Call for Papers

JAIF Special Issue

Journal of Advances in Information Fusion

A semi-annual archival publication of the International Society of Information Fusion

Special Issue for Journal of Advances in Information Fusion

(Multi-)Object Tracking using Non-traditional Measurement Models: Extended Objects & More

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Summary:
This special issue is aimed at methods for tracking target objects for which the usual "small target" (or "point target") assumptions do not hold. Among others, this includes extended objects, which give rise to multiple measurements from spatially distributed scattering centres; and group targets, which consist of several coordinated point targets. In particular, theoretical advances, novel algorithms, and applications will be considered.

The special issue extends the scope of the special session "Extended Object and Group Tracking" organized at the International Conference on Information Fusion since 2009.

Detailed description:
(Multi-)Object tracking considers the successive determination of the number and states of dynamic objects based on noisy sensor measurements. Object tracking is essential in many application areas such as surveillance, (mobile) robotics, automation, and computer vision. Traditionally, multi-object tracking algorithms are based on the following three "small target" assumptions:
(1) The states of individual objects evolve independently,
(2) each object can be modelled as a point, and
(3) each object gives rise to at most a single measurement per time frame.
These assumptions are usually valid for target objects that are far away from the sensor and/or for a low sensor resolution, e.g., in air surveillance. Due to recent advances in sensor technology, as well as novel applications involving objects in the near-field of sensors, e.g., in mobile robotics, it is becoming increasingly common that the objects occupy several sensor resolution cells. Because the "small target" assumptions do not hold, there is an increasing demand for tracking methods involving non-traditional measurement models.

Special Issue on

(Multi-)Object Tracking using Non-traditional Measurement Models: Extended Objects & More

Initial Submission Deadline:
October 31, 2015

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This is reflected by a very active research community and an ever increasing number of publications on the topic in the last years. This special issue addresses this trend by focusing on (multi-)object tracking methods that involve non-traditional measurement models. The most prominent examples are extended objects and group targets. An extended object gives rise to multiple measurements from different spatially distributed measurement sources on the extended object. In contrast to a point target, the aim is to estimate the shape of the object in addition to its kinematic parameters, which is a highly nonlinear problem. Furthermore, data association becomes much more challenging for multiple extended objects because a huge amount of association events is feasible. A group object consists of several point objects that evolve in a coordinated manner, and which all can give rise to measurements. While group tracking is related to extended object tracking, there are fundamental differences: For example, one typically aims at estimating the number and locations of the group members, and models for the group behaviour are required.

Extended object and group tracking involve both theoretical and practical challenges which will be addressed in this special issue. Possible topics include, but are not limited to:

- *Theory:* Optimal (Bayesian) estimation, random set methods, (C)PHD filters, multi-Bernoulli filters, random matrices
- *Modeling:* Shape and motion models for extended objects, models for group behaviour, multi-detection (multi-path) target models
- *Nonlinear estimation techniques for extended object and group tracking:* Particel filters, Nonlinear Kalman filters
- *Multi-extended object and group tracking:* Data association, track management
- *Multiple object types:* Measurement modelling, classification of object type
- *Evaluation:* benchmarks, performance bounds
- *Applications:* Surveillance, robotics, autonomous cars, automation, medicine, computer vision, real data (e.g., radar, laser, vision, and sonar)

Deadline for paper submission: **October 31, 2015**

During the submission of the paper please clearly indicate that the submitted paper is targeted to this special issue.

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