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A Survey on Multi Hop Minimum Delay Routing Protocols

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***Abstract:** Ongoing advances in wireless networks have empowered us to deploy and utilize mobile ad hoc networks for communication between the rescue officers in disaster recovery and reconstruction operations. This profoundly dynamic network does not require any infrastructure or centralized control. As the topology of the network stay dynamic, severe performance limitations acquire with traditional routing procedures. As of late another routing paradigm known as opportunistic routing protocols have been proposed to defeat these limitations and to give efficient conveyance of data in these profoundly dynamic ad hoc networks. Utilizing the broadcasting idea of the wireless medium, this most recent routing procedure attempts to address two noteworthy issues of changing connection quality and unpredictable node mobility in ad hoc networks. Not at all like conventional IP sending, where an intermediate node looks into a sending table for a reasonable next bounce, opportunistic routing gets opportunistic data sending that permits multiple competitor nodes in the sending area to follow up on the broadcasted data packet. This increases the unwavering quality of data conveyance in the network with diminished postponement. A standout amongst the most vital issues that have not been concentrated so far is the shifting performance of opportunistic routing protocols in wireless networks with profoundly mobile nodes. This exploration paper investigations and looks at the different advantages, disadvantages and the performance of the most recent opportunistic routing protocols in wireless ad hoc networks with exceedingly mobile nodes.*

***Keywords:** Ad hoc networks, Network Mobility, Opportunistic Routing, Performance Analysis, Reliability.*

I. INTRODUCTION

WSN can have a huge number of small sensor nodes. Largenumber of sensor nodes allow for sensing larger geographical area with more noteworthy accuracy. There are five types of the sensor network. Classification of various kind sensor networks has been appeared in figure 1.

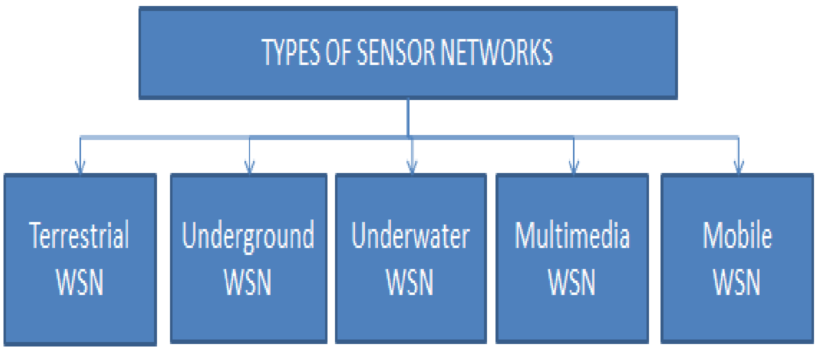

Figure 1: Type of sensor networks

WSN have wide scope of applications. Classification of these applications is appeared in figure 2.

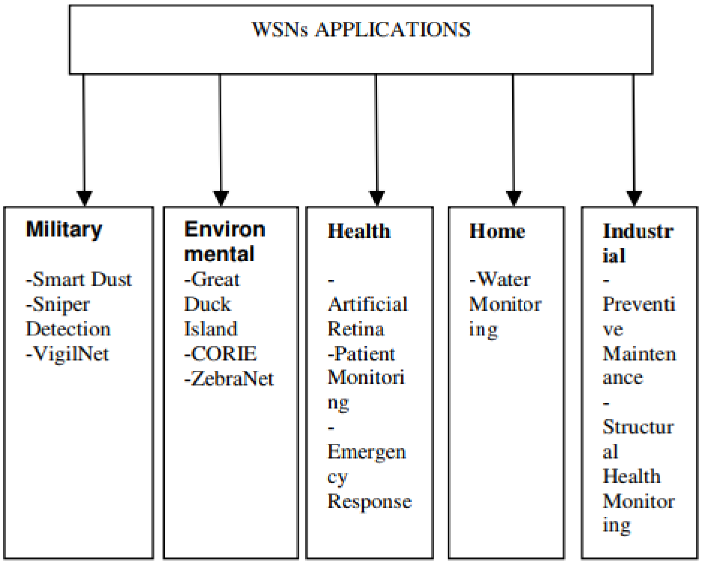

Figure 2: Main categories of WSN application and examples.

To achieve the task of transferring data, sensor nodes require routing protocols. Routing protocols for WSN are utilized for finding the best path to build up communication in the networks. Routing in WSN is a challenging task due to the intrinsic characteristics of WSN like energy, communication, architecture and deployment of nodes. Numerous analysts have proposed routing protocols.

II. CHALLENGES AND DESIGNING ISSUE FOR ROUTING IN WSN

Routing is the most entangled process in WSNs. The structure of routing protocols in WSNs is inclined by many testing factors. Efficient communication is reliant on these testing factors. In the accompanying, we précis a portion of the routing challenges that impact routing process in WSNs [12].

1.1. Node deployment

Node deployment is subject to the application and impact the performance of WSNs. The deployment can be either deterministic or randomized. In deterministic deployment, the sensing elements are manually identified and data is routed through pre-characterized routes. Be that as it may, in random node deployment, the sensor nodes are spotted randomly creating WSNs. In the event that the ensuing distribution of sensor node isn't uniform, optimally clustering winds up important to permit connectivity and empower energy efficient network performance. Inter-sensor communication is typically inside short communication ranges because of energy and bandwidth restrictions. In this way, it is most probable that a route will comprise of multiple wireless hops.

1.2. Energy consumption

The primary task of the routing protocols is efficient delivery of data from source to destination. Energy consumption is the significant worry in the improvement of routing protocols for WSNs. Sensor node has restricted energy resources and information or data need to be conveyed in an energy efficient route without bargaining the rightness of the information. The primary reason of energy consumption for routing in WSNs is neighborhood revelation and data aggregation.

