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A COMPARATIVE STUDY ON VARIOUS ROUTING TECHNIQUES IN MOBILE WIRELESS SENSOR NETWORKS: A REVIEW

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Abstract— WSN have diverse applications and difficulties in the era. This comprise of hundreds and thousands of small sensors. Cluster head election issue is one of the essential QoS requirement of WSNs, yet this issue has not been sufficiently investigated in the set of cluster based sensor systems. Mobility plays a key part in the execution of the application. Lately, portability has turned into an important area of research for the WSN group. The expanding capacities and the diminishing expenses of portable sensors make versatile sensor systems. In spite of the fact that WSN arrangements were never imagined to be completely static, mobility was first viewed as having a few difficulties that expected to be succeed, including connectivity, scope, and energy utilization, among others. In this paper we will clarify the fundamental focal points and weaknesses of every routing technique.

Keywords— Wireless sensor networks; routing protocols; sensor nodes; mobility; fault tolerance; heterogeneity; portability; remote sensor system; versatility; energy utilization; quality of service.

INTRODUCTION

WSN are homogeneous or heterogeneous framework containing little gadgets called sensors nodes. These sensors are little, with constrained processing and figuring assets and they are reasonable contrasted with customary sensors [1]. These sensor hubs can sense, measure, and assemble data from nature and, in light of some nearby choice methodology; they can transmit the sensed information to the client. Shrewd sensor hubs are low power gadgets furnished with one or more sensors, a processor, memory, a force supply, a radio, and an actuator. An assortment of mechanical, warm, organic, synthetic, optical, and attractive sensors may be joined to the sensor hub to gauge properties of the earth. Since the sensor hubs have restricted memory and are regularly conveyed in hard to-get to areas, a radio is executed for remote correspondence to exchange the information to a base station (e.g., a portable computer, an individual handheld gadget, or an entrance point to an altered framework). Battery is the primary force source in a sensor hub. Auxiliary power supply that gathers power from the earth, for example, sun oriented boards may be included to the hub depending on the fittingness of nature where the sensor will be conveyed. Contingent upon the application and the sort of sensors utilized, actuators may be joined in the sensors [7].

Remote sensor system (WSN) applications regularly include the perception of some physical marvel through examining of the earth. Versatile remote sensor systems (MWSNs) are a specific class of WSN in which portability assumes a key part in the execution of the application. Lately, versatility has turned into a huge examination region for the WSN. Despite the fact that WSN arrangements were never imagined to be completely static, portability was at first viewed as having a few difficulties that expected to be succeed, including integration, scope, and vitality utilization, among others. Be that as it may, late studies have been demonstrating portability in a more positive light. As opposed to confounding these issues, it has been exhibited that the presentation of versatile substances can resolve some of these issues. Furthermore, versatility empowers sensor hubs to target and track moving phenomena, for example, substance mists, vehicles, and bundles [8].

A standout amongst the hugest difficulties for MWSNs is the requirement for localization. In request to comprehend sensor information in a spatial connection, or for proper navigation throughout a sensing region, sensor position must be known. Because sensor nodes may be deployed dynamically (i.e., dropped from an aircraft), or may change position during run-time (i.e., when attached to a shipping container),there may be no way of knowing the location of each node at any given time. For static WSNs, this is not as much of a problem because once node positions have been determined, they are unlikely to change. On the other hand, mobile sensors must frequently estimate their position, which takes time and energy, and consumes other resources needed by the sensing application. Furthermore, localization schemes that provide high-accuracy positioning information in WSNs cannot be employed by mobile sensors, because they typically require centralized processing, take too long to run, or make assumptions about the environment or network topology that do not apply to dynamic networks.

This paper makes us enable to identify the different dimensions of clustering techniques in WSNs and MWSN to solve the energy limitation problem in these networks [11].

VARIOUS ISSUES AND ROUTING CHALLENGES

Despite of various advantages these networks have various restrictions i.e. limited energy supply, limited computing power, limited bandwidth etc. We are summarizing routing challenges and design issues:

1. Heterogeneous Nodes: All the sensor nodes are considered to be of same type i.e., all the nodes have same capacity in terms of calculation, communication, and power. However, depending upon the work done all the nodes have different responsibilities. There exists many technical issues related to the data. For example, some may require collection of sensors for the calculation of temperature, pressure and humidity of the environment, detecting motion via acoustic signatures, and taking images and video of particular object [4] .

2. Scalability: There may be large amount of nodes according detected by sensors[2].The quantity can be hundred and thousand. The routing technique which we are going to use should be able to cope up. Sensor system directing conventions ought to be sufficiently adaptable to react to environment. Until anything happens, the greater part of the sensors can stay in the slumber state, with information from the few remaining sensors giving a coarse quality.

