Volume 6, Issue 4, April 2016 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

River Based Formation Routing in WSN: A Survey

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Abstract*— Wireless sensor network is emerging field because of its wide applications in various fields and least cost. A wireless sensor network is a group of small sensor nodes which communicate through radio interface. These sensor nodes are composed of sensing, computation, communication and power as four basic working units. But limited energy, communication capability, storage and bandwidth are the main resource constraints. This survey is based on various aspects of wireless sensor networks. In multi-hop routing, the sensed data is relayed through multiple nodes to the base station, it uses less energy and introduced into survey a introduced a new mechanism for data collection and routing based on River Formation Dynamics.

***Keywords*— WSN, RFD, Routing in WSN**

I. INTRODUCTION

WSNs were primarily introduced for the defense application and so the target here is to watch activity of enemy with none human interference. A low-flying plane, ground vehicle or a powerful laptop computer acted as a base station to collect information from all detector nodes. WSNs are going to be presume as a special case of impromptu networks. WSN unit sometimes assumed to be energy restrained as a results of very little size detector node. detector nodes that unit really little in size accommodates a sensing unit, process unit, and geographic positioning system, power give unit like battery or electrical device and communication components like radio systems.[1] The position or location of these very little detector nodes needn't be absolute which we'll get position of the node exploitation GPS; this not only offers random placement but together implies that protocols of detector networks and its algorithms ought to possess self organizing skills in inaccessible areas. Distributed or unfold detector networks (DSNs)[12] have recently emerged as a really necessary analysis area. This development has been spurred by advances in detector technology and laptop networking. it's economically attainable to implement DSNs, but there unit several technical challenges that should be overcome before DSNs are going to be used for today's increasingly advanced activity tasks.[1]

The WSNs is formed of few to several thousands of sensors of nodes, where each and every node is connected to one or many detector nodes. offer node is connected to a central entree, together called as base station. Central entree provides a affiliation to world through utterly completely different communication channels (internet, Wi-Fi, WI-Max, wired computer network etc.). Figure: one shows data assortment from utterly completely different nodes that a lot of processed and analyzed.

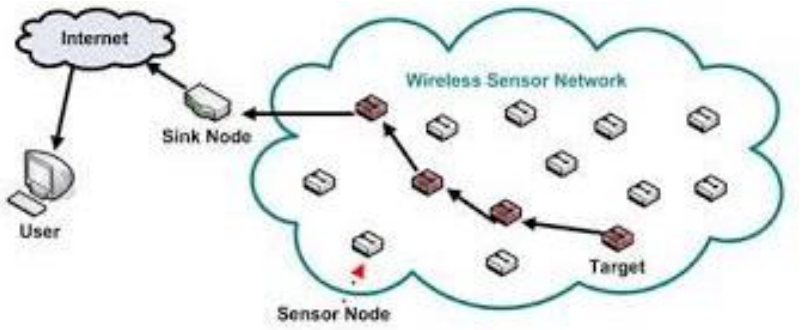

Fig 1: Wireless Sensor Network[10]

II. COMPONENTS OF WSN

Sensor Node:

Sensor nodes are generally consist of few sensors and processing unit/mote as shown in figure: 2. a sensor is device which senses the information and pass it on to mote. Sensor are typically used to measure the change in physical environmental parameters like temperature, pressure, humidity, sound and change in the health parameter of person e.g. heartbeat and blood pressure.

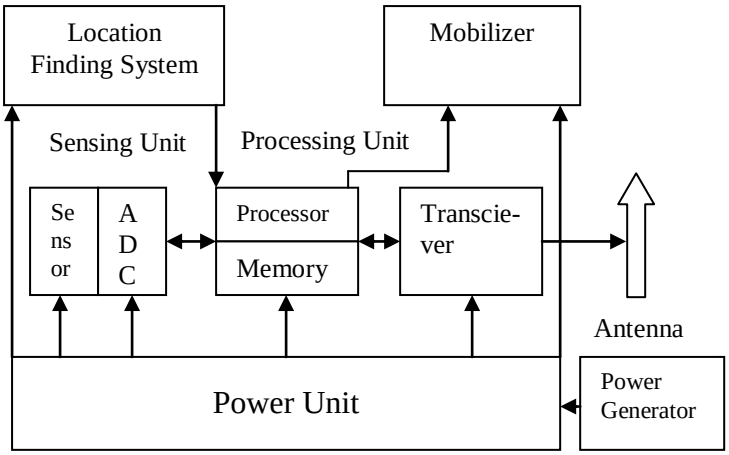

Fig 2: Block diagram sensor networks

Base Station:

