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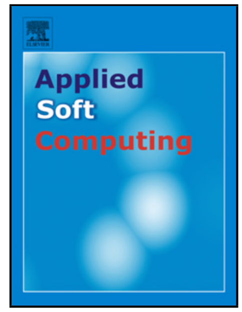

Title: ACO-based mobile sink path determination for wireless sensor networks under non-uniform data constraints

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ACO-based mobile sink path determination for wireless sensor networks under non-uniform data constraints

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Highlights

- An efficient mechanism to construct directed spanning tree to find forwarding node for each sensor node
- A new ACO-based algorithm for finding a near optimal set of RPs and tour length of the mobile sink under non-uniform data constraints.
- A comprehensive validation of the proposed algorithm ACO-MSPD via simulation runs
- Simulation study of various parameter to know their impact on the network lifetime

Abstract: In wireless sensor networks, a mobile sink is used to collect data from sensors by traversing the network periodically to prevent hotspot or energy-hole problem. In order to avoid the delay incurred by visiting all the sensor nodes, a mobile sink may allow visiting only a few number of locations or nodes referred as rendezvous points and remaining nodes send their data to the nearest rendezvous point. Finding an optimal set of rendezvous points will improve the data gathering process of the sink and also maximize the network lifetime. However, it is more challenging to find an optimal set of rendezvous points and traveling path of the mobile sink when the sensor node generates data unevenly. In this paper, we propose a new Ant Colony Optimization-based mobile sink path determination for wireless sensor networks. The objective of the proposed algorithm is to maximize the network lifetime and minimize the delay in collecting data from the sensor nodes. In the proposed algorithm, we devise an efficient mechanism to find a near-optimal set of rendezvous points and traveling path of the mobile sink to achieve the desired objectives. The proposed algorithm also adopts re-selection of rendezvous points to balance the energy consumption of the sensors. Through simulation runs, we show that the proposed algorithm outperforms the existing ones.

Keywords: *Wireless sensor networks, mobile sink, rendezvous points, non-uniform data, Ant Colony optimization, network lifetime.*

1. Introduction

Wireless sensor network (WSN) has emerged as an important technology for real-world applications such as military, automation, vehicle tracking, environmental, wildlife tracking, IoT, etc. A WSN consists of a finite number of sensor nodes, and each node contains a power unit for serving power, sensing unit to observe the phenomenon, transceiver to connect the network for data transmission, a small processing unit for data processing, and storage unit [1]. Sensor nodes gather data from the environment and forward to the sink or base station via direct or multi-hop communication [2]. Typically, sensors operate on limited battery power and most of their energy consumed due to the data transmission. Moreover, the sensor nodes near the sink consume more energy than others due to the heavy forwarding of data packets, and as a result, they may die quickly, and it may also lead to network partition. This problem is known as a hotspot problem [3-5]. A concept of the mobile sink has been introduced to overcome the problem. The mobile sink is used to collect data from the sensors by traversing in the network periodically to prevent or minimize the hotspot problem.