

EE/CprE/SE/CYBE 491 WEEKLY REPORT 04

2/21/2022 - 2/27/2022

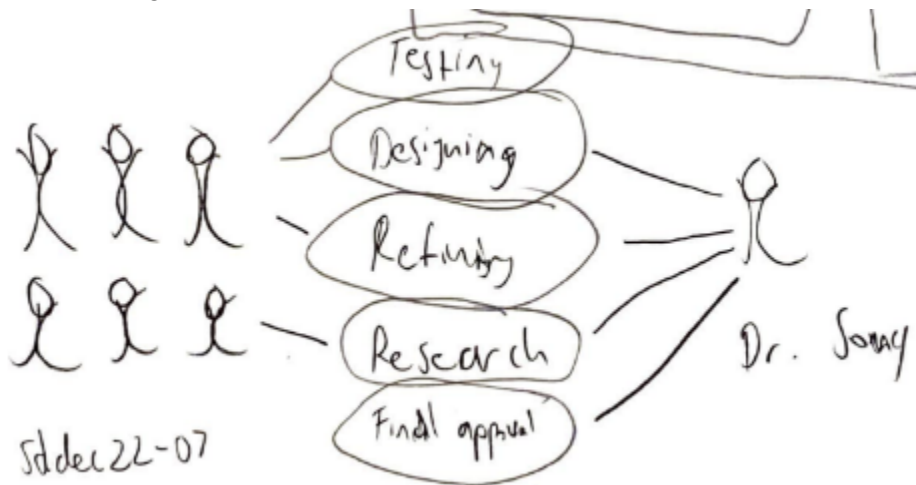
Group: 07

Project: Wireless Energy Harvesting

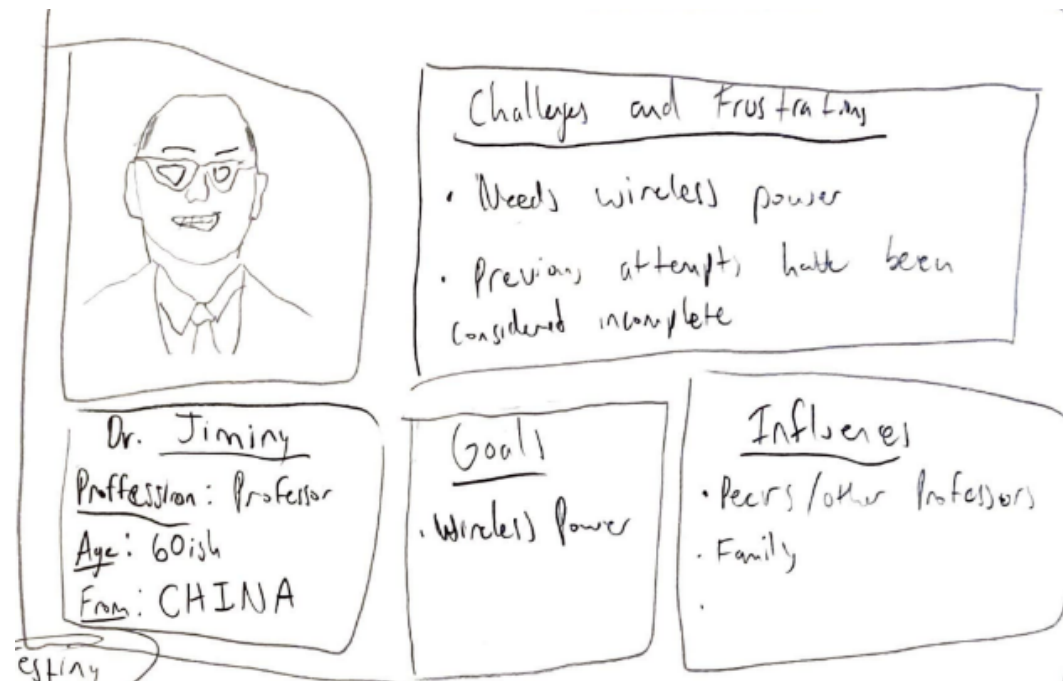
Client: Dr. Jiming Song

Team: Benjamin Brown, Christopher Marting, Greg Schmitt, Jacob Walczak, Sam Runkel, Tanner Garity

Use Case Diagram:



Persona Profile:



Weekly Summary:

