Robust Joint Target Detection and Tracking for Space Situational Awareness

Por: Pak, A (Pak, Andrey)[1]; Correa, J (Correa, Javier)[2]; Adams, M (Adams, Martin)[3,4]

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Resumen

An increased concern in space situational awareness has resulted from the rise in space debris and its threat to future space missions. For safety reasons, it is critically important to populate and maintain a catalog of orbiting objects. To detect and track space debris, telescopes and radars are typically used, resulting in multiple point measurements, which have to be processed in order to discriminate detections from clutter. Such processes are often based on Bayesian filtering. Conventional filters, such as the Kalman filter, cannot be directly applied to cluttered data problems because a multitarget estimate is required and/or multiple measurements are received. The recently introduced random finite set theory provides an elegant framework within which such problems can be naturally expressed and solved. This paper presents the application of several variations of the random finite-set-based joint target detection and tracking filter, which is a single-target multiple measurement-based filter, for processing radar measurements. Robust versions of this filter are presented to further account for unknown and possible time-varying detection statistics. The presented filters have the capability of differentiating a target from clutter measurements within real datasets as well estimating target probabilities of detection and radar clutter rates.

Palabras clave

KeyWords Plus: BERNOULLI FILTER

Información del autor

Dirección para petición de copias: Pak, A (autor para petición de copias)

+ Univ Chile, Dept Elect Engn, Santiago, Chile.

Direcciones:

+ [1] Univ Chile, Dept Elect Engn, Santiago, Chile
+ [2] Univ Chile, Dept Elect Engn, Adv Min Technol Ctr, Santiago, Chile

[3] Univ Chile, Dept Elect Engn, Elect Engn, Santiago, Chile

[4] Univ Chile, Dept Elect Engn, AMTC, Santiago, Chile

Direcciones de correo electrónico:ap360@hw.ac.uk; javier.correa@amtc.cl; martin@ing.uchile.cl

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