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## A Survey on Cluster Head Selection and Cluster Formation Methods in Wireless Sensor Networks

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#### Abstract

In recent years, wireless sensor networks (WSNs) have been growing rapidly because of their ability to sense data, communicate wirelessly, and compute data efficiently. These networks contain small and low-powered sensor nodes that organize and configure themselves to carry out their functions. Even though WSNs are cheap, easy to deploy, flexible, and efficient, there are some challenges in terms of energy efficiency and network lifetime. Clustering in WSNs is the most reliable solution for the challenges, in which nodes are grouped into few clusters, and a cluster head (CH) is selected for data aggregation and data transfer to the base station (BS). However, there are still many challenges such as energy hole and isolated node problems that exist because of inefficient CH selection and cluster formation methods. In this work, we comprehensively reviewed various nonmetaheuristic and metaheuristic methods for CH selection and cluster formation that are used in networks from various environmental settings, for a better understanding of how the aforementioned problems are tackled by some authors. Moreover, the methods' parameter settings, advantages, limitations, and future directions are presented with a brief performance summary of the approaches.

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