measure capacitance. Supported with Friis equation.

Team Member 2: Colin Sunderman
Developed capacitance measuring relaxation oscillator design using IEEE article. Gave presentation on using relaxation oscillators to measure capacitance.

Team Member 3: Pengyu Qu
Friis equation research.

Team Member 4: Lyle Bishop
Friis equation research. Troubleshooted Friis Equation. Presented Friis Equation results.

Team Member 5: Nathan Mulbrook
RFRD communication protocol research and presentation.

o Weekly Summary

9/27 - Colin Sunderman and Bailey Akers met to discuss relaxation oscillator design. We designed a spreadsheet to calculate the minimum gain bandwidth product, minimum slew rate, and maximum time response delay for op amps we are considering for our design. We ran into a discrepancy with the gain bandwidth equation.
We decided to finish the spreadsheet and present on our results on 9/29.

9/28 - Lyle Bishop researched antenna equations for near field approximation.

9/28 - Nathan Mulbrook researched using very low power microcontrollers to implement the wireless communications between reader and tag. He also researched a design called the WISP. This WISP design created an antenna/tag combo that can be read from a commercial RFRD reader.

9/29 - Met with advisors Dr. Daji Qiao and Dr. Nathan Neihart.

- Nathan Mulbrook discussed ideas on how to implement the RFRD reader/tag wireless interface using a very low power microcontroller. He also discussed the WISP.
    - Dr. Neihart and Dr. Qiao told Nathan to present on specific microcontrollers for the next week. They suggested that Bailey and Colin research and present on using microcontrollers for capacitance sensing for next week.
- Lyle Bishop and Pengyu Qu weren't able to present material.
- Colin Sunderman and Bailey Akers presented on the spreadsheet they developed to determine if op amps will fit design criteria for relaxation oscillator. They expressed concerns with the derivations that were developed for the gain bandwidth product in the IEEE paper that was referenced in the past week.
    - After discussion, Dr. Neihart suggested on looking at the equations again to determine if there was any unit errors or factors of 10 that were incorrect in the gain-bandwidth product equation.

This Week:

NAME	Individual Contributions Summary	Hours This Week	Hours Cumulative
Bailey Akers	Designed relaxation oscillator spreadsheet. Presented on results.	5	23
Colin Sunderman	Designed relaxation oscillator spreadsheet. Presented on results.	5	21
Pengyu Qu		4	16
Lyle Bishop	Antenna research.	4	17
Nathan Mulbrook	Microcontroller and WISP research. Presented.	4	17

***Details of weekly contributions are noted in above Weekly Summary section.**

o Comments and extended discussion

o Plan for coming week

Goals for next week's advisor meeting (10/6): Details also listed in Weekly Summary section.
Capacitive Sensing Circuit Design: Colin Sunderman and Bailey Akers

- Dr. Neihart and Dr. Qiao suggested for Colin and Bailey to research and develop a presentation about using low power microcontrollers for capacitive sensing.
- Look into spreadsheet derivations and conclude if there was any visible error in the gain-bandwidth calculations. Present on findings.

Antenna Design: Pengyu Qu and Lyle Bishop

- Dr. Neihart suggested for Lyle and Pengyu to research alternate methods to calculate max power transmitted/received wirelessly from an antenna.

Communications, Tx/Rx Module: Nathan Mulbrook

- Dr. Neihart suggested Nathan look further into using low power microcontrollers for this design. He asked to present on specific chips that we can use and what the rated power is for each chip.

o Team Difficulties

The main difficulties were with the gain-bandwidth product calculations. We weren't able to present this week on antenna progress due to a hospital visit.

Grading criteria

Each weekly report is worth 10 points. Scores will be awarded as follows:

• 8 – 10: Progress for your project seems to be suitable. Documentation and hours reported by team members are adequate.

• 6 – 8: There is scope of improvement both in your report and your project progress. Can consult with instructor/TA after class for further inputs.

• < 6: Please talk to instructors/TA after class hours about any difficulties that you/your team is facing.