# Chapter 12
# Proficient Clustering algorithm for Wireless Sensor Networks

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## ABSTRACT

*Enhancing the energy efficiency and maximizing the networking lifetime are the major challenges in Wireless Sensor Networks (WSN).Swarm Intelligence based algorithms are very efficient in solving nonlinear design problems with real-world applications.In this paper a Swarm based Fruit Fly Optimization Algorithm (FFOA) with the concept of K-Medoid clustering and swapping is implemented to increase the energy efficiency and lifetime of WSN. A comparative analysis is performed in terms of cluster compactness,cluster error and convergence. MATLAB Simulation results show that K-Medoid Swapping and Bunching Fruit Fly optimization (KMSB-FFOA) outperforms FFOA and K-Medoid Fruit Fly Optimization Algorithm (KM-FFOA).*

## INTRODUCTION

Wireless Sensor Networks (WSN) comprises of numerous tiny sensor nodes that are capable of sensing various environmental effects and transmitting them wirelessly to an information collecting agent. These sensor nodes are deployed in vast numbers in the regions where it is difficult to oversee by the people (Amgoth & Jana, 2015; Aslam, Phillips, Robertson, & Sivakumar, 2011; Anastasi, Conti, Di, & Passarella, 2009; Li, Xu, Xiong, Yang, Zhang, Chen, & Xu, 2011). The sensor nodes in wireless sensor networks are normally fueled by battery, which is undesirable, even difficult to revived or supplanted. Sensor nodes have to rely on batteries for sensing, communication and information gathering. Sensor nodes are significantly constrained in available resources including storage, computational capacity, however energy accounts for the most restrictive of all factors because it affects the operational lifetime of WSN. As a result, sensor nodes must automatically collaborate with each other to create a self-organized network,

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and must be outfitted with energy efficient modules and protocols to minimize energy consumption and ensure long network lifetime (Rault, Bouabdallah, & Challal, 2014; Min, Wei-ren, Chang-jiang, & Ying, 2010; Jung, Lim, Ko, & Park, 2011). In this manner, enhancing the energy efficiency and maximizing the networking lifetime are the significant challenges in sensor networks. Therefore the optimal use of these valuable energy resources becomes imperative. Generally, energy conservation should be possible in taking after ways energy-efficient routing, clustering, effective scheduling of sensor states to interchange between sleep and active nodes and data compression to decrease the extent of transmitted information. This paper addresses the issues such as energy-efficient routing and clustering. Wireless communication is the significant source of energy drainage in WSN. It is crucial that the transmission energy (E) which mainly dominates the overall energy consumption is proportional to the distance (d) between transmitter and receiver, i.e., $E \alpha d^{\lambda}$, where $\lambda$ is the path loss exponent. Subsequently, minimization of transmission distance can reduce the energy consumption. In recent years, researchers have done a lot of studies and proved that clustering is a compelling process in enhancing energy efficiency and lifetime of wireless sensor networks (Chamam, & Pierre,2010; Halgamuge, Guru, & Jennings,2003). In order to acquire a faster and efficient solution of the clustering and routing with the above issues, a swarm Intelligence based optimization approaches is exceedingly alluring. Numerous metaheuristic algorithms are intended for optimization, though they are not generally proficient and furthermore there may be different issues such as memory limit, computational efficiency, and computing resources (Yang, & Karamanoglu, 2013; Yang, 2013). SI-based algorithms are very efficient in tackling nonlinear design issues with real-world applications such as function optimization, traveling salesman problem, route planning, image segmentation, spam detection, data clustering and functional modules detection in protein-protein interaction network. Recently the U.S. military is exploring swarm systems for controlling unmanned vehicles. The European Space Agency is pondering about an orbital swarm for self-assembly and interferometry. NASA is researching the utilization of swarm innovation for planetary mapping .Anthony Lewis and Bekey discusses the likelihood of using swarm intelligence to control nanobots inside the body for the purpose of killing cancer tumors. Swarm intelligence (SI) is a relatively novel field that was initially defined as ''Any attempt to design algorithms or distributed problem-solving devices inspired by the aggregate manner of social creepy crawlies and other animal creatures" (Abraham, 2008; Crina Grosan, 2006). The main rationale behind this fact lies in the observation that these insect societies, as a collective unit, do actually solve routing problems. They need to discover and establish paths that can be used by the single insects to effectively move back and forth from the nest of the colony to sources of food. More over swarm intelligence algorithms show a number of properties, such as self-organization, adaptivity, scalability and robustness that are highly desirable in modern large-scale artificial systems (Saleem, Caro & Farooq, 2011; Ducatelle, Di & Gambardella, 2010).All these advantages make SI design interesting for modern networks such as the wireless sensor networks. The main objective of this paper is to develop an energy efficient cluster based swarm intelligence routing algorithms for WSNs with the consideration of low energy consumption of the sensor nodes for drawing out network lifetime. This paper is illustrated as follows:

1. Section 1 depicts related works,
2. Section 2 describes Swarm based routing protocol.
3. Network model is described in section 3,
4. Section 4 explains simulation and results and
5. Finally, section 5 concludes this paper.

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