# ELECTRICAL & COMPUTER ENGINEERING SEMINAR

# "A Wireless Local Positioning System for Mobile Monitoring and Tracking"

by

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### Abstract & Biography

**Abstract.** Wireless systems capable of positioning mobiles remotely in complex mobile environments have emerging applications in homeland security, law enforcement, defense command and control, multi-robot coordination, and traffic alert such as vehicle-to-vehicle and vehicle-to-pedestrian collision avoidance. These systems promise to dramatically reduce the society's vulnerabilities to catastrophic events and improve the quality of life. The present talk presents a novel wireless local positioning system (WLPS).

The proposed WLPS has two main components: 1) a base station deployed in a mobile (e.g., vehicles, robots or handhelds) that serves as a *Dynamic Base Station* (*DBS*); and 2) a transponder (TRX) installed in wireless mobile handhelds, robots and vehicles that act as *Active Targets*. Unique identification (ID) codes are assigned to each TRX. DBS transmits periodic ID request (IDR) signals in its coverage area. All TRXes reply to IDR signals as soon as they detect them. Depending on applications, each mobile in the coverage field may be equipped with only DBS, only TRX, or both. The DBS finds the position of each TRX via time-of-arrival (TOA) and direction-of-arrival (DOA) estimation. Such a framework offers attractive features: (i) high probability-of-detection performance via active as opposed to passive targets, (ii) low-cost TRX made of simple transceivers, and, (iii) infrastructure-less operation via dynamic as opposed to static base stations.

This talk briefly reviews the positioning systems, and motivates WLPS. The WLPS structure, its limitations, and the proposed solutions to those limitations will be analyzed and presented. The probability-of-detection performance of WLPS implemented via direct sequence code division multiple access (DS-CDMA) and beam forming will be analyzed. Finally, applications and current and future activities on the WLPS will be discussed.

**Biographical Sketch.** *Dr. Seyed A. Zekavat* received his Ph.D. from Colorado State University, Fort Collins, Colorado in 2002. He joined Michigan Technological University in 2002. He has published more than 60 journal and conference papers, and has co-authored two books and invited chapters published by Kluwer Academic Publishers and Springer. His research interests are in wireless communications at the physical layer, dynamic spectrum allocation methods, radar theory, blind separation and beam forming techniques, feature extraction, and neural networks.

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