Indonesian Journal of Electrical Engineering and Computer Science
Vol. 8, No. 3, December 2017, pp. 662 ~ 666
DOI: 10.11591/ijeecs.v8.i3.pp662-666

Diminishing Connectivity Failures by Auto-Reconfiguration in WSN

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Abstract

The Wireless Sensor Network is one of the most significant purposes behind the accomplishment of long range wireless communication. Frequent connectivity failures are occurred in the sensor-organised network due to obstruction, snags, message drop because of node energy depletion; obstacle and so forth. The total communication gets collapsed if there any lessening in the nature of correspondence or quality between the sensor nodes or from the sensor nodes to the sink nodes and this prompts to connection failures. To overcome the frequent connectivity failures we propose Diminishing Connectivity Failures by Auto-Reconfiguration in WSN (DCFA). This scheme provides steadfast routes to reduce the connectivity failure and improve the network performance.

Keywords*: Auto-Reconfigurable, Steadfast Routing, WSN.*

1. Introduction

Wireless Sensor Networks (WSNs) are used for several applications by employing a set of mobile sensor nodes to collaboratively monitor an area of interest and track certain events or phenomena. With the most elevated development in the field of embedded computer and sensor innovation, WSN, which is made out of a several thousands of sensor nodes equipped for detecting, actuating, and handing-off aaggregated statistics, have made remarkable impact all over the place. These sensor nodes ought to be steadfast, energy efficient, implanted with reconfigurable device.

The assets of the nodes are in like manner compelled as far as computational vitality of the Microcontroller Unit (MCU), control source and memory space. Due to the limited energy supply of sensors, energy is a very scarce resource and directly influencing the network lifetime. Therefore, the energy efficiency is the most important issue in WSN. The structure of WSN is illustrated in figure.1

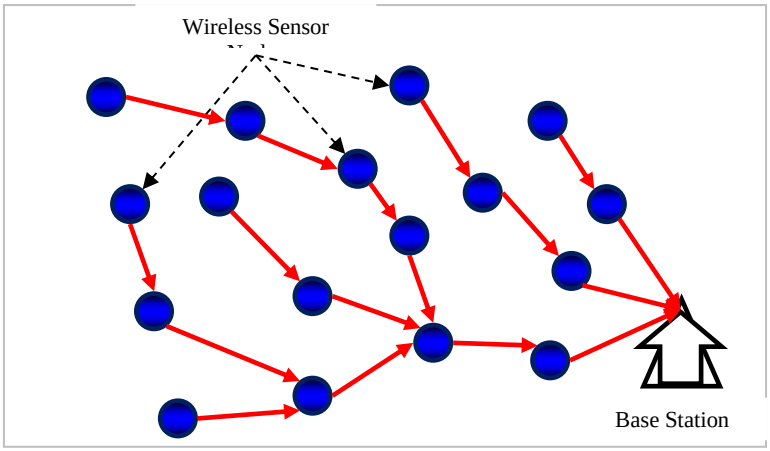

Figure.1. Structure of WSN

Received August 29, 2017; Revised October 5, 2017; Accepted November 23, 2017

Since a sensor node is typically obliged in its energy, computation and correspondence resources, an expansive set of sensors are included to guarantee range scope and increment the fidelity of the gathered information. Upon their sending, nodes are relied upon to remain reachable to each other furthermore, forms a network. Network connectivity empowers nodes to organize their activity while performing a task, and to forward their readings to in situ clients or a Base-Station (BS) that fills in as a passage (gateway) to remote war rooms.

2. Related Works:

In WSNs [1] a connection or a gathering of connections in the com DCF Active range or area could fail because of various causes such as radio blurring, signal attenuation, radio obstruction, background commotion, or failure of one of the sensor nodes that are connected to the connectivity. The most conventionally used radio model for association failures in wireless systems is based on the path loss model as the transmitter and the recipient move more distant DCF Ated. Time-Dependent Connectivity Failure Model incorporates the consideration of battery release display, sensor control utilization in various modes and remote channel conditions. This tradition inspects the WSN application relentless quality and vitality usage of transmitting detected information. Hello-based failure detection [2] is the prevalent disappointment location system that gives a lower bound on the packet delivery ratio. It captures the competing requirements of connection disappointments, false location, and missed recognizable data on the beaconing DCF Ameters. Drawbacks of this model are route repair, queuing losses when route misfortunes when course revelation is delayed and covering. Autonomous reconfiguration system (ARS) independently lightens the nearby connection inability to safeguard the system execution. The methods of Self-reconfigurable wireless mesh networks [3] identifies a delayed covering model.