Different wireless detector network square measure connected with base station. It consists of a chip, antenna, radio board and USB interface board. For communication with wireless detector nodes, Base station is pre-programmed with low-power mesh networking code. As all the detector nodes relinquishment their data to base station so it is important to deploy base station in wireless detector network. a lot of this data is analysed at base station for method and deciding. throughout preparation of base station in detector network coverage of detector nodes, Energy conservation and dependableness issues square measure taken care of. sometimes base stations square measure assumed static in nature but in some things, they are assumed to be mobile to assemble data from detector nodes.[2]

Fig 2 is also a diagram, basic cognitive process all totally different parts throughout a Distributed detector network from operational purpose of browse. the primary goal of detector networks is to create selections or acquire information supported the data consolidated from distributed detector nodes. among the lowest, detector node collects data from all totally different sensing events or conditions. associate initial process like data aggregation are going to be administrated at the native node to induce native event detection result. These intermediate results will then be integrated/ consolidated at associate higher method unit to derive information and facilitate making selections.[3] With the size of sensors getting shorter and thus the value of nodes getting cheaper, extra sensors are going to be deployed to achieve quality through quantity. On the other hand, sensors typically communicate through wireless communication media where the network system of measurement is way not up to for wired communication media. These issues bring new challenges to the look of DSNs: the communication system of measurement for wireless network plenty of lower; data volumes being integrated square measure abundant larger; the power resource on each detector is reasonably limited; fourth, the environment is extra unreliable and unsecure, inflicting unreliable network affiliation and increasing the similarity of data file to be in faulty.[3]

III. RELATED STUDY

Wireless device Networks (WSNs) are extensively utilised in numerous real time applications like military, medical, disaster detection, structural looking at, etc. These WSNs contains broad set of small device nodes, deployed inside the atmosphere for looking at environmental parameters like wetness, temperature, pressure, etc.[1] The wireless device nodes sense the information from atmosphere supported the appliance and forwards to the central base station or sink for any method. This technique is termed data assortment, that's that the first task of the WSNs. In data assortment technique, the device nodes forward the information to the central base station either by direct communication or by multi-hop communication.[2] The direct communication from device nodes to base station is energy expensive due the gap between device nodes and base station may be a heap of, this reduces the life of the network. instead, Multi-hop communication schemes are used for higher network life and performance as a results of its effective utilization of resources.[3] In multi-hop communication, every device node is busy in forwarding the sensed/received data to nearest intermediate (neighbor) nodes or to very cheap station mistreatment multi-hop routing ways that. throughout this technique, alternative of next (neighbor) node in routing path is very necessary for forwarding data.[4] consecutive node or forwarding node inside the routing path is not alone meant for relaying the information, but put together useful for aggregating the information. data aggregation or data fusion techniques are accustomed shrink the dimensions of the information packet to be transmitted to next node by aggregating the data or by eliminating similar data, received from previous nodes.[5] Multi-hop techniques improve the energy conservation of node and so the life of the network. Swarm intelligence is one in each of the mechanism used for locating the suitable nodes inside the routing path between device nodes and so the bottom station.[6] In WSNs, swarm intelligence mechanisms like hymenopteran colony, bee colony, etc., are already accustomed elect consecutive node inside the routing path. A nature galvanized mechanism said as stream Formation Dynamics (RFD) are introduced in WSNs for applicable node alternative in multi-hop routing. RFD mechanism is free from native cycles and this could be one in each of the facts making it applicable for path finding in WSNs. applicability of RFD mechanism in path finding for WSNs is explored. the two parameters hop count distance and residual energy are utilised by RFD for selecting the suitable nodes. The planned mechanism is termed as RFDMRP (River formation Dynamics

based Multi-Hop Routing Protocol). RFDMRP is enforced mistreatment MATLAB and performance is analyzed and compared with the prevailing rule like LEACH and MODLEACH. The metrics network life and energy consumption are used for comparison.[1]

IV. ROUTING SCHEMES IN WSN

Routing may be outlined as a method [9] of finding a path between the supply node and therefore the sink or destination node to perform knowledge transmission. In WSNs the network layer is oftenly accustomed implement the routing of the incoming knowledge. As we all know that usually in multi-hop networks the supply node cannot reach the sink node directly. So, intermediate sensing element nodes have to be compelled to forward their packets to the destination nodes. The formation of routing tables provides the answer. These contain the lists of node possibility for any given packet destination. Routing table is that the task of the routing rule along side the assistance of the routing protocol for his or her construction and maintenance [2].

