BI-CO MATHEMATICS COLLOQUIUM

Sarah Kate Wilson (BMC '79)
Santa Clara University

"Blinded by the Light: Optical Wireless Communications"

Friday, December 6, 2013*

Talk at 3:00* – Park 338
Tea at 2:30 – Park 355, Math Lounge

*Please note the special date and time

Abstract:

We tap away at phones, iPads and laptops on planes, on busses and in living rooms. The most common medium for transmitting cat videos and selfies is radio waves. While radio waves work well, they have the following issues: the amount of data that can be sent on a radio link is limited and radio waves are not confined to a given room. Have you ever been in a common area, happily downloading a video, when another person in the room fires up their iPad and sucks away your Internet connection? One way to solve the problem of slow Internet access is to add more avenues for transmitting data, such as room lighting. This technology is energy efficient as the light can be used for both illumination and information. In addition, data transmitted by light cannot go through walls, so your Internet secrets are secure, at least from your neighbors.

The actual transmission of data involves choosing appropriate waveforms to represent messages. For example, a cosine of certain frequency could represent a 0, while a cosine of a different frequency can represent a 1. So your smart phone has to recognize what waveform was transmitted. However, your phone's job is complicated by the fact that transmitted signals never seem to look like they should when they arrive at the receiver. They experience dispersion, which is modeled as convolutions, a mapping from one function space to another. In addition, they are corrupted by rogue electrons called noise. Noise is modeled as a Gaussian random process. This talk will give an introduction to some of these transmission methods and then focus on optical wireless communications. A proposed method for sending information via light is asymmetrically-clipped optical Orthogonal Frequency Division Multiplexing (ACO-OFDM). Some recent results for ACO-OFDM are presented and discussed.

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