Variants of the low-energy adaptive clustering hierarchy protocol: Survey, issues and challenges

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A wireless sensor network (WSN) is a modern technology in radio communication. A WSN comprises a number of sensors that are randomly spread in a specific area for sensing and monitoring physical attributes that are difficult to monitor by humans, such as temperature, humidity, and pressure. Many problems, including data routing, power consumption, clustering, and selecting cluster heads (CHs), may occur due to the nature of WSNs. Various protocols have been conducted to resolve these issues. One of the important hierarchical protocols that are used to reduce power consumption in WSNs is low-energy adaptive clustering hierarchy (LEACH). This paper presents a comprehensive study of clustering protocols for WSNs that are relevant to LEACH. This paper is the first to emphasis on cluster formation and CHs selection methods and their strengths and weaknesses. A new taxonomy is presented to discuss LEACH variants on the basis of different classes, and the current survey is compared with other existing surveys. A complete comparison of the location, energy, complexity, reliability, multi–hop path, and load balancing characteristics of LEACH variants is conducted. Future research guidelines for CHs selection and cluster formation in WSNs are also discussed.

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