1.3. Scalability

An extensive number of sensor nodes are dispersed in the application area, for example at least thousand numbers of node. Routing protocols work with huge number of sensor nodes. WSN routing protocols must be a satisfactory measure of versatile to act in light of events in the network [8, 5]. On the off chance that an event happens, at that point sensor nodes are responsible or handle that event.

1.4. Fault Tolerance

A couple of sensor nodes can crash because of lack of power, physical damage, or environmental interference. The crash of sensor nodes must not impact the general task of the WSNs. On the off chance that a substantial number of nodes crash, MAC and routing protocols must lodge formation of new links and routes for communication in the network. This may require more power for new connection formation and route these new links in the sensor network [16]. Consequently, a few dimensions duplication can be required in a fault tolerant sensor network.

1.5. Data Aggregation

Sensor nodes can create duplicate data from various regions. Data aggregation systems combine data from different nodes, as indicated by a clear aggregation function, e.g., duplicate repression, minima, maxima and average. Data aggregation is utilized to meet energy productivity and data transfer optimization in all routing protocols.

1.6. Quality of Service

In numerous applications, data must be conveyed in adefinite period of time from the instant it is sensed, generally the data will be of no utilization. Hence restricted latency for data conveyance is another circumstance for time-constrained applications. Since, the energy gets depleted; the network needs to degrade the performance.

III. Literature Survey

[9], paper presents ExOR, an integrated routing and MAC protocol for multi-jump wireless networks in which the "best" of multiple receiver forwards each packet. ExOR enhances performance by exploiting long-separate yet loosely links which would some way or another have been maintained a strategic distance from by traditional routing protocols. The outcome is a factor of two to four enhancements in throughput between distant pairs of nodes in a real test-bed.

[10], In this paper, Author have described a novel sending procedure based on geographical location of the nodes included and random selection of the transferring node by means of conflict among beneficiaries. We first centered around the multihop performance of such an answer, as far as average number of hops to achieve a destination as a function of the separation and of the average number of accessible neighbors. An idealized scheme (in which the best transfer node is dependably picked) was talked about, and its performance was assessed by methods for both simulation and diagnostic systems.

[11], Author center around choosing and organizing forwarder rundown to limit energy consumption by all nodes. Author think about the two situations where the transmission power of every node is settled or dynamically adjustable. Creator present an energy efficient opportunistic routing system, indicated as EEOR. The broad reenactments in TOSSIM demonstrate that our protocol EEOR performs superior to anything the outstanding ExOR protocol (when adapted in sensor networks) regarding the energy consumption, the packet misfortune proportion, the average delivery delay.

[12], In this paper, author center around limiting energy consumption and augmenting network lifetime for data relay in one-dimensional (1-D) line network. Following the standard of opportunistic routing hypothesis, multihop relay choice to advance the network energy productivity is made based on the distinctions among sensor nodes, as far as both their separation to sink and the remaining energy of one another. In particular, an Energy Saving by means of Opportunistic Routing (ENS_OR) algorithm is intended to guarantee least power cost amid data relay and protect the nodes with moderately low leftover energy. Broad reproductions and real test bed results demonstrate that the proposed arrangement ENS_OR can significantly enhance the network performance on energy saving and wireless connectivity in correlation with other existing WSN routing plans.

[13], Author propose congestion-aware opportunistic routing protocol in WSN. Increase in IOT applications is giving rise to strong need for congestion control mechanisms to reduce traffic in the network to achieve stable performance. These mechanisms are required in WSN as well as at the interface of IOT. It is impractical to implement heavy mechanisms in WSN; hence, this is an area of considerable research.

TABLE I. Comparisons of various techniques and method used in existing system

Ref. No.	**Protocol Name**	Parameters to calculate route	Candidate coordination method	Evaluation parameters	**Limitation**
[9]	ExOR	ETX 1 Number of transmissions 2 Number of hops 3 Internode packet loss, S/N ratio	Ack-based	1 Distance per transmission 2 Batch size 3 Throughput	1 For wireless mesh networks not for WSN 2 Concentrates on transmission of large files than energy consumption
[10]	GeRaF	1 Average energy consumed 2 Geographic distance of each node to destination	1 Average energy consumed 2 Geographic distance of each node to destination	1 Energy consumed 2 Latency 3 Number of nodes in the network	1 Assumed constant traffic model and high density 2 More communication overhead
[11]	EEOR	1 Energy of nodes 2 Link error probability	Ack-based	1 Energy consumption 2 Packet loss ratio 3 End-to-end delay 4 Packet duplication ratio	1 Agreement cost can be calculated in more realistic way instead of number of acknowledgements sent 2 Sleep Scheduling modes are not considered
[12]	ENS_OR	1 Optimum distance of sensor node to sink 2 Residual energy of each node	Ack-based	1 Receiving packets ratio 2 Network lifetime 3 Avg. of residual energy 4 First dead node	1 Interference of signals is not considered 2 Sleep scheduling mechanism is not considered
[13]	congestion-aware opportunistic routing protocol	To reduce traffic in the network to achieve stable performance	Ack-based	1 Reduce processing power 2 energy consumption	Need to validate results of proposed idea on simulator and implement it on real-time network

IV. Conclusion

In this paper, we dissected the behavior and performance of opportunistic routing protocols in profoundly mobile ad hoc networks. The various routing protocols were examined in detail along with the metrics utilized in every protocol. Most recent applications of opportunistic routing that incorporate maintaining communication in disaster recovery operations was examined. We classified the opportunistic protocols into five classifications and talked about the working of the most famous and generally utilized protocol from every classification. Different advantages and disadvantages of previous researches were talked about in detail. We utilized reproductions to dissect the performance of these protocols in profoundly mobile ad hoc networks.

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