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Review

A systematic review on heterogeneous routing protocols for wireless sensor network

Sudeep Tanwar [a], Neeraj Kumar [b], Joel J.P.C. Rodrigues [c,d,*]

[a] Department of Information Technology, B.I.T., Meerut (U.P.), India
[b] Department of Computer Science and Engineering, Thapar University, Patiala (Punjab), India
[c] Instituto de Telecomunicações, University of Beira Interior, Portugal
[d] ITMO University, St. Petersburg, Russia

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ABSTRACT

The latest developments in wireless communication are more focused on delivering sensitive information to its final destination under several constraints such as energy, latency, reliability, stability, and security. Through the latest developments in digital technology, wireless transceiver, and Micro-Electro-Mechanical Systems (MEMS), it is possible to integrate sensing and computing units along with transceiver and power supply to a single unit called as Sensor Node (SN). The collection of SNs built a specialized type of network called as Wireless Sensor Networks (WSNs). Many pre-existing research proposals on WSNs have focused mainly on minimization of energy consumption during the process of sensing, computation, and transferring data to the Base Station (BS) using gateways. Although clustering is the most prominent technique for the enhancement of network lifetime by efficient energy utilization of SN, but node heterogeneity is another interesting aspect which can be used to save the energy consumption of SNs in the network field. Keeping in view of all these issues, in this paper, we have categorized various heterogeneous routing protocols for WSNs based upon various predefined parameters. Relative comparison of various protocols with other existing state-of-the-art protocols is provided with respect to various performance evaluation parameters such as- CH Selection, Energy Efficiency, Security, and Application Specific. The broad categorization gives insights to various users to select one of the protocols from different categories based upon its merits over the others.

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* Corresponding author.
E-mail addresses: sudeep149@rediffmail.com (S. Tanwar), nehra04@yahoo.co.in (N. Kumar), joeljr@ieee.org (J.J.P.C. Rodrigues).

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1. Introduction

With advancements in wireless and related technologies in last two decades, Wireless Sensor Networks (WSNs) become an integral part of our daily life as these networks are being used in wide areas of applications. WSNs consist of Sensor Nodes (SNs) which are equipped with low-power microcontrollers and transceivers to perform various operations in the network field (Akyildiz and Su, 2002). These SNs collect the data from the regions in which these are deployed and then transfer to Cluster Heads (CHs) to the Base Station (BS). BS is the location, from which sensed data can easily be sent to the user by some physical medium. The connectivity among the SNs can be of single or multihop. Both mechanisms provide overburden to BS as a number of SNs try to communicate directly with BS. Mostly, this process is not used as their is a wastage of energy, clustering is a better solution for saving energy of individual SN. Clustering is the mechanism in which all the major decisions on behalf of SNs are taken by some specialized nodes called as CHs. Clustering based on single, and multihop communication is shown in Fig. 1(a) and (b) respectively. Both single and multihop communications are having several merits and demerits such as single hop communication suffers from energy losses with an increase in distance (Houngbadji and Pierre, 2010), whereas the multihop communication suffers from energy hole problems.

There is large range of applications such as monitoring of environment, pollution control system, military operations, control of vehicle motion, detection of earthquake, tracking of target and surveillance system, monitoring system for patients (Kulakowski et al., 2013), where WSNs can play an important role. Although there

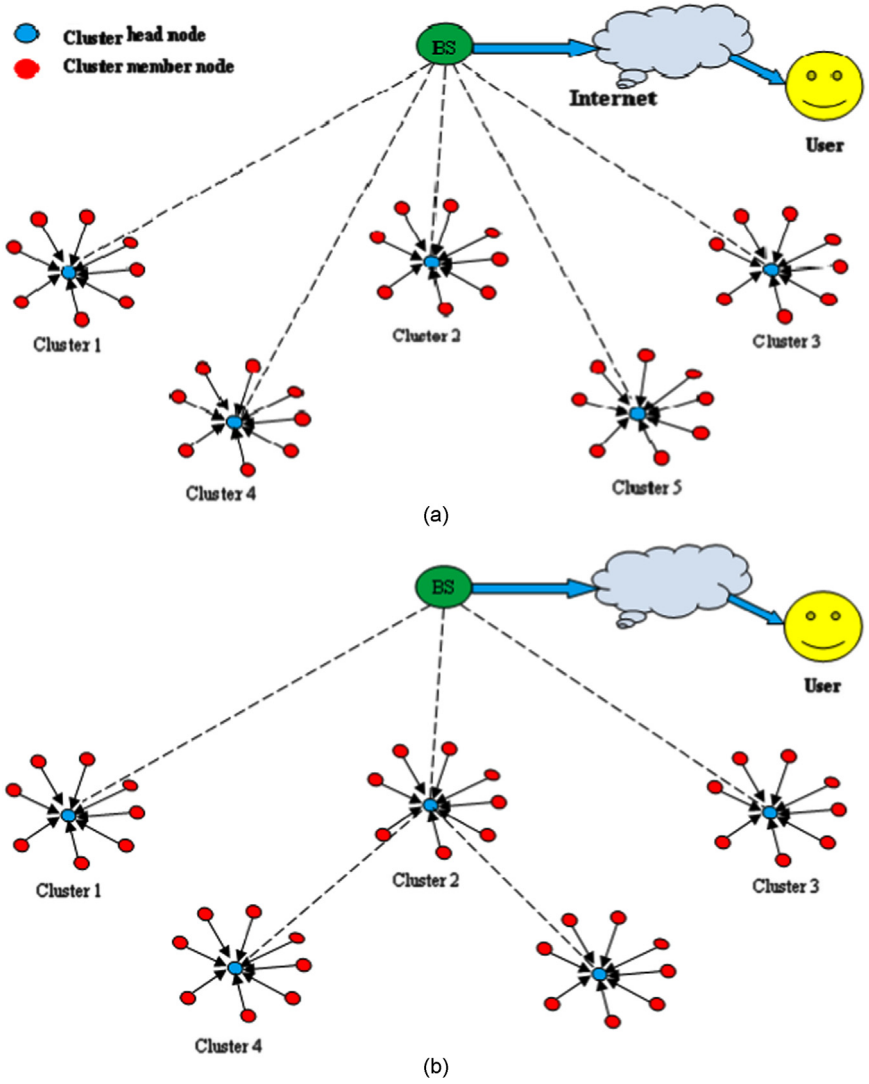

Fig. 1. Cluster based data communication from sensor nodes to the user through BS with (a) single hop and (b) multihop communication.

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