A Review Paper on Routing Protocols

Rupinder Kaur

Department of Electronics and Communication
Baba Banda Singh Bahadur Engineering College
Fatehgarh Sahib(Punjab), India
roopkaur3959@gmail.com

Prof.Mandeep Kaur

Department of Electronics and Communication
Baba Banda Singh Bahadur Engineering College
Fatehgarh Sahib(Punjab),India
mandeep.kaur@bbsbec.ac.in

Abstract— *WSN is a wireless network which comprises of small sensors. These sensors are used for creating a route between source and sink node in case of data transferring. The route creation is done by inter-connecting the most adjacent nodes. Routing is used to find the shortest distance between the different nodes from source to destination. Routing is basically used to find the efficient path to send the packets from source to destination. There are varieties of routing protocols which are specially meant for establishing efficient route between sources and sink node. This study is conducted for having a review over the work that has been done previously in this field.*

It represents the basic concept of routing along with its related terms such as Protocols developed for routing along with their brief explanation. The work is divided into sub section, section 1 represents the introduction to the topic, and section 2 represents the protocols of routing, section 3 represents the work which has been done in this field by various experts.

Keyword:-. Wireless Sensor Network, Routing.

I. INTRODUCTION

WSN stands for wireless sensor network. It has the ability of monitoring physically large areas or surroundings, accessing remote places, real-time reacting, and relative ease of use. WSN is used in various fields such as in military activities like reconnaissance, target acquisition, environmental activities such as forest fire prevention, geophysical physical activities such as volcano activity study, biomedical related fields such as health data monitoring or artificial retina or civil engineering such as structural health measurement.

Routing

Routing is a process in which the packets or data travels from source node to destination. Routing is a mandatory process in both of cases whether it is wired network or wireless network. In this the packet or message from source node is transferred to the sink node by following an efficient route. Route is created by creating a link between the most adjacent nodes. Routing is considered efficient in case when the following route has less traffic. The route which has less number of nodes i.e. shortest route is mostly preferred for transferring the data as data can reach to the destination as soon as possible.
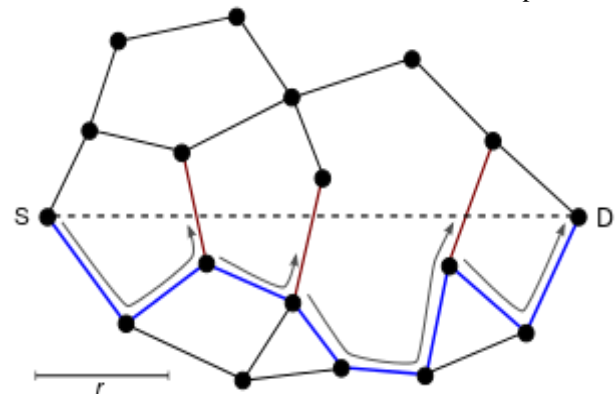

Figure1: Example of Routing [27]

The above diagram shows the basic working of routing where there is a source and destination from where data packet has to be sent. And the defined route (shortest and less congested) has been selected for the communication..

Packet switching networks and general purpose computers do routing whereas in packet switching network, packets are routed from source to destination through the intermediate nodes known as network hardware devices (routers, bridges, gateways, switches) and general purpose computers also routes packets from source to destination but there is not specialized hardware thus it may suffer from limited performance. [8] The process routing involves the routing tables that contain the information about the routers and their routing paths as well to the destination. Consequently, construction of routing tables are efficient part of the routing as it is going to be stored in the memory of the routers. Path chose by the routing algorithm depends upon the type of algorithm as most routing algorithm choose one path at a time but in case of multipath routing techniques, choose multiple alternative path for communication. Routing path that are overlapped or have equal routes described in the routing tables are installed in terms of priority:

1. Prefix-Length: where subnet masks length is longer are preferred.
2. Metric: according to this parameter, a lower metric cost is preferred valid in one and same routing protocol.

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3. Administrative distance: learned route from a more reliable routing protocol is preferred valid between different routing protocols.

To represent the route, a single routing table has been assigned in structured addresses thus in large networks, structured addressing performs better than unstructured addressing. As the technology enhances, routing is becoming prominent technology on the internet. Unstructured addressing or bridging is used within localized environments. [10]

II. ROUTING PROTOCOLS

Wireless Sensor Network (WSN) field got tremendous attention from industry and research across the globe. This field had inherent limitations of node energy, bandwidth and deployment. This constraint had made routing protocol for WSNs a Challenging issues.

