Principles of wireless communications

Lab 1

In this assignment, you will work in pairs to implement a basic digital communications link using the universal software defined radio peripheral (USRP). Your link should operate over a distance of at least 2 feet, and support a data rate of 32kb/s, with an error rate of less than 10^{-3}.

The following are the steps you should take in implementing your system

1. Install the UHD driver http://files.ettus.com/manual/page_install.html and verify that you can successfully transmit and receive signals. The simplest way to do this is to use the tx_samples_from_file and rx_samples_from_file. These utilities are included with the UHD driver and transmit and receive complex samples through the USRP from and to binary files. The binary files are saved as alternating real and imaginary values in a data format that you specify, e.g. float32. These files can be found in /usr/lib/uhd/examples
2. Transmit data at a low-rate data (large symbol period, 1 bit/symbol). Visualize effects of carrier frequency offsets. Research methods for timing synchronization.
3. Implement a low data rate communications system.
4. Optimize the communications system to improve data rate.

Deliverable

Please submit a report on your assignment that contains a block diagram of your system, plots of transmitted and received signals (before and after timing synchronization), a complete description of the timing synchronization algorithm you used and your achieved data rate.

The writeup should take 3-4 pages and is due electronically (by e-mail to sgovind@olin.edu) by February 9.