International Journal of Emerging Trends in Research

Literature Review of Route Discovery Based Routing Protocol in Wireless Sensor Networks

Apoorva Agarwal[1*,] Abhay Goel[2], Parveen Kumar [3]

[1, 3] *Department of Electronics &Communication Engineering, Vivekanand Institute of Technology& Science, Ghaziabad*
[2] *Department of Electronics &Communication Engineering, ABES Engineering College, Ghaziabad*

Abstract

Routing in Wireless Sensor Networks (WSNs) plays a significant role in the field of environment-oriented monitoring like temperature, sound, pollution levels, humidity, wind, military applications such as battlefield surveillance, traffic monitoring, etc. A single routing protocol cannot be efficient for sensor networks across all applications because they are application dependent. In wireless network, routing protocols play an important role in managing the formation, configuration, and maintenance of the topology of the network. Routing is to be handled carefully. Routing technique is needed for sending the data between the sensor nodes and the base stations, so as to establish communication. Here we discuss various route discovery based routing protocols like Destination sequenced Distance vector routing (DSDV), Source Tree Adaptive Routing (STAR), Optimized Link-State Routing (OLSR), Ad-Hoc On-demand Distance Vector (AODV), Dynamic Source Routing (DSR), Dynamic MANET On-demand Protocol (DYMO), Zone Routing Protocol (ZRP) and fisheye routing protocol.

Keywords: Wireless Sensor Networks; Protocols; DSDV; STAR; OLSR; AODV; DSR

1. Introduction

By virtue of current technological advances, the manufacturing of consuming low power, low cost and multifunctional sensors has become technically and economically feasible. These sensors are small in dimensions and communicate in nutshell distances [1]. These smart sensors networked through wireless links and deployed in vast quantities, provide unprecedented opportunity for monitoring and controlling homes, cities, along with the environment. Furthermore the networked sensors use a broad spectrum of applications. A sensor device combines the abilities to sense, compute and communicate. A sensor is well-equipped with sensing and data processing components, can capturing surrounding environment condition and transform these measurements into corresponding signals. These signals can be processed further to provide information about the object present in the vicinity of the sensor. The sensors then send these data signals to a command centre either directly or via specific relaying sensors. A massive number of these smart sensors can be networked in many applications and operated various unattended environment hence producing a wireless sensor network. These networks have potential to interface the physical world on an unprecedented scale and provide practical usefulness in developing a large number of applications, including the protection of civil infrastructures, habitat monitoring, precision agriculture, toxic gas detection, supply chain management and health care. Designing of a wireless sensor network introduces formidable challenges.

2. Study of Wireless protocols

Wireless sensor networks (WSNs) are achieving importance with the passage of time. Out of massive usage of wireless sensor networks, few applications demand quick data transfer including minimum possible interruption. The knowledge of network structure and routing protocol is very important and it should be appropriate for the requirement of the usage. The routing protocol is a process to select suitable path for the data to travel from source to destination. The process encounters several difficulties while selecting the route, which depends upon, type of network, channel characteristics and the performance metrics [2].

Routing protocols are classified on the basis of process they used to discover the routes as shown in [Figure 1]. Routing protocols are in charge of discovering and maintaining the routes in the network. However, the appropriateness of a particular routing protocol mainly depends on the capabilities of the nodes and on the application requirements.
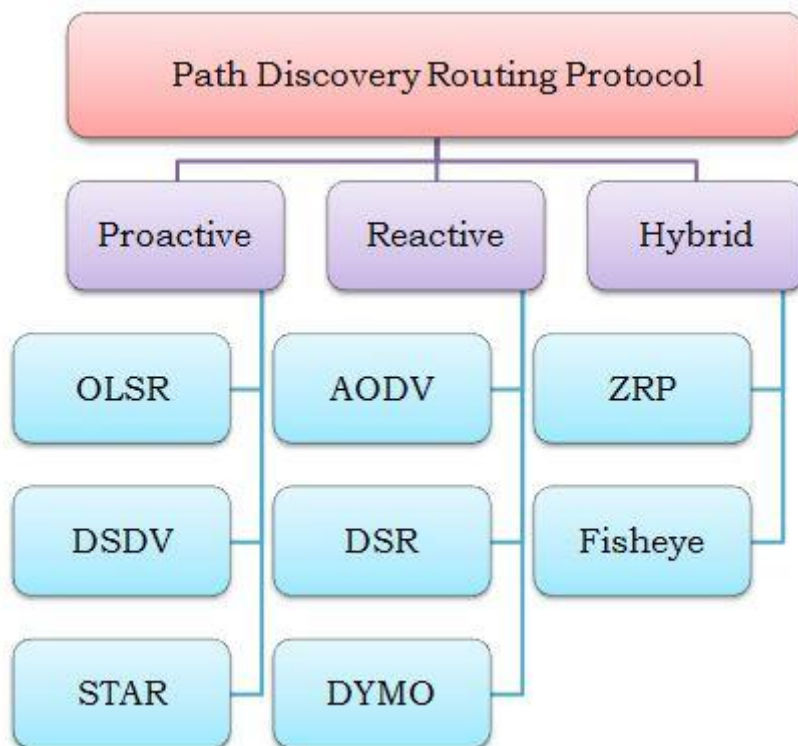
Figure 1: Classification of path discovery routing protocols in WSN

A. Proactive routing protocols

These routing protocols also called as table driven routing protocol. Continuously evaluate the routes within the network, so that when a packet needs to be forwarded the route is already known and can be immediately used. Table driven protocols maintain consistent and up to date routing information about each node in the network. These protocols require each node to store their routing information and whenever there is a change in network topology, the updates has to be made throughout the network. The table driven protocols for example are:

1) Destination sequenced Distance vector routing (DSDV)

The DSDV routing protocol is an enhanced version of the distributed Bellman-Ford algorithm where each node maintain a table that contain the shortest distance and the first node on the

shortest path to every other node in the network. It can be applied to MANETs with few modifications [3].

