

Wednesday, November 4, 2009

4:00–4:50 p.m.

SAS 2229

# Finding Message in the Noise: Mathematics of Direct-Sequence Spread Spectrum

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Digital signal processing is a lively area of engineering that relies on various mathematical theories and methods to develop and improve telecommunications. The basic problem is to accurately transmit information from point A to point B. Spread spectrum is one of many approaches used to modify the signal before sending it through the transmission medium (wires, air, etc). A spread spectrum technique called direct-sequence spread spectrum (DSSS) multiplies the data signal by a "noise" signal (called spread code), creating a low power signal with wide bandwidth. The modified signal is hard to detect and jam which makes DSSS an appealing technique used by the military. DSSS also appears in "3G" wireless technology, where it allows different callers to use the same signal frequencies at the same time. However, DSSS technology comes with challenges including synchronization (aligning the phase of the received signal). We will examine the basics of the digital signal processing, direct-sequence spread spectrum, and an innovative method (based on linear algebra) for solving the problem of synchronization and even blind despreading (extracting the data signal without knowing the spread code).

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