

*Computer Science & Electrical Engineering Seminar Series*

**Sensor Data Fusion and Integration: Applications and Simulation Testbed**

**Dr. M. Farooq, Larus Technologies**

**Friday, Fri Oct 31<sup>st</sup>, 2008 in FH 557 at 2:00 pm**

Sensor integration and registration are prerequisites for exploiting the inherent advantages of multi-sensory systems over single sensor systems. By using multiple sensors to observe an object, we can obtain multiple viewpoints, extend coverage both spatially and temporally, reduce the ambiguity and obtain more precise estimates of object kinematics than is possible with the best individual sensor. Engineers can replace a single expensive sensor with a network of several sensors in a tracking scenario or employ a variety of sensors to construct a complete view of a robot's environment. From a military point of view, multiple sensors provide diverse information, which can be used by decision-makers to derive an appropriate response to perceived threats. As the number of threats or objects being monitored increases, the difficulty in maintaining an accurate picture of the environment grows exponentially. As such, the need to develop state-of-the-art techniques capable of functioning in a cluttered, dynamic environment containing the objects of interest is of fundamental importance to enhancing the survivability and usefulness of a multi-sensory system. The development and the design of a Distributed Multi-Sensory environment must be based on a solid understanding of the theoretical foundations and should yield the required performance in a control simulation environment. To this end, the presentation will provide an overview of the integration and registration issues in a distributed sensory environment and point out some of the outstanding problems that need to be addressed and the challenges that still remain. Besides discussing conventional techniques to resolve sensor integration and registration issues, non-conventional approaches such as Neural Networks and Fuzzy Logic based methods will also be explored. The formulation of the problem in light of these techniques will be discussed in detail. In addition, the design of a versatile simulation environment to evaluate sensor integration techniques will be presented and the benefits of fusing kinematics and non-kinematics information will be demonstrated through simulation results.

**Mohamad Farooq, Ph.D.**



M. Farooq received his BSc degree from Punjab Engineering College, Chandigarh, India, M Tech degree from the Indian Institute of Technology, Delhi, India and his PhD from the University of New Brunswick, Canada, all in Electrical Engineering. In March 1980, he joined the Royal Military College of Canada (RMC), Kingston, Ontario, where he served as a professor in the Department of Electrical and Computer Engineering and was instrumental in establishing a research group on Multisensor Multitarget Tracking. He held a number of research contracts on various aspects on Target Tracking, Robotics, Motor Control and Drives and Sensor Data Fusion and has published numerous technical papers.

Subsequently, he joined Larus Technologies, Ottawa, Canada as a Scientific Consultant. Dr Farooq has had several productive sabbaticals. He

developed a testbed for "Network-Centric Multiplatform Surveillance System for Precision Engagement," and performed research in the areas of Target Tracking and Sensor Data Fusion with applications to the Swedish's coastal sonar Defense system. During his Sabbatical in 1991-1992 at Thomson-CSF Canada, he was instrumental in securing funding for a number of research projects in the area of Multisensor Multitarget Tracking and successfully.

He has organized and served as technical chair on a number of conferences on Applications of Advance Technologies to Canadian Forces, and served as a Co-Editor of the resulting Conference Proceedings. He continues to be a member of the Steering Committee of the Midwest Symposium on Circuits and Systems. He has served on a number of Conference Program Committees such as the Conference Editorial Board of the IEEE Control Society, the IEEE Industrial Electronics Conferences, the International Society for Optical Engineering (SPIE Conferences), and Fusion. He was nominated to the first Board of Directors of the International Society of Information Fusion and appointed to the Editorial Board of the International Journal on Multisensor Information Fusion. He has presented a number of invited lectures on Sensor Fusion Technology and its applications and has consulted for several companies in the defense industry.