2) Source Tree Adaptive Routing (STAR)

In source tree adaptive routing, a router sends data to its neighbours regarding the nodes in its preferred paths to destinations. The links along the preferred paths from a source to each desired destination creating a source tree that definitely specifies the complete paths from the source to each destination [5].

3) Optimized Link-State Routing (OLSR)

In this protocol routes are immediately available when needed. It is an optimization on pure link state protocols. Optimized Link-State Routing performs hop by hop routing. Each node carries most recent information to provide a route for delivery of packets [4].

B. Reactive routing protocols

Reactive routing protocols, also called on demand routing protocol, it invokes a route only on demand. A node wishing to communicate with another node first seeks for a route in its routing table. If it finds one the communication starts immediately, otherwise the node initiates a route discovery phase. Once a Route has been established, it is maintained until either the destination becomes in accessible or until the route is no longer used or expired. For example:

1) Ad-Hoc On-demand Distance Vector (AODV)

AODV, a route is established only when it is required by a source node for transmitting data packets. In AODV, the source node and intermediate nodes store the next-hop information corresponding to each flow for data packet transmission. AODV utilizes routing tables to store routing information [4].

2) Dynamic Source Routing (DSR)

Dynamic source routing depends on two main mechanisms: Route Discovery and Route Maintenance. Route discovery is the procedure used at the source of the packets to discover a route to the destination. Route Maintenance is the procedure that discovers link failures and repairs them. DSR is a self-maintaining routing protocol [6].

3) Dynamic On-Demand MANET Routing Protocol (DYMO)

In dynamic on demand routing protocol a routes can be discovered just when they are required. the DYMO routing protocol is a successor to AODV routing protocol and shares many of its features. This protocol is an energy efficient protocol even when the network is large. The main advantage of DYMO is that it is slightly easy to implement and design with keeping future enhancements in mind [7].

C. Hybrid routing protocols

This type of protocols combines the advantages of proactive and reactive routing. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding. These protocols maintain topology information up to m hops in tables. Here the network is divided into small clusters or zones. For Example:

1) Zone routing protocol (ZRP)

A hybrid routing protocol which effective combines the best features of both proactive and reactive routing protocols. The key concept employed in ZRP is to use a proactive routing scheme within a limited zone neighbourhood of every node, and use a reactive routing scheme for nodes beyond this zone [8].

2) Fisheye routing protocol

In routing, the fisheye approach translates into maintaining an updated information set about distance and path quality information for the immediate neighborhood of a node, against a progressively less updated information as the distance increases. Fisheye represents a valid trade-off between the accuracy of the routing function and the overhead due to the generation of control messages by the routing protocol [9].

3. Conclusion

In this paper various route discovery based routing protocols of wireless sensor networks are discussed. To increase the lifetime of sensor nodes, it is important to design an efficient routing protocol. For Although many of these routing techniques look promising, there are still many challenges that are need to be solved. For further information, the Routing protocols for wireless sensor networks are responsible for maintaining the routes in the network in which information can exchange.

References

[1] Kay Soon Low, Win Nu Nu Win, Meng Jo Er, "Wireless Sensor Networks for Industrial Environments", *the proceedings of International Conference on CIMCA-IAWTIC*.

[2] N. Al-Karaki Jamal, E. Kamal Ahmed, "Routing Techniques in Wireless Sensor Networks: A Survey", Wireless Communications IEEE, vol. 11, no. 6, pp. 6-28, December 2004.

[3] C. Perkins and P. Bhagwat. Highly dynamic destination-sequenced distance-vector routing (DSDV) for mobile computers. Proc. ACMSIGCOMM 94, October 1994.

[4] Aleksand Huhtone, Helsinki University of Technology TelecommunicationSoftwareandMultimediaLaboratory"Comparing AODV and OLSR Routing Protocols", Seminar on Internetworking.

[5] Parma Nand, S.C. Sharma, Rani Astya, "Traffic Load based Performance Analysis of DSR, STAR & AODV Ad hoc Routing Protocol", International Journal of AdvancedComputer Science and Applications, vol 1 No 4, pp 58-62,Oct 2010

[6] Josh Broch, David Johnson, and David Maltz. "The dynamic source routing protocol for mobile ad hoc networks for IPv4 IETF RFC 4728, Feb 2007

[7] Jatinder Pal Sing, Anuj Kr. Gupta " A Review on Dynamic MANET On Demand Routing Protocol in MANETs" International Journal of Advanced Trends in Computer Science and Engineering volume 2, No.2, March-April 2013.

[8] Schauman, J.,"Analysis of Zone Routing Protocol", December,2002.

[9] G. Pei, M. Gerla, and T. W. Chen, "Fisheye State Routing in Mobile Ad Hoc Networks," In Proceedings of the 2000 ICDCS workshops, Taipei, Taiwan, Apr. 2000.