Call for Papers

IEEE Journal of Selected Topics in Signal Processing

Special Issue on Multi-target Tracking

The track-oriented multiple hypothesis tracking (MHT) approach has been established as the most accurate multi-target tracking algorithm over many years. Recently, the random finite set (RFS) based algorithms have drawn a great deal of attention in the tracking community. Some successful RFS based multi-target tracking algorithms are the probability hypothesis density (PHD) filter cardinalized PHD (CPHD) filter and the multi-Bernoulli filters. These RFS-based filters can adaptively estimate the clutter model as well detection probability profile from data. This feature is currently absent the MHT. Moreover, the CPHD filter which is comparable to the MHT, in the few attempts at benchmarking their performance, is only cubic in complexity. While there are a few attempts to compare the performance of the MHT and Gaussian mixture CPHD (GM-CPHD) a rigorous and detailed evaluation of these advanced tracking algorithms in terms of tracking accuracy and computational complexity is needed at present. In many radar tracking problems, the target is modeled as a point target and at most one measurement is assumed to originate from a target in a dwell/scan. However, for a high range resolution (HRR) radar sensor, measurement on the target extent can be obtained. Similarly, a video or electro-optical (EO) sensor can image an extended target. Thus, measurements by video or EO sensors demand the need for extended target tracking. If a group of closely spaced targets are moving together, then it is not possible for a sensor (e.g. a ground moving target indicator (GMTI) radar sensor) to resolve all targets in the group. Hence, a group tracking algorithm is needed for this class of problems. Due to increasing terrorist activities in recent years, the problem of tracking multiple contaminant clouds has drawn a great deal of interest. The filtering distribution for this class of problems is complex and highly nonlinear. Moreover, the dimension of the state space is high and Markov chain Monte Carlo (MCMC) techniques have been popular. For the multi-target tracking problem using the over-the-horizon radar (OTHR), there can be multiple detections for a target in a dwell due to reflection from multiple ionosphere layers. This requires advanced algorithms in both the MHT and RFS based tracking algorithms.

Topics of interest include, but are not limited to:

- Random Finite Set multi-target filters
- Extended object and group tracking
- Tracking of multiple contaminant clouds
- Multi-target tracking using over-the-horizon radar (OTHR) sensor
- Tracking airborne targets using the passive coherent location (PCL) system
- Tracking space debris
- Joint tracking and classification using kinematic and feature measurements
- Network-centric Multi-platform target tracking
- Multi-target tracking and cooperative positioning in a system of networked sensors
- Data registration error estimation in multi-sensor multi-target tracking systems.
- Robust multitarget tracking in the presence of model uncertainty
- Coupled tracking and sensor management
- Rigorous performance evaluation of multiple target tracking algorithms
- Performance bounds and metrics for multi target tracking
- Track-before-detect

Suggested time table for paper submission:

Manuscript submission due: September 1, 2012
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Revised manuscript due: December 15, 2012
Second review completed: February 1, 2013
Final manuscript due: February 15, 2013

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