

Application of Simulated Annealing to Threshold Optimization in Distributed OS-CFAR System

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Abstract : This paper proposes an application of the simulated annealing to optimize the detection threshold in an ordered statistics constant false alarm rate (OS-CFAR) system. Using conventional optimization methods, such as the conjugate gradient, can lead to a local optimum and lose the global optimum. Also for a system with a number of sensors that is greater than or equal to three, it is difficult or impossible to find this optimum; Hence, the need to use other methods, such as meta-heuristics. From a variety of meta-heuristic techniques, we can find the simulated annealing (SA) method, inspired from a process used in metallurgy. This technique is based on the selection of an initial solution and the generation of a near solution randomly, in order to improve the criterion to optimize. In this work, two parameters will be subject to such optimisation and which are the statistical order (k) and the scaling factor (T). Two fusion rules; "AND" and "OR" were considered in the case where the signals are independent from sensor to sensor. The results showed that the application of the proposed method to the problem of optimisation in a distributed system is efficiency to resolve such problems. The advantage of this method is that it allows to browse the entire solutions space and to avoid theoretically the stagnation of the optimization process in an area of local minimum.

Keywords : distributed system, OS-CFAR system, independent sensors, simulating annealing

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