For this week during our team meeting we went over the research we did in the previous week. We discussed how antennas send signals and how they receive signals. The S-band has a range of frequencies ranging from 2-4 GHz. We discussed what would be the best antenna to use for our first prototypes. We decided that dipole antennas would be the best starting antenna to work with. Additionally, we went over what evaluation board we wanted to buy for our first prototype. We decided to go with the board that Dr. Song provided. It is a fairly simple evaluation board that is cheap and easy to use for our first attempt at converting radio waves to alternating current. Later on we can discuss other evaluation boards that are more complex to further our project in the testing phase and final project. This first one is perfect for a prototype. Lastly, we individually researched on how exactly we convert radio frequencies to alternating current. And how we can apply this procedure to our project.

Weekly Accomplishments:

Benjamin Brown - Researched on how to convert radio frequency to alternating current. The conversion from radio frequencies to alternating current can be done when conductors absorb the radio frequency and create an electrical current that has the same frequency as the radio waves. Then the alternating current is passed to a rectifier which converts the alternating current to a direct current. This process is known as a rectenna (rectifying antenna). A rectenna can be used to convert from RF energy to usable DC electrical energy.

Christopher Marting - Further familiarized myself with yagi-uda antennas as that will most likely be our best bet to get more DC power from wireless energy. I also did some research on microstrip antennas in case we also wanted to try our hand at using that type of antenna.

Sam Runkel - Determined that yagi-uda array is our best bet to get any amount of wireless energy. We will initially start with a dipole antenna because they are cheap and easy to get but down the line we will need to design a yagi-uda antenna because it will allow us to use the constructive interference from the reflectors to greatly increase the overall gain.

Jacob Walczak - Refamiliarized myself with Cadence Virtuoso. We might be using this software to design a new circuit board after the testing board. I also researched another design software in the case that we do not want to use Cadence Virtuoso. The best free software I could find was KiCad EDA.

Tanner Garity- Further Researched dipole antenna and multiband signal processing. Viewed comparable RF receiver boards to the RFD102A-TB such as the Powercast's WSN-EVAL-01 and the P2110 evaluation board.

Greg Schmitt - Discussed potential test boards with the team during our weekly meeting. The pros and cons of singular (P1110-EVB) vs multiple (P21XXCSR-EVB) inputs, form factor and pricing were all discussed, but no final decision was made.

Plans for upcoming week:

1. Meet with Dr. Song to discuss how the project is coming along and determine which board we should use
2. Order test board through ETG
3. Begin simulation work using researched softwares

Individual contributions:

Name	Individual Contributions	Hours this week	Hours cumulative
Benjamin Brown	<ul style="list-style-type: none">● Researched radio frequency to alternating current - 1 hour● Discussed with team best antenna type to use, Discussed the evaluation board we want to buy, Discussed how antennas send signals and how they receive signals - 1.5 hours	2.5	11.5
Jacob Walczak	<ul style="list-style-type: none">● Explained basic antenna theory to the team, discussed the evaluation board, and discussed which type of antennas would work best - 1 hr● Refamiliarized myself with Cadence Virtuoso - 1 hr● Researched other design software - .5 hrs	2.5	11.5
Greg Schmitt	<ul style="list-style-type: none">● Continued research into testboards that would be compatible for energy harvesting in our application. This list is limited as the antenna interface is relatively uncommon on pre-made boards. - 1 hr● Discussed with team potential testboards with differing feature sets. Some boards offer multiple inputs that could be useful for comparing	2	11

	antennas to each other, while others focus on simplicity with a small form factor and minimal components - 1 hr		
Christopher Marting	<ul style="list-style-type: none"> • Researched yagi-uda and microstrip antennas - 1.5 hrs • Discussed antennas, test boards, and the evaluation board with the team - 1 hr 	2.5	11.5
Sam Runkel	<ul style="list-style-type: none"> • Discussed potential boards to purchase and use for testing. We discussed the board Dr. Song found which is the cheapest option. We also discussed a few other boards which have more capability such as multiple antennas but cost much more. -1hr • Researched Yagi-Uda array and determined that it will likely be what we design because we are able to get a larger gain from the constructive interference of its reflectors. -2hrs 	3	12
Tanner Garity	<ul style="list-style-type: none"> • Researched further into multiband rectennas.. - 1.0 hrs • Reviewed the compatibility of RFD102A-TB to the WSN-EVAL-01 and the P2110 in order to boost performance- 1 hrs. 	2	12