

The Multi-Objective Optimization Algorithm Based on Sperm Fertilization Procedure (MOSFP) Method for Solving Wireless Sensor Networks Optimization Problems in Smart Grid Applications

**Hisham A. Shehadeh, Mohd Yamani Idna Idris, Ismail Ahmedy,
Roslina Ramli, Noorzaily M. Noor**

Prior studies in Wireless Sensor Network (WSN) optimization mostly concentrate on maximizing network coverage and minimizing network energy consumption. However, there are other factors that could affect the WSN Quality of Service (QoS). In this paper, four objective functions that affect WSN QoS, namely end-to-end delay, end-to-end latency, network throughput and energy efficiency are studied. Optimal value of packet payload size that is able to minimize the end-to-end delay and end-to-end latency, while also maximizing the network throughput and energy efficiency is sought. To do this, a smart grid application case study together with a WSN QoS model is used to find the optimal value of the packet payload size. Our proposed method, named Multi-Objective Optimization Algorithm Based on Sperm Fertilization Procedure (MOSFP), along with other three state-of-the-art multi-objective optimization algorithms known as OMOPSO, NSGA-II and SPEA2, are utilized in this study. Different packet payload sizes are supplied to the algorithms and their optimal value is derived. From the experiments, the knee point and the intersection point of all the obtained Pareto fronts for all the algorithms show that the optimal packet payload size that manages the trade-offs between the four objective functions is equal to 45 bytes. The results also show that the performance of our proposed MOSFP method is highly competitive and found to have the best average value compared to the other three algorithms. Furthermore, the overall performance of MOSFP on four objective functions outperformed OMOPSO, NSGA-II and SPEA2 by 3%, 6% and 51%, respectively.

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