3. Network Dynamics: The majority of the system architectures expect that sensor nodes are stable[2]. Versatility of both BS's or sensor node is now and again useful in various applications. Directing messages from or to moving nodes is additionally difficult since condition turns into a critical issue, with data transmission and so on.

4. Network connectivity: High node thickness in sensor systems blocks them from being totally attached to one another. In this way, sensor nodes are required to be exceptionally associated. This, then again, may not keep the system topology from being variable and the system size from being contracting because of sensor nodes disappointments. Furthermore, integration relies on upon and perhaps irregular distribution of nodes [2].

5. Quality of Service: In a few applications, information to be conveyed inside a certain span of time from the minute it is sensed, generally the information will be pointless[4]. Then again, in many applications, preservation of energy, which is straightforwardly identified with system lifetime, is considered moderately more critical than the nature of information sent. As the energy gets exhausted, the system may be required to decrease the nature of the result so as to diminish the energy dispersal in the nodes and consequently extend the aggregate system lifetime.

6. Fault Tolerance: Some sensor nodes may be hindered because of absence of energy, physical harm, or ecological impedance[4]. The disappointment of sensor nodes should not influence the general working of the sensor system. In the event that numerous nodes fail, MAC must suit development of new connections and courses to the information gathering base stations.

7. Data Reporting Model: Information sensing and reporting in WSNs is reliant on the application and the time criticality of the information reporting. Information reporting can be sorted as either time-driven(continuous), occasion driven, question driven . The time-driven model is suitable for applications that require occasional information observing. In that capacity, sensor nodes will occasionally switch on their sensors and transmitters, sense the environment and transmit the information at consistent occasional time intervals. In occasion driven and question driven models, sensor nodes respond promptly to sudden and radical changes in the estimation of a sensed credit because of the event of a certain occasion or an inquiry is created by the BS. Thusly, these are appropriate for time basic applications. A result of the past models is additionally conceivable [4].

VARIOUS CLUSTERING TECHNIQUES

1. Network structure based clustering

1.1 Flat routing

In flat routing systems, every node regularly assumes the same part and sensor node work together to perform the sensing. Because of the vast number of such nodes, it is not possible to allot a global identifier to every node. This thought has lead information to be centralized, where the BS sends questions to specific locales and sits strictly for information from the sensors placed in the chosen areas. Since information is being asked for through inquiries, quality based naming is important to indicate the properties of information.

- **SPIN(Sensor convention for data by means of arrangement):**

These protocols make utilization of the property that nodes that are close enough have comparative information, and consequently there is a need to just convey the information that different nodes don't work together. Nodes running SPIN allocate and abnormal state name to totally depict their gathered information (called meta-information) and perform meta-information arrangements before any information is transmitted. This guarantees that there is no repetitive information sent all through the system. The semantics of the meta-information configuration is application-dependent and is not tagged in SPIN. Sensors may use their remarkable IDs to report meta-information in the event that they cover a certain known area. For eg, SPIN has admittance to the current vitality level of the nodes and adjusts the convention it is running in view of the amount of vitality is remaining [3].

- **Rumor routing:**

Rumor routing is a type of diffusion and is essentially expected for applications where geographic routing is not applicable. When all is said in done, coordinated dispersion uses flooding to infuse the query to the whole system when there is no geographic basis to diffuse undertakings. Nonetheless, now and again there is just a little measure of information asked for from the nodes and therefore the utilization of flooding is pointless. An option methodology is to surge the occasions if the quantity of occasions is little and the quantity of inquiries is expansive. The key idea is to course the questions to the nodes that have observed a specific occasion as opposed to flooding the whole system to recover data about the specific occasions. At the point when a node identifies an occasion, it adds such occasion to its table, called 11events table, and creates an agent. Agent travels to every part of the system so as to engender data about nearby occasions to removed nodes. At the point when a node creates an inquiry for an occasion, the node that know the course, may react to the question by examining its occasion table. Subsequently, there is no need to surge the entire system, which lessens the correspondence cost [2].

• **Minimum Cost Forwarding Algorithm (MCFA):**
The MCFA algorithm exploits the way that the way of routing is constantly known, that is, towards the base-station. Subsequently, a sensor node does not require having an extraordinary ID nor keeping up a routing table. Rather, every node keeps up the least estimate from itself to the base-station. Every message to be sent by the sensor node is show to its neighbors. At the point when a node gets the message, it checks that it is on the minimum expense way between the sensor node and the base-station. In the event that this is the situation, it re-shows the message to its neighbors. This procedure repeats until the base-station is arrived at destination. In MCFA, every node should to know the way assess from itself to the base-station. This is acquired as follows. The base-station shows a message with the expense set to zero while each node at first set its minimum expense to the base-station to infinity (∞). Every node, after accepting the message began at the base-station, verifies whether the evaluation in the message in addition to the link on which it is received is not exactly the same. If yes, the current estimation and the estimation in the show message are updated. If the telecast message is upgraded, then it is re-sent; else, it is cleansed and nothing further is carried out. Nonetheless, the past technique may bring about a few nodes having numerous redesigns and those nodes far from the base-station will get more overhauls from those closer to the base-station[12].