According to antecedently done analysis work WSN Routing Protocols may be classified [7] into 5 ways that, in keeping with the manner of creating the routing methods, in keeping with the network structure, in keeping with the protocol operation, in keeping with the instigator of communications, and in keeping with however a protocol chooses a next-hop on the route of the forwarded message, as shown in Figure 3.

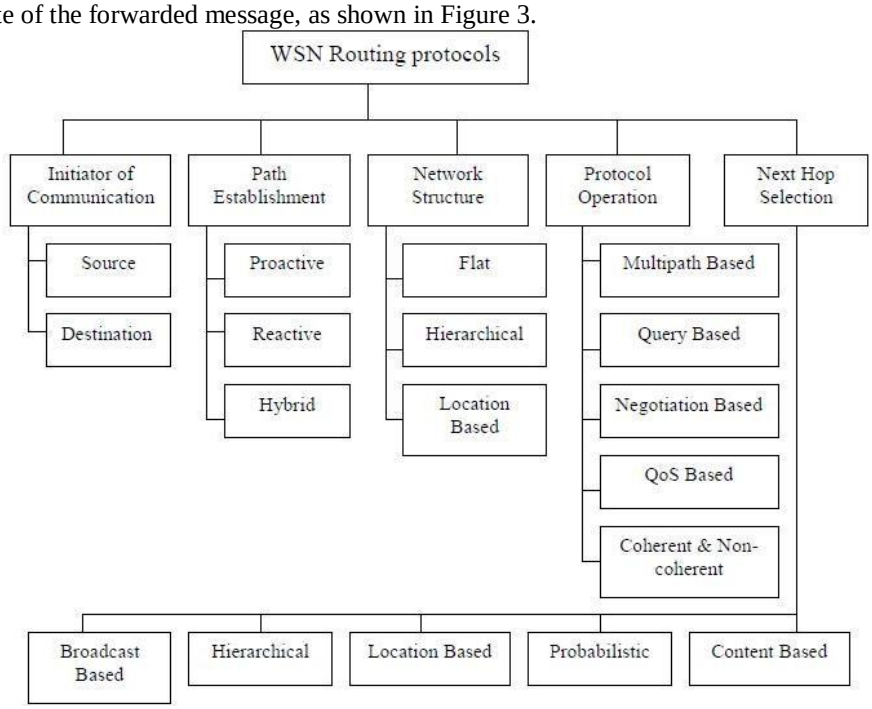

Fig 3: WSN Routing Protocols Classification

Network Structure Based Protocols: The underlying network structure can play significant role in the operation of the routing protocol in WSNs. In this section, we survey in details most of the protocols that fall below this category.

Flat Routing: The first category of routing protocols are the multihop flat routing protocols. In flat networks, each node typically plays the same role and sensor nodes collaborate together to perform the sensing task. Due to the large number of such nodes, it is not feasible to assign a global identifier to each node. This consideration has led to data centric routing, where the BS sends queries to certain regions and waits for data from the sensors located in the selected regions. Since data is being requested through queries, attribute-based naming is necessary to specify the properties of data.

Hierarchical Routing: Hierarchical or cluster-based routing, originally proposed in wireline networks, are well-known techniques with special advantages related to scalability and efficient communication. As such, the concept of hierarchical routing is also utilized to perform energy-efficient routing in WSNs. In a hierarchical architecture, higher energy nodes can be used to process and send the information while low energy nodes can be used to perform the sensing in the proximity of the target. This means that creation of clusters and assigning special tasks to cluster heads can greatly contribute to overall system scalability, lifetime, and energy efficiency. Hierarchical routing is an efficient way to lower energy consumption within a cluster and by performing data aggregation and fusion in order to decrease the number of transmitted messages to the BS. Hierarchical routing is mainly two-layer routing where one layer is used to select clusterheads and the other layer is used for routing. However, most techniques in this category are not about routing, rather on ”who and when to send or process/aggregate” the information, channel allocation etc., which can be orthogonal to the multihop routing function.

