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A Survey on various Multipath Routing protocols in Wireless Sensor Networks

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Abstract

There has been a huge development in the field of Wireless Sensor Networks (WSN) in the recent years. The development is mainly due to the availability of small size sensor cameras and microphones. Such devices capture the multimedia data from the environment and effectively transmit them. Wireless Multimedia Sensor Networks (WMSN) is also the current topic of discussion due to its application in various fields. In order to improve the channel utilization rate, reduce transmission delay and balance the transmission load in WMSN multipath routing is a promising solution. Multipath routing helps to transfer data simultaneously thus by reducing delay and congestion in WMSN. In this paper, various protocols and schemes are being discussed on multipath routing strategy which will identify the areas of further development for WMSN.

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1. Introduction

Since the past years many Research Community has been working on Wireless sensor networks (WSN) because of its theoretical and practical challenges. It includes the applications for large-scale networks having small devices which are capable of extracting information from the real environment then performing simple processing

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on the extracted data and transmitting it to remote locations. Significant result in this area has help in the development of civil and military applications. Till today the developed system using WSN are used to measure temperature, pressure, humidity or the location of objects. The various applications of WMSN include battlefield visual monitoring, traffic monitoring, environment monitoring, safety monitoring, medical treatment, intelligent home, public healthcare and various other applications.

Transmission of mass data and processing the data requires lots of energy in WMSN. The necessary thing is to provide the required quality of service and to have minimum end delay while meeting the bandwidth requirements in the system. The main factor which need to be considered for real-time multimedia transmission are low transmission delay, balanced energy distribution and duplicated paths which are explained below.

1. Low transmission delay: The transmission delay should be as small as possible as the delayed data become useless from the view of real time application.
2. Balanced energy distribution: The sensor nodes are battery powered and get exhaust with time thus to have balanced energy distribution the load must be distributed equally on all the sensor nodes in the environment.
3. Duplicated paths: When the small sensor nodes are affected by disturbances in the path they try to reconstruct a new path for retransmission which may result in formation of new paths which we can say duplicated paths which are supposed to be avoided in the network system.

As a result, multi-path is an important feature for the development of WMSN. The multiple path schemes will construct multiple transmission paths from each source to sink pair and send the data packets through these multiple paths. In wireless communication, bandwidth is usually shared among neighbor nodes and a node may interfere with its geographically close nodes thus reducing the throughput of the network. Thus to ensure effective real-time transmission for WMSN it is therefore required to transmit the data through paths that will not interfere with each other. Other important factor for consideration also includes reliability, fault tolerance, load balance and bandwidth improvement which are explained below.

1. Reliability and fault tolerance: The reliability can be increased by sending the data through multiple paths such that if one path fails then it can be recovered by another path. In fault tolerance some additional information is transmitted along with the data and then the data is transmitted through multi-path such that if the receiver node receives a part of the data the whole data can be recovered.
2. Load Balance and Bandwidth Improvement: Multipath routing can support different applications and can solve the network congestion problem by distributing the traffic equally through multi-paths and also can obtain equal load balancing for traffic.

This paper is organized in the following way as follows. Section 2 provides a significant survey on various protocols and schemes in Multipath WMSN, including their working mechanism, advantages and drawbacks so as to consider them as a source of future work. Section 3 concludes the paper with providing a glance on various issues to be considered as a topic of research.

2. Literature Survey

It includes the brief overview of existing work of various protocols in Multipath WMSN:

The Greedy Perimeter Stateless Routing (GPSR¹) scheme uses the positions of routers and a packet's destination to make packet forwarding decisions. It makes greedy forwarding decisions when it is impossible and it uses routing around the perimeter of the region. GPSR simply sends a packet to a neighbouring node which sits nearest to the sink instead of constructing and maintaining a routing table. It can reduce a large amount of memory required for maintaining a routing table and can react easily to topology changes. The major drawback of GPSR is that it sends a packet only to the node closest to the sink and allows a node to change its next hop only when the original next hop is dead. Besides GPSR, there are also protocols that take both the angle and distance into consideration.

The Two-Phase geographical Greedy Forwarding (TPGF²) scheme builds multiple node-disjoint paths to

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