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A Survey on Opportunistic Routing Protocols for Wireless Sensor Networks

Payal Jadhav*, Prof. Rachna Satao**

*Department Of Computer Engineering,Smt.Kashibai Navale College of Engineering, Pune,411041,India.
**Assistant Professor, Department Of Computer Engineering, Smt.Kashibai Navale College of Engineering ,Pune 411041,India.

Abstract

Opportunistic routing is a new paradigm in routing for wireless sensor network which chooses the node closest to the target node for forwarding the data. It uses the broadcasting nature of wireless sensor networks. Opportunistic routing has increased the efficiency, throughput and reliability of sensor networks. Many energy saving techniques has been introduced using opportunistic routing in wireless sensor networks for increasing the network lifetime. In this article we have elaborated the basic concept of Opportunistic routing, different areas in which it has been claimed to be beneficial, some protocols their metrics and their drawbacks.

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Keywords: Wireless Sensor Networks (WSN); Opportunistic Routing (OR)

1. Introduction

Wireless sensor networks (WSNs) are the network of spatially distributed sensors which gathers information from the physical world. It is used for monitoring environmental factors like temperature, pressure moisture etc. and send this data to the sink or destination node. WSN has proven beneficial in number of applications in the area of traffic surveillance, military application, weather forecasting, landslide detection, fire detection etc. It is the backbone of the emerging technologies like Internet of Things (IoT), cyber physical system (CPS) etc. The most interesting contribution of WSN is in the healthcare. WSN in healthcare itself is the topic of

* Payal Jadhav. Tel.: +918806632346; fax: (020)24354938.
E-mail address: rasatao@sinhgad.edu

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research which has gained much popularity these days. The potential of sensing the information from the physical entities makes the wireless sensor network a hot topic for the research.

Routing is the difficult task in terms of wireless sensor network. Designing a routing protocol for wireless sensor network is different from designing it for the traditional networks. In case of the WSN, there is a strict energy saving requirement and there is a issue of the increasing network lifetime. Therefore, while designing the routing protocol for WSN resource management is important. The main function of the routing is route selection and data forwarding. The route selection includes selecting the best route between two nodes. The data transmission is done by selecting the next node or hop to forward the data. The packet forwarding in the traditional routing approaches for multihop wireless networks is done by selecting the node proactively at the sender side before transmission. Traditional multi-hop routing strategies suppresses the broadcasting nature of the wireless networks by using the Automatic Repeat Request [ARQ] or Forward Error Control [FEC] Data link techniques[8].

The new approach discussed in this article uses the broadcasting nature of the wireless network for packet forwarding. This approach is named as "Opportunistic Routing (OR)". The key idea behind OR is to use the broadcasting nature of wireless network such that transmission from one node can be overheard by multiple nodes. Instead of choosing the next forwarder node ahead of time, the OR chooses the next node dynamically at the time of transmission. The forwarding is done by the node closest to the destination. It has been shown that OR gives better performance than traditional routing. The key task of the OR is to select the forwarder set and prioritize the nodes in the set. Consider the following example. Here the source node S has four intermediate nodes with packet delivery probability of 15%. Each intermediate node has packet delivery probability of 85% to the destination. Traditional routing will choose only one intermediate node for data forwarding, while OR will consider all these nodes for data forwarding. Thus, OR proves to be more efficient and reliable than traditional routing. In the remaining paper the existing work related to the OR in different types of networks and its comparative analysis [14, 15, 16].

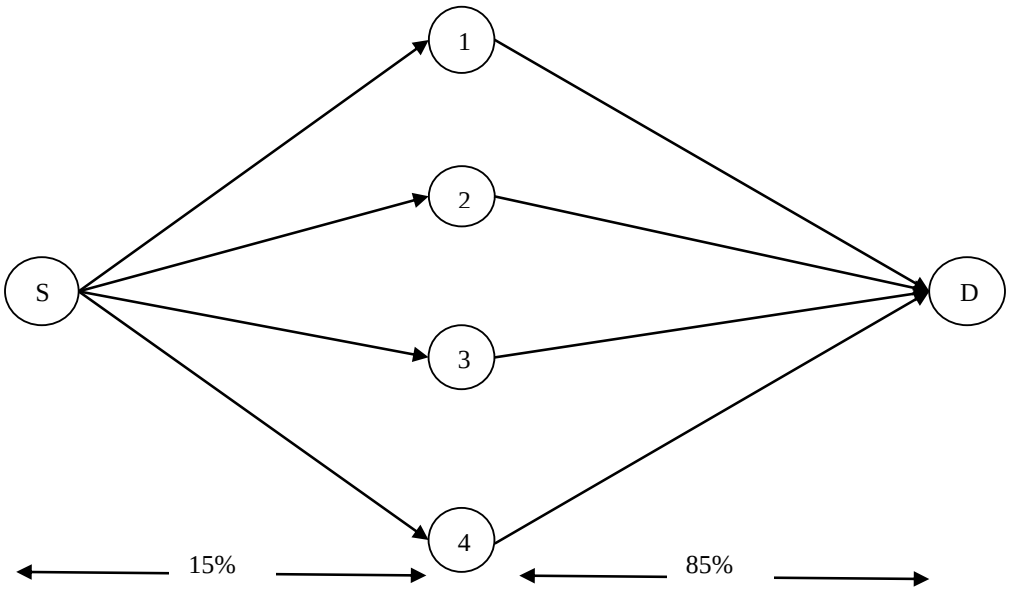

Fig. 1. Illustration in which each source node has multiple intermediate nodes along with packet delivery probability for data transmission to the destination node.