Location based routing protocols: In this kind of routing, sensor nodes are addressed by means of their locations. The distance between neighboring nodes can be estimated on the basis of incoming signal strengths. Relative coordinates of neighboring nodes can be obtained by exchanging such information between neighbors [20], [21], [30]. Alternatively, the location of nodes may be available directly by communicating with a satellite, using GPS (Global Positioning

System), if nodes are equipped with a small low power GPS receiver. To save energy, some location based schemes demand that nodes should go to sleep if there is no activity. More energy savings can be obtained by having as many sleeping nodes in the network as possible. The problem of designing sleep period schedules for each node in a localized manner was addressed in [25]. In the rest of this section, we review most of the location or geographic based routing protocols.

Routing Protocols based on Protocol Operation: In this section, we review routing protocols that different routing functionality. It should be noted that some of these protocols may fall below one or more of the above routing categories.

Multipath routing protocols: In this subsection, we study the routing protocols that use multiple paths rather than a single path in order to enhance the network performance. The fault tolerance (resilience) of a protocol is measured by the likelihood that an alternate path exists between a source and a destination when the primary path fails. This can be increased by maintaining multiple paths between the source and the destination at the expense of an increased energy consumption and traffic generation. These alternate paths are kept alive by sending periodic messages. Hence, network reliability can be increased at the expense of increased overhead of maintaining the alternate paths.

Query based routing: In this kind of routing, the destination nodes propagate a query for data (sensing task) from a node through the network and a node having this data sends the data which matches the query back to the node, which initiates the query. Usually these queries are described in natural language, or in high-level query languages. For example, client C1 may submit a query to node N1 and ask: Are there moving vehicles in battle space region 1?. All the nodes have tables consisting of the sensing tasks queries that they receive and send data which matches these tasks when they receive it. In directed diffusion, the BS node sends out interest messages to sensors. As the interest is propagated throughout the sensor network, the gradients from the source back to the BS are set up. When the source has data for the interest, the source sends the data along the interests gradient path. To lower energy consumption, data aggregation (e.g., duplicate suppression) is performed enroute.

Negotiation based routing protocols: These protocols use high level data descriptors in order to eliminate redundant data transmissions through negotiation. Communication decisions are also taken based on the resources that are available to them. The SPIN family protocols [3] discussed earlier and the protocols in [7] are examples of negotiation based routing protocols. The motivation is that the use of flooding to disseminate data will produce implosion and overlap between the sent data, hence nodes will receive duplicate copies of the same data. This operation consumes more energy and more processing by sending the same data by different sensors. The SPIN protocols are designed to disseminate the data of one sensor to all other sensors assuming these sensors are potential base-stations. Hence, the main idea of negotiation based routing in WSNs is to suppress duplicate information and prevent redundant data from being sent to the next sensor or the base-station by conducting a series of negotiation messages before the real data transmission begins.

QoS-based routing: In QoS-based routing protocols, the network has to balance between energy consumption and data quality. In particular, the network has to satisfy certain QoS metrics, e.g., delay, energy, bandwidth, etc. when delivering data to the BS.

Coherent and non-coherent processing: Data processing is a major component in the operation of wireless sensor networks. Hence, routing techniques employ different data processing techniques. In general, sensor nodes will cooperate with each other in processing different data flooded in the network area. Two examples of data processing techniques proposed in WSNs are coherent and non-coherent data processing-based routing [11]. In non-coherent data processing routing, nodes will locally process the raw data before being sent to other nodes for further processing. The nodes that perform further processing are called the aggregators. In coherent routing, the data is forwarded to aggregators after minimum processing. The minimum processing typically includes tasks like time stamping, duplicate suppression, etc. To perform energy-efficient routing, coherent processing is normally selected.

V. RIVER FORMATION DYNAMICS

River Formation Dynamic is improvement methodology and a collection topic of swarm intelligence. River Formation Dynamic depends on replicating the construct of but water drops combine to make rivers and rivers in turn combine to hitch the ocean by selecting the shortest path supported altitudes of the land through that they flow. among the tactic of stream formation, the water drops unit of measurement constantly flowing from higher altitude position to lower altitude positions. Since, the slope of the two positions is extra, then the water flowing from higher positions to lower positions erode and carry the worn soil to be deposited among the lower positions. By this layer the altitude of the lower position get increased. to boot shortest path is formed from higher to lower position.[1]

