DEPENDABLE AND RELIABLE ROUTING WITH SPATIAL AND TEMPORAL FEATURES IN WIRELESS SENSOR NETWORKS

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ABSTRACT

In the world of computer Network, Wireless Sensor Network (WSN) is the latest research field. Because in WSN contains various varieties of real time applications. It also consist of individual and small sensor nodes which is applied in a remote area and it is useful to collect, detect and process data and broadcast it to the user. The nodes are able to move and synchronize with the neighbors in such network. Due to the mobility of nodes and nodes get added and removed, the network changes dynamically. In wireless sensor network, a geographical based multipath routing for in network data aggregation is proposed in this paper. Based on geographical distances routing path is selected and packets travel over lesser distance. Due to this energy efficiency is improves. The reliable of path ensures by the Multipath router and in case one path is failure then other path is always available. At cluster head, data is aggregated and forwarded the data towards sink. Also, in this paper we approach a Spatial based multipath routing for the network aggregation in Wireless sensor network

Index Terms - Wireless Sensor Networks, Energy Efficient, Reliable

I. INTRODUCTION

Alliance of electronics pasture, information technology is nothing but a wireless sensor network (WSN). It is spatially dispersed in individual devices that professionally sense physical or environmental conditions like sound, pressure, vibration, motion at different places etc [1]. The equation Sensing + CPU + Radio = Thousands of real time applications shows the idea of WSN. With the help of radio frequency channel (RF) the small size sensor network which is present in WSN gatherer the data, and process it at the time of comminuting with other nodes in the network. Routing is nothing but a process of determining path between source and destination for data transmission. For in network data aggregation in WSNs spatial based routing is implemented in this paper. Sensor node is normally unfeasible Due to node deployment recharging. Therefore, in wireless sensor network energy saving is one of the significant intend issues. The power consumption of sensors is dominated by data transmission and reception [2]. To prolong the lifetime of network should be required efficient energy and this is obtained by the scheming the routing protocol. Furthermore WSNs are a data ambitious network that generally manufactures big quantity of information that required to be routed frequently in a multihop fashion, towards the sink node. Data aggregation is one of the effectual techniques to save the energy in WSNs. Data in-network routing proposes for with obtainable dispensation ability transported by the intermediate sensor nodes along the routing paths. In this paper we approach a Geographical based multipath routing for in-network data aggregation in WSNs. The superfluous data are mislaid in data aggregation and it leads to minimize the communication cost. Which are further clues to find out the shortest multipath geographical based routing towards the sink node. [3]

Whereas, multipath geographical based routing towards the sink node. [1] The routing principle that trusts on geographic position information is nothing but a geographical routing. In 1980s, for routing by using position information idea are firstly proposed in the packet area networks. The own location is determined by the each node and the source is must be aware about the destination location is the requirement of a geographic routing [4]. How to give guarantee of the delivering the sense data even after interruption in communications and nodes failures are the main challenge in the routing algorithm. It is also become more critical when along with routing paths packets with aggregated data contains information from sources data aggregation is performed. If the packet is lost, a considerable amount of information also is lost. High aggregation rate, a reduced number of messages for setting up a routing tree, a reliable data transmission, and a reliable data transmission are the characteristics present in the data aggregation routing protocol, in the WSN context.

II. RELATED WORK

In the literature [1], [3] found a few approaches regarding the situation of Wireless Sensor Network, were data innetwork routing mentions to the dissimilar habits that intermediate nodes forwarded data packets to the sink node.

2.1 Tree structure Approaches

The hierarchical relationship of nodes in the network is established in the tree structure. The node selection is depend on the tree structure aggregation point works and followed preferred direction. When two or more than two data packets arrive at at the same node of a tree at that time routing of data aggregation is executed. Here this node aggregates its own data with all receivers' data and forwarded only one packet to its neighbors which is lower in the tree structure. If the packet is lost at an influenced level of a tree the data from the whole sub tree will also be lost as well due to the channel impairments. The conventional tree based protocol built the shortest path routing tree (SPT) [1]. The nodes reported its information with the help of shortest path to the sink node at the time of event detection [5], [6], [7].

The tree structure advantages are,

- Firstly create tree structure and then decided either react to the query sent or route the gathered data by the sink node [8], [9].
- Network use hierarchical relationship.
- The tree structure disadvantages are,
- Due to the channel impairments or technological difficulty, if the data lost at influenced level of the tree then whole data from the sub tree also be lost.
- Needs device for tolerance of fault to dependability forwarded data packets towards the sink node.

2.2 Clusters Structure Approaches

Here also nodes prearranged in hierarchical manner in the network in this approach. Were cluster are formed by dividing nodes partially. Here cluster head noting but a special node elected from the cluster which have high computing power and aggregated data and use to forward the result of such aggregation towards the sink node. Here the election of cluster head is done on the base of distance from the sink node. The nodes which is closer to the sink node elected as a cluster node. Gathering information from the remaining nodes and forwarding those gather data towards the sink node are the responsibilities of the cluster head [1], [6]. In the next section we proposed an algorithm which is used in the data aggregation with geographical base routing algorithm in the network. In this literature also found a Spatial-temporal correlation. Here this algorithm selects the cluster heads

are selected on the basis of the spatial correlation of the nodes in wireless sensor network and the residual power of each node. Where, these cluster-head nodes broadcast their status to other nodes in the network. Here each node decided that which cluster it want to belong and joint that particular cluster. And after that the each cluster head aggregate the data acquire by the nodes and forwarded towards the base station. Our simulation result clearly shows that our approach algorithm is clever to dispense energy indulgence evenly throughout the sensor nodes and prolong or increase the lifetime of the whole network effectively [10], [11], and [12].

