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A Novel Polytope Algorithm based On Nelder-mead Method for Localization in Wireless Sensor Network

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Abstract
Background and Objectives: Magnificent localization precision and low operating ex-penses are the main keys and essential issues to managing and operating outdoor wireless sensor networks. This work proposes a novel and rigorous efficiency localization algorithm utilizing a simplex optimization approach for node localization. This novel optimization method is a direct search approach, and is usually directed to solve nonlinear optimization problems that may not have well-known derivatives, and it is called the Nelder-mead Method (NMM). Methods: It is suggested that the objective function that will be optimized using NMM is the mean squared error of the range of all neighboring anchor nodes installed in the studied WSNs. This paper emphasizes employing a ranging technique called Received Signal Strength Indicator (shortly RSSI) to calculate the length of distances among all the nodes of WSNs. Results: Simulation results perfectly showed that the suggested localization algorithm based on NMM can carry out a better performance than that of other localization algorithms utilizing other optimization approaches, including a particle swarm optimization, ant colony (ACO) and bat algorithm (BA). This obviously appeared in several metrics of performance evaluation, such as accuracy of lo-calization, node localization rate, and implementation time. Conclusion: The proposed algorithm that utilized NMM is more functional to enhance the precision of localization because of particular characteristics that are the flexible implementation of NMM and the free cost of using the RSSI technique.

Author Keywords
localization; nelder mead method; optimization techniques; ranging model; RSSI; Wireless sensor networks

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