Hybrid Probabilistic Information Matrix Fusion

Kaipei Yang, Yaakov Bar-Shalom, Daiji Watanabe, Shawn Hunt
Dept. of ECE, University of Connecticut, Storrs, CT 06268
Email: {kaipei.yang, yaakov.bar-shalom}@uconn.edu

Abstract

In autonomous driving systems, distributed sensor fusion is widely used where each sensor has its tracking system and only the local tracks (LT) are transmitted to the fusion center. We consider the fusion of LTs taking into account all the Fusion Center (FC) track-to-LT association hypotheses via probabilities in the proposed Hybrid Probabilistic Information Matrix Fusion (HPIMF) algorithm. In HPIMF, the track association and fusion are carried out with probabilistic weightings rather than using a single track association only. Different from track-to-track fusion (T2TF), which is one of the most commonly used approaches for distributed tracking systems, the associations considered in HPIMF are between the predicted FC state and the LTs from local sensors. At each time for an association event, up to one of the tracks within the track list of a local sensor can be associated with the FC state. In real world scenarios there can be large uncertainties and missed tracks due to sensor imperfections and sensor-target geometry. Consequently, the association might be unreliable and fusion based on only a single association hypothesis could fail. It is shown in the simulations of a realistic autonomous driving system that HPIMF can successfully track a target of interest and is superior to T2TF which relies on hard association decisions.

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