

MULTI-TARGET, MULTI-SENSOR TRACKING BASED ON QUALITY-OF-INFORMATION AND FORMAL BAYESIAN FRAMEWORKS

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Abstract- We consider a multi-target tracking problem that aims to simultaneously determine the number and state of mobile targets in the field. Conventional paradigms tend to report only the existence and state of targets according to centralized detection and data fusion. On the contrary, we investigate a multi-target, multi-sensor scenario in which (a) both the number and the state of the targets are unknown a priori; and (b) the detection with respect to targets is employed in a distributed manner. Toward this end, we exploit random set theory, a statistical tool based on Bayesian framework, for establishing generalized likelihood and Markov density functions to yield an iterative filtering procedure. We conduct a study regarding how the design of distributed detection has impact on the result of system level information fusion. The sources of analyzed data include (a) simulation-based sensor readings through bi-directional sensing/communication; and (b) practical images taken by multiple cameras through uni-directional sensing/communication. The formulation of Bayesian filtering suggests that a design of a tracking system be adaptive to change of detection performance.

Index terms: Sensor networks, multi-target tracking, detection, random set theory.