Writeup for:
1) Test bed for a wireless network on small UAVs (paper 25)
2) Design and implementation of an underlay control channel for cognitive radios (paper 26)

1) This paper was a write-up on testbed for UAV command and control. The most useful parts of this paper deal with protocols and the hardware/software interfaces. The main protocol used for command and control was standard WiFi. This paper would be a good introduction into controlling the UAVs using WiFi instead of the more proprietary Zigbee/AODV implementation we are currently considering.

2) This paper considers the combination of both cognitive radio algorithms and filter bank multicarrier spread spectrum. The most interesting parts of this paper is how the two powerful algorithms are used concurrently to reduce radio interference not only to itself, but to other radio communications. Also, this paper was written in Idaho Falls under the same situations we face during this doctorate research process. Personally, I believe this would be a good starting point to really tackle interference and bandwidth as it appears the results are promising and the hardware is affordable.

Writeup for:
1) Design and Impl. of an Underlay Control Channel for NC-OFDM-based Networks (paper 27)
2) A Tutorial on Interference Alignment (paper 19)

1) This paper discusses improvements to Orthogonal Frequency Division Multiplexing (OFDM). The main modification of OFDM is the usage of non-contiguous carrier frequencies, hence the “NC” in “NC-OFDM.” Basically, by using a non-contiguous set of carrier frequencies, the authors of the paper are able to send control and data information in a situation in which large swaths of the spectrum are reserved. Also, the authors of this paper were able to lower the amount of power necessary to transmit on the carriers. Basically, cognitive technologies mixed with low-power OFDM carriers. Interesting tools used: ORBIT testbed and GNU Radio.

2) This paper, while intended for MIMO interference alignment, actually does a good job explaining the topics of interference and noise in the general sense. To begin, there is a discussion on the differences between noise and interference. Interference is the unintended consequence of multiple parties using the same “interference channel.” Most radio algorithms are “greedy” in the sense that a communication pair tend to want to control the entire channel for themselves. This leads to other users of the channel having to deal with high interference levels. The greater the interference, the more complex the algorithms required to clean up communications. The paper explains that a small amount of interference can be “filtered” or “decoded.” But there is no algorithmic solution for massive interference.

While orthogonalizing MIMO communications will not be part of my dissertation, it’s interesting to read about how it’s done and the “degrees of freedom” which must be considered. Basically, the more moving parts in the interference channel, the more variables (“degrees of freedom”) must be computed in order to reduce interference and noise. The topic of “Interference Alignment” is starting to become more understandable to me and this paper helps in that matter. The final topic touched by this tutorial is the idea that networks can either help eachother out, or guess at what everyone else is doing in order to reduce interference. If, for example, all the senders have network state info, they can coordinate their usage of the interference channels in time and space. Thus, the more state info, the less degrees of freedom in the system. Very good paper.

Writeup for:

1) Single Antenna Interference Cancellation Algorithm based on lattice Reduction (paper 24)

This paper attempts to solve interference using oversampling on a single attenna. By over-sampling, the researchers are able to create virtual MIMO signals. This signals are then used to create a lattice of signal vectors which can then be used to cancel eachother out. Basically, this to me feels like something similar to OFDM.

The authors claim that this method is significantly less complex then traditional MIMO algorithms and the complexity scales quadratically depending on channel length. I believe they also claim that modulation techniques used do not increase complexity but I have to read deeper into the paper to understand exactly what they mean. If anything, this paper does a good job surveying many phase shifting procedures common to SAIC reductions.

SIDE PROJECT: AODV Links

The following are excellent AODV introductions:

(The main paper)
https://www.ietf.org/rfc/rfc3561.txt

(research via white paper)
https://www.cs.cornell.edu/people/egs/615/aodv.pdf

(classroom notes)
http://www.cs.jhu.edu/~cs647/aodv.pdf

(great video on AODV trace)
https://youtu.be/wlyibjrHhrs