Network Structured Based Routing

Routing protocols can be categorized on basis of various parameters. It can be categorized on the basis of topology which is followed by the network. On the basis of network structure it is divided into three parts as follows:
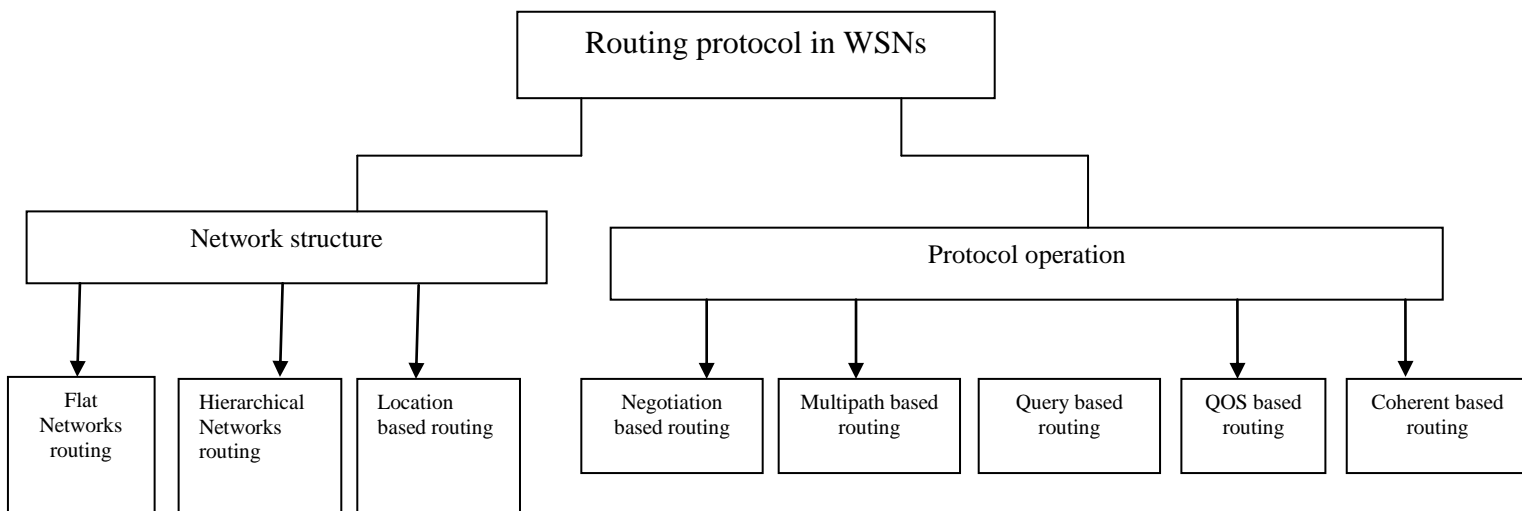
- Flat based
- Location based
- Hierarchical based

Figure 2 Taxonomy of Routing Protocols

Network structure based routing

While designing routing protocols for data transmission network structure or topology plays an important role. On the basis of the network structure the routing is divided into three major categories as defined below:

- Flat networks based routing
- Hierarchical networks based routing.
- Location based routing.

(i) **Flat networks based routing:** In flat network based routing the all nodes that are present in the network plays same role. Because there can be large number of nodes so it is not feasible that the global identity can be assigned to each and every sensor individually. All nodes present in the network get together for performing sensing task. Due to this the data centric routing is performed in which the quire is send by Base station to certain regions and waits for the data that is to send form the sensors located area.

(ii) **Hierarchical network based Routing:** Hierarchical network based routing is also known as cluster based routing. Scalable and efficient communication. The goal of implementing this routing protocol is to achieve the energy efficient routing mechanism in network. In such type of sensor networks the nodes having higher energy is used for the processing and receiving the information where as the nodes having less energy are used for the sensing of the target. [Jamal N. Al-Karaki et al] Clusters are formed and the selection of the Cluster-head is chosen that used for performing communication this will effects the performance of the system with respect to the scalability, lifetimes and the energy efficiency. This hierarchical routing is considered as the efficient methods by forming cluster the energy consumption is reduced thus increasing the life time of the network.

(iii) **Location based routing:** In this routing scheme the nodes are identified with respect to their location. The location of the nodes is obtained by the satellite using GPS. The difference between the nodes can be calculated with the help of the strength of the incoming signals.

Protocol Operation Based Routing

Negotiation-Based Routing: In this protocol number of negotiation message within sensors nodes is interchanged. It had advantage of lowering data redundancy and reduces data duplication Example SPIN.

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(i) **Multipath-based routing:** The main aim of this protocol is to develop an alternative route so that the transmission does not get effected in case if the route is failed or halted. These better alternative paths results in reducing power consumption hence prolonging network life time

(ii) **Query-based routing**: In this protocol destination node (the node which wants to start the communication) sends a query in the network, another node with matching interest respond to the query. High level language is used in these queries. These queries help in finding optimal path between source and sink. It results in reduction of transmission within a network.

(iii) **QoS-based routing:** QoS stands for Quality of Service. As the name defines this protocol is applied for the purpose of quality output with respect to various parameters such as energy efficiency, scalability etc. in other words various metrics such as energy metrics, delay metrics, bandwidth metrics etc are maintained in order to satisfy the factor of quality of service.

(iv) **Coherent Base routing**: The followed behind this protocol is data processing mechanisms such as coherent or non-logical. Accuracy of the selected route w.r.t energy depends on extent of processing. Coherent data processing techniques are more energy efficient.