2. Hierarchical Routing

Progressive directing is a productive approach to lower energy utilization inside a clustering and by performing information total and combination to reduce the quantity of transmitted messages to the BS. This process is mostly two-layer routing where one layer is utilized to choose cluster heads and the other layer is utilized for routing. Most systems in this class are not about routing, rather on "who and when to send or procedure/total" the data, channel portion and so forth, which can be orthogonal to the multihop steering capacity [11].

- **LEACH Protocol:**

Low Energy Adaptive Clustering Hierarchy ("LEACH") is a TDMA-based MAC convention which is incorporated with grouping and a straightforward directing convention in remote sensor systems (WSNs). The objective of LEACH is to bring down the vitality utilization needed to make and keep up bunches so as to enhance the life time of a remote sensor system. Drain is a progressive convention in which most hubs transmit to group heads, and the bunch heads total and pack the information and forward it to the base station (sink). Every hub utilizes a stochastic calculation at each round to figure out if it will turn into a bunch head in this round. Filter expect that every hub has a radio capable to such a degree as to specifically achieve the base station or the closest bunch head, however that utilizing this radio at full power all the time would squander vitality. Hubs that have been bunch heads can't get to be group sets out again toward P rounds, where P is the wanted rate of group heads[5].

- **Power-Efficient Gathering in Sensor Information Systems (PEGASIS):**

The convention, called Power-Efficient Gathering in Sensor Information Systems (PEGASIS is a close ideal chain-based protocol. The essential idea of the convention is that so as to extend system lifetime, nodes require just to communicate with their closest neighbors and they alternate in corresponding with the base-station. At the point when the round of all nodes communicate with the base-station closes, another round will begin etc. This reduces the force needed to transmit information every round as the force depleting is spread consistently over all hubs. Thus, PEGASIS has two fundamental goals. In the first place, expand the lifetime of every node by utilizing procedures and accordingly the system lifetime will be expanded. Second, permit just nearby coordination between nodes that are near one another so that the data transfer capacity devoured in correspondence is decreased. Dissimilar to LEACH, PEGASIS avoids cluster arrangement and uses stand out node in a fasten to transmit to the BS as opposed to utilizing numerous nodes [6].

- **Threshold-sensitive Energy Efficient Protocols (TEEN and APTEEN):**

Two various leveled directing conventions called TEEN (Threshold-touchy Energy Efficient sensor Network convention), and APTEEN (Adaptive Periodic Threshold-delicate Energy Efficient sensor Network convention) are proposed for basic applications. In TEEN, sensor nodes sense the medium persistently, yet the information transmission is carried out less much of the time. A group head sensor sends its individuals a hard limit, which is the edge estimation of the sensed attribute and a delicate edge, which is a little change in the estimation of the sensed characteristic that triggers the node to switch on its transmitter and transmit. In this way the hard threshold tries to reduce the quantity of transmissions by permitting the nodes to transmit just when the sensed quality is in the scope of investment. A little estimation of the threshold gives a more exact picture of the system[7].

- **Sensor Aggregates Routing:**

In this, a set of algorithm for building and keeping up sensor totals were proposed. The target is to on the whole screen target action in a certain situation (target following applications). A sensor total contains those nodes in a system that fulfill a gathering predicate for a community preparing undertaking. The parameters of the predicate rely on upon the undertaking. Sensors in a sensor field is partitioned into cluster as indicated by their sensed sign quality, so that there is peak per cluster. At that point, local group leaders are chosen. To choose a cluster, data trades between neighboring sensors are variable. On the off chance that a sensor, in the wake of trading parcels with all its one-jump neighbors, observes that it is higher than all its one-bounce neighbors on the sign field scene, it announces itself a leader. This leader based following calculation expect the special leader knows the land area of the joint effort[4].

3. Routing Protocols based on Protocol Operation

- **Multipath routing Protocols**:

In this subsection, we think about the directing protocols that utilize various ways as opposed to a solitary way to improve the system execution. The adaptation to internal failure (flexibility) of a convention is measured by the probability that another way exists between a source and a destination when the essential way fails. This can be expanded by maintaining various ways between the source and the destination. These other ways are kept alive by sending messages [2].

