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AN EFFICIENT COMPUTATIONAL APPROACH FOR MULTITARGET TRACKING FROM BEARINGS-ONLY MEASUREMENTS BY DECENTRALIZED COOPERATIVE PROCESSING

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Abstract. *This paper firstly has proved that the well known Hungarian type assignment algorithms* [14, 4] *embedded in the relaxation-based maximum-likelihood (ML) solution for a bearings-only passive multitarget-multisensor tracking problem can be replaced by a much simpler sorting algorithm of $O(N \log N)$ complexity, provided that the sensor system is ideal such that the system has no cluttering points nor missing data. A new computationally efficient ML-based relaxation method for multitarget motion analysis under a fixed networked multisensor environment is then developed by exploiting a new cooperative decentralized processing scheme of* [15]. *Embedding locally an optimal data association algorithm of $O(N \log N)$ into each of Gauss-Newton's downhill iteration loops, our simulations show that we are able to track multiple targets with improved accuracy and efficiency, where all targets are allowed to move in variable directions at varying speeds. The solution we have developed constitutes a suboptimal solution in the sense of* [14, 8] *because an optimal solution is embedded within part of the entire optimization problem.*
keywords: Hungarian algorithm, Data associate problem, Multitarget motion tracking, Bearings-only measurement, Distributed passive sensor network, Cooperative processing

1. **Introduction.** Multitarget tracking from bearings-only measurements under a distributed sensor network is a hard inverse problem [14], largely due to uncertainty in data assignment problem of tracks with respect to the multitarget objects whose time dependent motions are entirely independent and are often subject to components of independent noise. In spite of extensive research work on the subject [18, 12, 10], the problem remains unsolved because it is shown that the statistic data assignment problems with more than three sensors is an NP hard problem [5, 6, 11]. The difficulty increases perhaps beyond an exponential complexity if the number of targets, the number of sensors and the number of sampling scans increase [14, 8] with notable exceptions of the case studied by Zhou