

EE/CprE/SE 491 - sddec22-13

Simultaneous Call Transmission (SCT)

Week 6

March 7th, 2022 - March 13th, 2022

Client: Collins Aerospace

Faculty Advisor: Dr. Andrew Bolstad

Team Members

- Hani El-Zein - *Digital Signal Processing Lead and Research*
- Sullivan Jahnke - *Project Manager, Lead Communicator, and Machine Learning Lead*
- Tyler Mork - *Reports, Communicator, Co-Webmaster, and Communication Systems Co-Lead*
- Json Rangel - *Reports, Communicator, Co-Webmaster, and Communication Systems Co-Lead*
- Austin Rognes - *Research, MATLAB Lead, and Co-Webmaster*

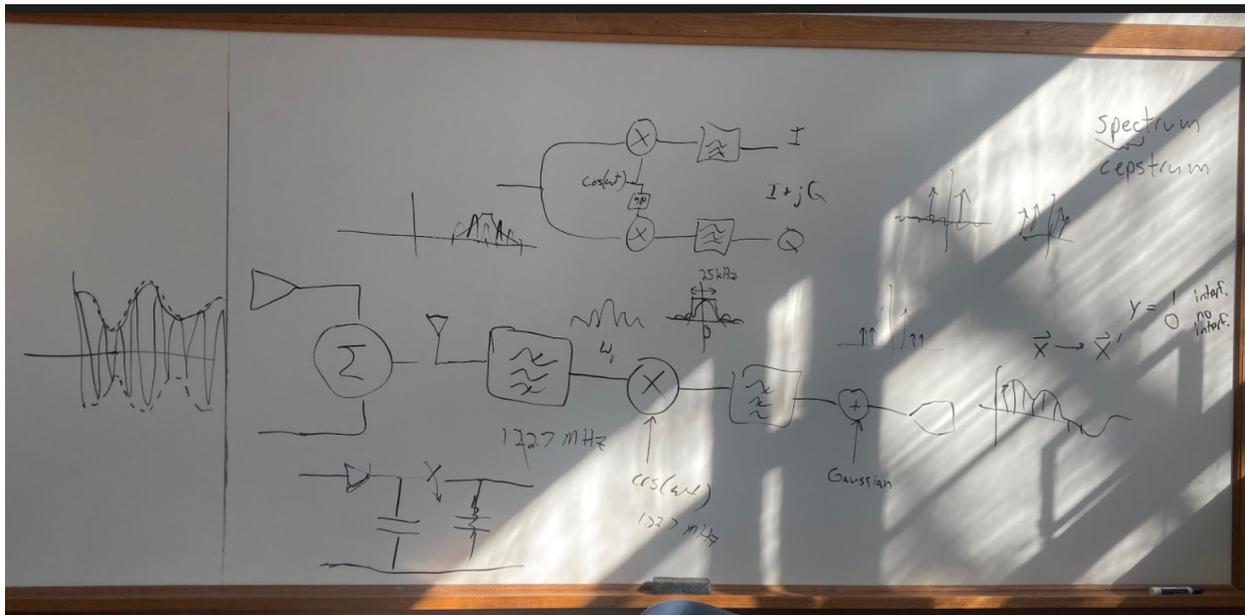
Week 6 Summary

During this week, our group attended another meeting with Dr. Bolstad where we gained some insight into aspects of the project we can improve. Dr. Bolstad mentioned that we should utilize FFT or Fast Fourier Transform to obtain the frequency spectrum components needed to obtain peak values for the SCT event. These peak values are expected to be below a certain threshold on the y-axis. The received signal will be filtered by RF (radio frequency) passband, run through a mixer where it is multiplied with a carrier frequency signal again and then low pass filtered to obtain the demodulated signal.

This week we also discussed some of our next steps with Collins. We walked through some of the work done on our simulation, and when talking about what we set our carrier frequency to, Marty mentioned that by setting our carrier signal to DC baseband, it allows us to make the carrier frequency 0, which should make the process a little simpler, but poses some potential issues as we were building our simulation model on the assumption that there would be modulation with a carrier (DSB-LC).

Past Week Accomplishments

This week we improved some aspects of our simulation and discussed what necessary changes are needed in the future. Dr. Bolstad viewed our Simulink simulation system and gave us some suggested changes and how to fit it into generating training data for our machine learning algorithm.



Notes taken from the meeting with Dr. Bolstad

We also got some more detailed information on machine learning from the Iowa State class machine learning (EE 425) and by discovering open lectures files on machine learning from Stanford University. This will be a big step for us in the creation of our machine learning algorithm, as it gives us more resources. From a combination of our meeting with Dr. Bolstad, and the new info from Stanford University, we now have a plan for how we shall implement it through neural networks.

Tyler was also able to implement some of the suggested changes into our Simulink system. This takes into account some of the changes Dr. Bolstad suggested, such as removing a sine wave signal unnecessary to the system, as well as some changes requested by Collins. Collins revealed to us that we should be working in DC baseband, meaning no modulation.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Hani El-Zein	Practice Machine Learning implementation in Matlab, more research	3	17.5
Sullivan Jahnke	More Python machine learning research and practice.	2	18
Tyler Mork	Introducing DC baseband into Simulink simulation	5	21.5
Json Rangel	Gathered machine learning lectures from Stanford for team, baseband research, and additional machine learning research	3.5	22.5
Austin Rognes	machine learning with python	3	18

Plans for Upcoming Week

This next week is Spring Break at the University, so we will all take time to breathe for a bit. However, we will not be totally sedentary during this upcoming week. We all will be doing further research into baseband and supervised machine learning, albeit at a more relaxed pace compared to the prior weeks.

In between now and when Spring Break ends, Sullivan and Austin will work together on sharing information on python machine learning to build the rough draft of the algorithm. Along with finding some ways to transform and filter the sound waves to create cleaner data for the ML algorithm to learn from.

We also plan to eventually convert our python algorithm into a block function in Simulink, to be added to the simulation. We will also start to take into consideration reflections, and doppler effects, and how they will be incorporated into the project.