The SPIN family conventions examined prior and the conventions are illustrations of arrangement based on routing conventions. The inspiration is that the utilization of flooding to scatter information will deliver implosion and cover between the sent information, subsequently nodes will get copy duplicates of the same information. This operation acquires more data additionally handling by sending the same information by different sensors. The SPIN conventions are intended to scatter the information of one sensor to all different sensors expecting these sensors are potential base-stations. Consequently, the fundamental thought of arrangement based routing in WSNs is to make copy data and keep repetitive information from being sent to the following sensor or the base-station by leading a progression of transaction messages [3].

- **QoS-based routing:**

In QoS-based routing protocols, the network needs to balance between energy utilization and information quality. Specifically, the system needs to fulfill certain QoS measurements, e.g., delay, vitality, data transfer capacity, and so forth when conveying information to the BS. Sequential Assignment Routing (SAR) proposed in is one of the first directing conventions for WSNs that presents the thought of QoS in the routing decision. Directing choice in SAR is reliant on three components: energy resources, QoS on every way, and the need level of every packet. To stay away from single path failure, a multi-way approach is utilized and restricted way rebuilding plans are utilized. To make various ways from a source node, a tree established at the source node to the destination node (i.e., the set of base-stations (BSs)) is assembled [2].

CONCLUSION

Generally, the directing methodologies are described considering the framework structure into three classes: Flat, Hierarchical and location based routing techniques. Besides, these traditions are divided into multipath-based, query based , location based, or QoS-build directing system depending regarding the protocol operation. We in like manner highlight the layout tradeoffs in middle of energy and correspondence. There are still numerous difficulties in the event of sensor systems that can be talked about in future headings.

REFERENCES:

[1] S. A. Munir, B. Ren, W. Jiao, B. Wang, D. Xie, and J. Ma, "Mobile Wireless Sensor Network: Architecture and Enabling Technologies for Ubiquitous Computing," *21st International Conference on Advanced Information Networking and Applications Workshops (AINAW'07)*, pp. 113–120, 2007.

[2] M. P. Singh and D. K. Singh, "Routing Protocols in Wireless Sensor Networks –A Survey," *International Journal of Computer Science & Engineering Survey*, vol. 1, no. 2, pp. 63–83, 2010.

[3] R. U. Anitha and P. Kamalakkannan, "Enhanced cluster based routing protocol for mobile nodes in wireless sensor network," in *2013 International Conference on Pattern Recognition, Informatics and Mobile Engineering*, 2013, pp. 187–193.

[4] K. Musale, "Analysis of Cluster Based Routing Protocol for Mobile Wireless Sensor Network," *International Journal of Advanced Trends in Computer Science and Engineering*, vol. 2, no. 1, pp. 124–129, 2013.

[5] P. Kumari, M. Singh, and P. Kumar, "Cluster head selection in mobile wireless sensor networks: a survey," *International Conferences on Advances in Computing and Communication*, pp. 978–981, 2013.

[6] R. U. Anitha, "EEDBC-M : Enhancement of Leach-Mobile protocol with Energy Efficient Density-based Clustering for Mobile Sensor Networks (MSNs)," *International Journal of Computer Applications*, vol. 74, no. 14, pp. 19–27, 2013.

[7] R. U. Anitha and P. Kamalakkannan, "Energy efficient cluster head selection algorithm in mobile wireless sensor networks," in *2013 International Conference on Computer Communication and Informatics*, 2013, pp. 1–5.

[8] M. Azharuddin, P. Kuila, and P. K. Jana, "A distributed fault-tolerant clustering algorithm for wireless sensor networks," in *2013 International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, 2013, pp. 997–1002.

[9] M. Arshad, M. Alsalem, F. a. Siddqui, N. Kamel, and N. M. Saad, "Efficient cluster head selection scheme in Mobile Data Collector based routing protocol," *2012 4th International Conference on Intelligent and Advanced Systems*, pp. 280–284, Jun. 2012.

[10] J. D. Gaurkar and K. Dhote, "Review paper on design of distributed Energy Efficient and Reliable Routing Protocol for Wireless Sensor Networks," *International Journal For Research In Emerging Science And Technology*, vol. 1, no. 4, pp. 41–46, 2014.

[11] P. Madhumathy and D. Sivakumar, "Mobile Sink Based Reliable And Energy Efficient Data Gathering Technique For WSN," *Journal of Theoretical and Applied Information Technology*, vol. 61, no. 1, pp. 1–9, 2014.

[12] M.Raja," The Minimum Cost Forwarding Using MAC Protocol for Wireless Sensor Networks, " *International Journal of Modern Engineering Research*, vol. 2, no. 4, pp. 4122-4127, 2012.