

Radar Signal Processing

Unit-1: Multitarget Multisensor Tracking: Introduction, Formulation of multisensor-multitarget tracking problems, Target dynamic models, Sensor models, clutter model, Filters: Bayesian Filtering. Kalman filter, EKF, UKF, Particle filter.

Unit-2: Multitarget Tracking: Feature-assisted Tracking, Cluster Tracking, Modeling Target Dynamics: Interacting Multiple Model (IMM) Estimators. Filter initialization Single-point track initialization, Two-point difference track initialization. Data association.

Unit-3: Multitarget tracking algorithms: Probabilistic data association (PDA) and joint probabilistic data association (JPDA), Multiple Hypothesis Tracker (MHT) Probability Hypothesis Density (PHD) algorithm. Architectures of multisensor multitarget tracking: Centralized tracking, Distributed tracking.

Unit-4: Multisensor Data Fusion: Data Fusion Process Model, JDL Data Fusion Model, Types of Relationships. Introduction to the Algorithmics of Data Association in Multiple-Target Tracking: Keeping Track, Nearest Neighbors, Track Splitting and Multiple Hypotheses, Gating, Binary Search and kd -Trees. Ternary Trees.

Unit-5: ADS-B Automatic Dependent Surveillance (Broad cast): Introduction, Theory of operation, ADSB Challenges and Application. Secondary surveillance radar, SSR, Comparison with ADS-B. Integration of ADSB and Radar track. Challenges Applications of Multisensor Systems and Data Fusion. Introduction to MIMO radar Advanced radar systems with conflict detection.

Text Books

Rama Chellappa, Sergios Theodoridis. "Academic Press Library in Signal Processing": Volume 2: Communications and Radar Signal Processing 1st edition 2011. (Chapter 15).

David L. Hall and James Llinas. "Handbook of multisensor data fusion", CRC Press LLC, 1st edition 2001.

Cary R. Spitzer, Uma Ferrell, Thomas Ferrell. "Digital Avionics Handbook", Third Edition [3 ed.] CRC Press Taylor & Francis Group, 2015.

References

William L. Melvin, James A. Scheer, "Principles of Modern Radar" Vol. II: Advanced Techniques, 1st edition SciTech Publishing, Edison, NJ, 2013

J. Li and P. Stoic, "MIMO radar--diversity means superiority," in Proceedings of the 14th Adaptive Sensor Array Processing Workshop (ASAP '06), Lincoln Lab, Massachusetts, USA, December 2006.

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Mrs. RB/BM for Senaka