

Project Plan:

For our project we would like to explain how WiFi networks work, test different WiFi home networks, and establish the factors that contribute to both poor and excellent reception to the end user devices. Things like faulty microwaves, cement walls, and other variables can disrupt the user's connection to their wireless router. Both team members, Zach and Tyler, will test out their own home's wireless networks with various iOS apps that are available to test the speed and signal strength of home wireless networks. To start the project, the team plans to do extensive research on WiFi's functionality, and the variables that contribute to its signal strength. Devices like WiFi extenders will also be covered as a means to solve poor WiFi reception, as well as the geometry of the home, and the materials the structure is made of. The team will be using applications like MATLAB for analysis, GNUradio to simulate a WiFi channel, and will construct a model channel from an optics type simulator. We hope to compare the model channel's results with the real-world tests that both team members will conduct in their homes, and explain the anomalies that contributed to their reception strength. On top of this, some basis will be made to be able to predict which parts of a home will have better reception than others. Besides testing in our own homes, the team would like to be able to explain how a noisy environment, such as an apartment complex, handles all the signal traffic that occurs when multiple wireless networks are transmitting and receiving to a large number of end user devices. So discussing the difference in potential wireless setups will be covered as well. These topics, tests, and results will all be covered in the Project 5 presentation and report due at the end of the semester in December.

Week 1

- find wifi weak spots in an actual setting, my house, and Tyler's house
 - Use phone app to test signal strength throughout house
 - Document where weak signals are and list parameters
 - Distance for modem (source of signal)
 - Physical factors of weak location (multiple walls/floors away from source, inside or outside the house, nearby devices that can cause interference)
- Preliminary research for Wifi in general
 - How does the channel work?
 - The difference in types (2.4 GHz Vs. 5 GHz) and Bandwidth for each channel
 - How do wifi extenders work?

Week 2

- Research and learn simulating software
 - Learn GNURadio interface

- Simulate a wifi channel
- How to choose parameter (number of scatters, phase, delays)
- Geometrical simulator?
 - Find and use a geometrical optics/physical optics simulator
 - Used to simulate a physical space in a model, predict unknown/future layouts to predict signals strengths

Week 3

- Find connection to the cause of weak signals from physical testing and simulations
 - Use the variables in the physical location to the model and see the effect it has on the signal
 - Vary single variables at a time(distance, objects in the way, other devices) and see which have greater effect
- Use the connections to be able to form predictions
 - With a given new setting, use the variables about the location to predict if there will be a weak or good signal.

Week 4

- Test connections using a third physical Wifi location
 - Predicted base of the variables of different locations if there will be a weak or strong signal
 - Model the location and simulate the channel to support the prediction made based on physical variables
 - Physically measure signal and compare to the predictions and simulated model

Week 5

- Write up a final draft of the project
 - Show the connects we make with physical locations and simulations to why signals become weak in wifi
 - List the predictions we made based on any given location on where signal loss would be
 - Results of the predictions and the actual measurement of a new location