Efficient Cluster Head Selection in Wireless Sensor Networks using Bacteria Foraging Optimization

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Abstract: Large-scale Wireless Sensor Networks (WSN) is the focus of recent research and development efforts. Due to their benefits in monitoring physical environments, WSN find diverse applications from military usage to agriculture and scientific works. To maximize WSN's network life, data transfer paths are selected so that total energy consumed on the path is minimal. To ensure high scalability and improved data aggregation, sensor nodes are grouped into disjoint, non-overlapping subsets known as clusters. This study proposes improved Cluster Head (CH) selection for efficient sensor networks' data aggregation. The suggested hybrid algorithm is based on Bacterial Foraging Optimization (BFO) and Gravitational Search Algorithm (GSA). The proposed hybrid BFO is incorporated in Lower Energy Adaptive Clustering Hierarchy (LEACH).

Keywords: Bacterial Foraging Optimization (BFO), Cluster Head (CH) selection, Gravitational Search Algorithm (GSA), Lower Energy Adaptive Clustering Hierarchy (LEACH), Wireless Sensor Networks (WSNs)

INTRODUCTION A sensor network comprises of sensing (measuring), computing and communication elements that ensures an administrator can instrument, observe and react to events in a specific environment (Sohraby *et al.*, 2007). Sensor networking is multidisciplinary involving radio and signal processing, networking, database management, artificial intelligence, systems architectures for operator-friendly infrastructure administration, power management algorithms, resource optimization and platform technology. WSN is a network of distributed autonomous devices that sense/monitor physical/environmental conditions cooperatively (Kulkarni *et al.*, 2011). WSNs have many small, inexpensive, disposable and autonomous sensor nodes deployed in an adhoc way for remote operation in geographical areas. Sensor nodes operate with batteries and are usually deployed in hard-to-access or hostile environments, occasionally in large quantities. It is hard or nearly impossible to replace sensor nodes batteries. However, the sink has rich energy. As sensor energy is a precious WSN resource, efficient energy use is needed to prolong network life and this has been focused in most WSN research. With WSN, objects can be tracked by tagging them with small sensor nodes which are tracked as it moves through a sensor node field deployed at known locations.