III. SYSTEM ARCHITECTURE

Projecting a system architecture which is creating a geographical based multipath routing for in network aggregation in WSNs are our main goal. Our system architecture has different phases which are describe here.

3.1 Multipath Routing Table Creation

The multipath routes are created from the source node at the time of event detection, in the context of WSN. With the help of distance vector routing a multipath routing table is created. On the basis of geographical distances which recover the energy efficiency as packets portable over lesser distance, the routing path is selected. This provides the all possible path from the source node. Multipath routing gives guarantee that paths are trustworthy and in case if one path is failure then other path is always obtainable [13]. It is the routing technique of using multiple alternative paths through a network, which can be yield a variety of benefits such as increased bandwidth, fault tolerance, or improved security.



Figure 1: A Geographical Based Multipath Routing For In Network Aggregation in WSNS System

Architecture

3.2 Cluster Creation and Cluster Head Selection

In this approach the nodes which are closer to the sink node are selected as a cluster head. The cluster head which is nothing but a coordinator is elected on the basis of closest to the base station at the time of event detection through the one or more than one nodes. Else which is closest to the already established path is elected as coordinator or cluster head. Forwarding the data packets towards the sink node are responsibilities of a cluster head. It is also have a high computation power and residual energy. Here only one node is selected as coordinators that means leader and remaining nodes will be preserved as a collaborators. The coordinator gathers the information collected by the collaborators and sends them to the sink.

3.3 Geographical Based Routing

The method to transport a message to a node in a network is called as geometric routing. It is also called as position based routing. Routing decision is based on multipath routing table created by distance vector routing. Cluster head aggregate the data and forward that data towards the sink node. It is used multiple paths which is created with the help of distance vector routing and as a Euclidean distance calculates the distance among the two nodes and also on the base of its distance the next nodes are selected that is the shortest distance node is selected [14]. Every path created using multipath routing are calculated by cluster head and from this selected path, cluster head select the path which have shortest path to the sink [3]. Based on the location of sensor nodes, the routing is performed. Using distance vector routing, it select the best route according to the selection of multipath routing table for every node n. Multipath routing which is based on geographical safeguards that paths are reliable and in case one path is failure then there is always present the another path and data is aggregated by the cluster head and forwarded that data to the sink.

IV. PERFORMANCE EVALUATION

Based on the following factors our approach shows the algorithm performance

- Communication Cost
- If any aggregated data loss
- Total energy saved
- Whole distance saved
- Dependable data aggregation
- Total aggregation

4.1 Communication Cost

Extra the communication cost cause the climbable system, at the time of measuring the performance communication cost should be abridged.

4.2 If Any Aggregated Data Loss

It is one of the most significant presentation events completed the network. It is nothing but an amount of data lost at the time of routing.

4.3 Total Energy Saved

The saving the energy of sensor nodes is the result of data packets forwarded over the lesser distance.

4.3.1 Mathematical Model

Problem Definition:

Formation of geographic routing for in network aggregation in wireless sensor network.

Mathematical model project:

Let total number of wireless sensor networks be the N.

Let n_i be the single sensor node

Where $i = \{1, 2..., N\}$

Let $P_i = \{p_1, p_2, p_3, p_4, \dots, p_{mi}\}$ be the set m multiple paths for node n towards sink S.

Let (C_{l_i}, C_{a_i}) be the set of co-ordinates of node n.

Let (C_{l_s}, C_{a_s}) be the set of coordinates of sink, S.

We express our problematic as from any node n, to Sink S, aggregate the packets after any event and with the help of geographic routing find the shortest path to sink S.

4.3.2 Algorithm

Step1: With the help of distance vector routing, generate the multipath routing table for every node n.

Step2: Election of cluster head

The node which has highest outstanding energy will be elected as a cluster head and all remaining nodes in the cluster forwarded data towards the cluster head.

Step3: the multiple path which are generated in Step1 are taken by the cluster head to calculate the distance among two nodes using the equation

$$C(n_1, n_2) = \sqrt{(c_{l_1} - c_{l_2})^2 + (c_{a_1} - c_{a_2})^2}$$

Where,

 $C(n_1, n_2)$ is the distance between two nodes. And

$$C(c_{l_1}, c_{a_1}) \& C(c_{l_1}, c_{a_2})$$

Are coordinates of node n_1 , n_2 respectively.

The total distance for every path P_i is calculated by using the equation

$$C_{(n_i,s)} = \sum_{i=0}^{k} \sqrt{(c_{l_i} - c_{l_{i+1}})^2 + (c_{a_i} - c_{a_{i+1}})^2}$$

Where, K is the total number of nodes in path p_i .

Step4: After that the path which have shortest distance to the sink, is selected by the cluster head. Algorithm

Step1: Let x is a distance and μ is a time.

Were $x \rightarrow \mu$.

Step2: at the data aggregation,

Total distance =
$$x\mu + \sum_{i=1}^{\alpha} \sum_{i=1}^{\alpha} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{i=1}^{n} \sum_{i=1}^{n} \sum_{j=1$$

Where,

 μ_i is an ith aggregation time and i = {1, 2 ...n}

is a number of aggregation.

V. RESULT

Here, we show the result graph which shows the number of hops verses distance were number of hops increases, the distance will be increases.



Here, this graph represent that, at some number of hopes the time remain constant, after that there is found increment in time.



VI. CONCLUSION

In this paper, we have monitored the multipath routing which is based on the geographical. It is used to save the node energy and increased the lifetime of network model because it route the packets via shortest distance. As well as calculated aggregation also used for saving the energy. It is also used to verdict the trustworthy path from the present set of path. The time required for sending data is equal to the number of nodes present in that particular. The contribution of work is design system architecture. We trust that this will be help in fast construction, effective energy and dependable WSN applications.

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