The process of in the River Formation Dynamic main contains two stages viz., format stage and stream formation stage. In format stage, three whole totally different positions (called water drop generating positions or provide (S), intermediate positions (I), and destination (D) or sea) unit of measurement initialized. of those positions unit of measurement represented with whole totally different altitude worth (S which i unit of measurement represented with positive altitude values and D is represented with Zero). The water drop generating positions constantly generates water drops. The intermediate positions receives the water drops from provide and forward towards the ocean. In stream formation stage, the stream is created between drop generating positions and ocean exploitation the unvaried technique having the functions select−Forward−Position(), move−Drops(), erode−Path(), and add−Sediments(). The unvaried technique is continual until either all drops follow an identical path or satisfying the other ending conditions like restricted type of iterations, restricted execution time. there is similarity a between and d River Formation Dynamic ata assortment processes in Wireless sensor network. In , River Formation Dynamic the availability (drop generating) River

Formation Dynamic positions generate water drops Associate in Nursingd these water drops have an interest to satisfy the destination or ocean. Similarly, in Wireless sensor network data assortment technique, the detector nodes generate the data and this information is interested to attain the lowest station. Hence, the detector data act like water drops, the availability positions like detector nodes, and base station as ocean. The drops unit of measurement combined and flows from provide to ocean to make the rivers supported altitude worth of position in . among identical due to forward the data in WSNs, the detector nodes can kind a path to the lowest station supported hop-count and residual energy.

RFDMRP, a multi-hop routing protocol, is planned for information assortment in Wireless sensor network. Associate in Nursing example network having one hundred every which way deployed device nodes and a base station bestowed in middle of the network. the bottom station divides the network into varied regions like R1, R2, R3, etc. Initially, during this stage, all the device nodes square measure every which way placed within the setting depends on the appliance. All nodes within the network computes its hop count distance from the SB. For calculation of hop count, SB broadcasts the Beacon message containing its identity. The node, that receives the Beacon signal responds with its id and its location coordinates. SB calculate the hop count from every node victimization the node coordinates and send the hop count worth to nodes. every device node stores hop count worth in Neighbor Node data table (NN table). The NN table comprises Next−Node, Hop Count between Next node and SB (HC−BS), Neighbor Node Remaining Energy (NNRE), Distance (Distance between supply node and next node), and Distance from next node to SB (D−to−BS). To calculate the neighbor node data, supply nodes (Src−ID) sends missive of invitation packet to the neighboring nodes. The neighboring (Dest−ID) node upon receiving REQUEST packet, search in its NN table for HC−BS, NNRE, and Coordinates. Then, it replies with the REPLY packet to the supply node (Src−ID) then supply node updates its NNtable.

In this stage, path is chosen between supply nodes and therefore the SB by choosing the forward node victimization River Formation Dynamic mechanism. Once the trail is chosen, the supply node uses the chosen path to relay the information to SB. This stage consists of 3 steps: 1) Forward Node choice 2) mixture and Forward {the data|the info|the data} 3) Update Energy of every Node and NN information table.

In WSN, multi-hop routing is a good mechanism for information assortment. In multi-hop routing, the choice of forward node for relaying information plays a significant role. during this paper, one in every of the swarm intelligence mechanisms, , is employed to propose RFDMRP. RFDMRP, is Associate in Nursing based mostly multi-hop routing protocol for information assortment in WSN to conserve River Formation Dynamic energy and expand the network period. In RFDMRP, considers the hop count worth and residual energy as parameters for forward node choice.

VI. CONCLUSION

Wireless Sensor Networks are one of the emerging fields in research area. Wireless sensor networks has a remarkable feature to monitor environmental and physical phenomenon River Formation Dynamic such are temperature, pressure, humidity etc.. In this paper we discussed various aspects of wireless sensor networks and also discussed various types of WSNs and their applications and classify various categories of routing protocols. The routing protocols in WSN has become one of the most important research areas and introduced unique challenges compared to traditional data routing in wired networks. The main aim behind the routing protocol design is to keep the sensors operating for a long time, thus extending the network life time. Although many routing protocols have been proposed for sensor networks, many issues still remain to be addressed. In this paper, one of the swarm intelligence mechanisms, , River Formation Dyanamic is used to propose RFDMRP. RFDMRP, is an River Formation Dyanamic based multi-hop routing protocol for data collection in WSN to conserve energy and expand the network lifetime. In RFDMRP, considers the hop count value and residual energ River Formation Dyanamic y as parameters for forward node selection.

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