Soft Computing Paradigms for WSN Routing

Various techniques are developed to achieve efficient routing in wireless sensor networks. Some of the techniques such as RL (Reinforcement Learning), AIS (Artificial Immune System), NN (Neural networks), SI (Swarm Intelligence) are used in various applications of WSN.

III. RELATED WORK

Cheng-Fu Chou (2005) [1] , focused on the wireless sensor networks, thus energy efficient routing protocol has been proposed. The proposed protocols also known as straight line routing algorithm i.e. SLR that is being used in wireless sensor network. Broad cast based routing protocols do not use in this paper so on the behalf of these protocols, SLR protocols have been used. Thus to obtain the same concept follows in broadcasting, source and sink host constructs event path and query path respectively. Query path helps in finding the routing path and event path first intersect. SLR algorithm does not want any type of geographic information to find the event and query path for a network. Performance has been evaluated on straight line and rumor routing protocols with the help of simulations. Thus result shows that the SLR performs better in comparison with rumor routing in terms of energy consumption, path quality and ratio of successful routing. SLR

saves more energy consumption and ratio of finding a best path improves.

Kavitha Rani (2014) [2], As technology grows, wireless sensor network has becoming the most emerging and popular among researchers. Thus, information processing and then routing this information is an important task in WSN. As a result to find the optimal routing protocol for routing purpose is a critical task. Optimal routing protocol will be able to perform securely, efficiently, reliable data delivery. This paper focuses on the routing protocol with reliable delivery which routes the data packets from source to destination efficiently with proper utilization of energy resources. Experiments have been performed to show the performance of the proposed method which results reliable and robustness of routing.

Samanpreet Singh (2014) [3], In this paper, the main focus is on the vehicle ad hoc networks (VANETs) due to the increment in vehicles on roads and for the traffic safety. These networks are complex but need to be taken care for the better performance. VANET is helpful in achieving this goal by providing driver assistance, passenger comfort and vehicle safety. Due to the dynamic nature of the road environment and traffic patterns VANETs facing with the problem of breakage problem, so there should be a reliable protocol that provides better communication without any breakage. There are various protocols that have been used for the routing of MANETs (mobile ad hoc networks) but characteristics of both the networks are different which results in advancements in MANETs so that it can be further used by VANETs. Mobility in VANETs is higher as compared to MANETs thus number of link breakage also increased. As a result, existing MANET has advanced to improve the performance of the VANET environment. Advancement shows that number of routing error messages has been removed that present in ADOV routing protocol.

Rani, P.K. (2014) [4], In multi hop heterogeneous, data packets should be sent efficiently from source to destination. Thus this paper brings the concentration on the straight-line routing v2 algorithm which is an optimized proposed model for multi hop heterogeneous in WSN. This paper focus on the advent of next hop graph which is generated through the ring based super node structure. Results show that the proposed technique performs better in terms of accuracy, connectivity and topological characteristics also. Proposed approach follows the graph and cut algorithm where SLR evaluates the optimal path for data transmission. Experiments have shown that the proposed algorithm provides accuracy and efficacy.

Adnan Fida (2014) [5], focused on the selection of the path or route and its optimization in mobile sensor network. Transmission has been done between the source and the destination through multiple intermediate routers between them across presence of noise, path loss, multipath fading and interference. This paper proposes a route optimization technique known as COMPARE named as communication and

position aware reconfigurable route optimization which provides end to end transmission. This approach selects the route after checking the quality of the link of the network and this quality has been checked through the probability of the successfully receiving packets over a link. After the selection of the path, route is reconfigured. At the end, experiments has been performed and results shows that proposed approach is better than conventional approach.

S. No	Author	Proposal	Framework Used	Objective
1.	Cheng-Fu et al(2005)	SLR(Straight Line Routing Algorithm)	WSN (Wireless Sensor Network)	To accomplish the routing without broadcasting
2.	Kavitha Rani et al(2014)	Hybrid Routing Approach (Swarm Intelligence and Basic approach in computational efficiency)	WSN(Wireless Sensor Network)	The objective was to utilize the energy resources and reliable data delivery.
3.	Samanpreet Singh et al (2014)	Enhance AODV	VANETs (Vehicle Ad-Hoc Networks)	The objective of this study was to remove the errors that occurs at the time of routing process)
4.	Rani P.K et al(2014)	Straight Line Routing Algorithm	Multi Hop Heterogeneous Wireless Sensor Network	The objective was to optimize the routing data packets.
5.	Adnan	COMPARE	Realistic	The study
	Fida et al(2014)	Routing	Communication Environment	was conducted in order to improve the end-to-end throughput of the routes.

IV. CONCLUSION

As Wireless Sensor Network is the most prominent field for the researchers. It is a vast field in which lot of inventions are still pending to perform. All of the inventions has same objective as to increase the performance efficiency along with the lifetime of the network.

As concluded from the related work most of the research work focus on variety of aspects to enhance the performance, routing is one of the aspect from them. This study provides a review over the work that has been done for efficient routing in network.

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