

## EE Department Seminars

July 22, 2013, Monday, 14:00

**Yorgo I Stefanopoulos Meeting Lounge**

### **POINTING, ACQUISITION, TRACKING, AND RECONFIGURATION IN DIRECTIONAL WIRELESS NETWORKS**

*Professor Christopher C. Davis*

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High capacity directional wireless communications networks are an active area of research because of their Gb/s or greater data rates over link lengths of many kilometers, providing fiber-like networks through the air, with physical security. Their high data-rates arise partly from their very high carrier frequencies (>60GHz for RF, and ~1550nm for free-space optical (FSO)) and partly because of their very narrow beamwidths. In this talk I will discuss the challenges of pointing, acquisition, and tracking in these networks in which a narrow laser beams or radiofrequency beams from antennas must be aimed precisely between nodes in the network. How the node platforms initially point at a target, acquire the signal, and then stay locked on to the signal is known as pointing, acquisition, and tracking (PAT). Approaches for PAT in both RF and FSO have some similarities, but require overall divergent solutions, especially if the platforms are moving. In particular, approaches for GPS or beacon based pointing, types of acquisition scans, totally blind acquisition possibilities, and different tracking techniques will be discussed. Directional wireless networks can be optimized by reconfiguration where the topology of the network is changed in response to traffic demands, link degradations, or mobility of nodes.

#### **Short Bio:**

**Christopher C. Davis** is Minta Martin Professor of Engineering and Professor of Electrical and Computer Engineering at the University of Maryland, College Park. He received the B.A. degree (with Honors) in Natural Sciences from the University of Cambridge in 1965, the M.A. degree from the University of Cambridge in 1970, and the Ph.D. degree in Physics from the University of Manchester in 1970. From 1973-1975 he was an Instructor/Research Associate at Cornell University, and from 1982-83 was a Senior Visiting Fellow at the University of Cambridge. He has been a recipient of the following Honors and Awards: University of Maryland Distinguished Scholar-Teacher, 1989-90; Fellow of the Institute of Physics, 1989; AT&T/ASEE Award for Excellence in Engineering Education, 1990; Fellow of the IEEE, 1993; Invention of the Year Award in Information Technology, University of Maryland, 2000. Professor Davis is the author of the widely used text "Lasers and Electro-Optics," soon to be published in its second edition by Cambridge University Press, and co-author with Jack Moore and Mike Coplan of the best-selling text "Building Scientific Apparatus," now in its 4th edition published by Cambridge University Press. He is also author or co-author of 14 chapters in books, co-editor of seven volumes of SPIE Proceedings, author or co-author of 215 refereed journal articles and over 295 conference papers, and is the holder of twelve awarded and several pending patents. He is Conference co-Chair of the SPIE Free Space Laser Communications Conference, and is a frequently invited lecturer both nationally and internationally. He has served as a scientific consultant to several US Government agencies and industry. He is a member of the IEEE Standards Coordinating Committee SCC-34 SC2, which deals with RF exposure from wireless devices. His currently active research includes optical and RF directional wireless, real-time advanced surveillance systems with "event" detection, the optical properties of nanostructures where surface plasmons can be excited, laser interferometry, dielectrometry, fiber sensors and biosensors, optical trace detection, atmospheric turbulence, optical communication systems and devices, and studies of the biological effects of non-ionizing radiation.