1. **Title:** Multisensor-Multitarget Tracker/Fusion Engine Development and Performance Evaluation for Realistic Scenarios

2. **Duration:** Half-day

3. **Intended Audience:** The proposed three-hour tutorial will be valuable to students, researchers and practicing engineers at universities, government research labs and companies who are interested in developing tracking and fusion solutions for real-world surveillance problems. This tutorial, which will be of high interest to a vast majority of participants, will complement (and follow-up on) the one typically presented by Prof Yaakov Bar-Shalom at Fusion conference where he focuses on theory.

4. **Description:**
While numerous tracking and fusion algorithms are available in the literature, their implementation and application on real-world problems are still challenging. Since new algorithms continue to emerge, rapidly prototyping them, developing for production and evaluating them on real-world (or realistic) problems efficiently are also essential. In addition to reviewing state-of-the-art tracking algorithms, this tutorial will focus on a number of realistic multisensor-multitarget tracking problems, simulation of large-scale tracking scenarios, rapid prototyping, development of high performance real-time tracking/fusion software, and performance evaluation on realistic scenarios. A unified tracker framework that can handle a number of state-of-the-art algorithms like the Multiple Hypothesis Tracking (MHT) algorithm, Multiframe Assignment (MFA) tracker and the Joint (Integrated) Probabilistic Data Association (J(I)PDA) tracker is presented. Modules for preprocessing (e.g., coordinate transformations, clutter estimation, thresholding, registration), data association (e.g., 2-D assignment, multiframe assignment, k-best assignment), filtering (e.g., Kalman filter, Interacting Multiple Model (IMM) Estimator, Unscented Kalman filter) and postprocessing (e.g., prediction, classification) are discussed. Fusion software with different architectures is also presented. Integration of sensors like radar, ESA, angle-only, PCL and AIS/ADS-B is demonstrated. Side-by-side performance evaluation of multiple algorithms using more than 30 metrics on realistic large-scale tracking scenarios is presented. A hands-on approach with ISR360, which is an end-to-end real-time software suite for Intelligence, Surveillance and Reconnaissance, will be the cornerstone of this tutorial.

   The topics will include Review of Bayesian state estimation, Multitarget tracking system architecture, Implementation of J(I)PDA/MHT/MFA trackers, Implementation of a multisensor fusion engine, Implementation of realistic simulators, Implementation of a track analytics engine, Performance evaluation of trackers (MOP/MOE), and Real-world examples.

5. **Prerequisites:** Basic knowledge of tracking and fusion concepts.

6. **About the presenter:** Professor T. Kirubarajan (Kiruba) holds the title of Distinguished Engineering Professor and holds the Canada Research Chair in Information Fusion at McMaster University, Canada. He has published about 350 research articles, 11 book chapters, one standard textbook on target tracking and four edited volumes. In addition to conducting research, he has work extensively with government departments and companies to process real data and to transition his research to the real world through his company TrackGen. As part of this, he has led the development of a number of software programs, including MultiTrack for real-time large-scale multisensor-multitarget tracking, MultiFuse for distributed tracking, and ISR360 for visualization, performance analysis and situation awareness, which have been integrated into some real systems.