

## A spawn mobile agent itinerary planning approach for energy-efficient data gathering in wireless sensor networks

### ABSTRACT

Mobile agent (MA), a part of the mobile computing paradigm, was recently proposed for data gathering in Wireless Sensor Networks (WSNs). The MA-based approach employs two algorithms: Single-agent Itinerary Planning (SIP) and Multi-mobile agent Itinerary Planning (MIP) for energy-efficient data gathering. The MIP was proposed to outperform the weakness of SIP by introducing distributed multi MAs to perform the data gathering task. Despite the advantages of MIP, finding the optimal number of distributed MAs and their itineraries are still regarded as critical issues. The existing MIP algorithms assume that the itinerary of the MA has to start and return back to the sink node. Moreover, each distributed MA has to carry the processing code (data aggregation code) to collect the sensory data and return back to the sink with the accumulated data. However, these assumptions have resulted in an increase in the number of MA's migration hops, which subsequently leads to an increase in energy and time consumption. In this paper, a spawn multi-mobile agent itinerary planning (SMIP) approach is proposed to mitigate the substantial increase in cost of energy and time used in the data gathering processes. The proposed approach is based on the agent spawning such that the main MA is able to spawn other MAs with different tasks assigned from the main MA. Extensive simulation experiments have been conducted to test the performance of the proposed approach against some selected MIP algorithms. The results show that the proposed SMIP outperforms the counterpart algorithms in terms of energy consumption and task delay (time), and improves the integrated energy-delay performance.

**Keyword:** Data gathering; Itinerary planning; Mobile agent; Spawn mobile agent; Wireless sensor network