Dynamically Reconfigurable Routing Protocol [4] was intended for submerged Sensor Network. The nodes must have the capacity to re-route their packets if the design of the system changes. It is a multi-hop datagram routing plan which will offer solid submerged wireless transmission by progressively re-directing when network setting changes. This tradition gives the perfect courses for effective correspondence of information with no interference and grants dependable correspondence inside restricted. Node-connectivity failures may leave some areas uncovered and corrupt the loyalty of the gathered data. Losing network connectivity has an extremely negative impact on the applications. Topology administration techniques for persevering node failures in WSN [5] focus on network topology management for tolerating/handling node failures in WSNs. Faulty sensor node is recognized by computing the Round Trip Delay time of discrete round trip paths and contrasting them with limit esteem value [6].

Failure detection using counter approach [7], examines the failure circumstance of communication. This approach is utilised to recoup from the message failure at the circumference node and the radius node. Self-connectivity Breakage Announcement [8] introduced rapidly distinguishes the connection breakages in order to limiting the deferral and power utilization. In this scheme, a node perceives forthcoming connection connectivity breakages in such interfaced connection breakage cases by implementing inner detectors inside of the node to detect that cause before the connectivity breakage actually occurs therefore the neighbour nodes can promptly start the course of route recovery process. This scheme also eliminates the routing overhead. Hardware (HW) Reconfigurable Node with Novel Scheduling [9] enables the utilization of environmental imperativeness with gathering cares. The task allocation can be arranged by imperativeness availability. In this approach, energy imperative can be saved because only the most frequently used tasks are executed time to time only using the hardware. The novel scheduling strategy is used to identify the most valuable application for the reconfigurable hardware. The reconfigurable HW-based heterogeneous system is a suitable procedure for extending the get ready limit of structures however at lower imperativeness costs. However, this scheme provides versatile complexity.

Each mobile device in the network is controlled by a multi-role agent by using the local interactions can be done using the protocol Distributed Self-Organization Algorithm (DSOA). The role management allows the strength of characterised reconfiguration when the nodes leave or arrive in to the network of the global emergent behaviour. Energy reduction is achieved by adapting the time interval and transmission power only after the network formation.

3. Diminishing Connectivity Failures by Auto-Reconfiguration in WSN

In this scheme, the source flood the Route Request (RREQ) message. Then every sensor nodes screens the nature of its connection by considering the Route Reply (RREP) message. This is ensuring the connectivity between all nodes in the network. These nodes are sending the connectivity association information to the source node. Then the source transmits the data to receiver node. Secondly, the connectivity failures connectivity's are detected caused by packet loss or connectivity's are not used yet. Thirdly, this failed node constructs the auto re-configuration plan and sends to the forwarding node and its neighbourhood node. Finally, these nodes execute the self re-configuration plan and re-establishment of route.

Diminishing Connectivity Failures by Auto-Reconfiguration in WSN performance is examined by using Network Simulator-2. The simulation parameters used for DCFA and DSOA are shown in Table 1. Performance evaluation of the DCFA and DSOA protocols are provided by estimating the Packet Delivery Rate, Packet Loss Rate and Delay in the network.

Table.1.Simulation parameters

Parameter	Value
Channel Type	Wireless Channel
Simulation Time	50 ms
Number of nodes	50
Network interface Type	WirelessPhy
Transmission range	250m
MAC type	802.11

The Packet Delivery Rate (PDR) is the ratio of number of packets delivered to all receivers to the number of data packets sent by the source node. The PDR is calculated by the equation 1.

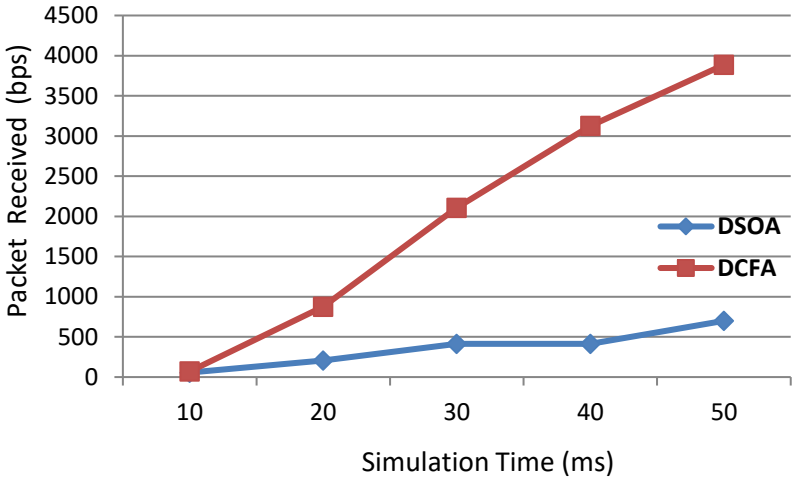

Figure 2. Packet Delivery Rate

$$PDR = \frac{\sum_0^n Packets\ Received}{\sum_0^n Packets\ Sent} \quad (1)$$

The figure 2 shows the performance of PDR for the proposed scheme DCFA. The PDR of the LFTR method is greater than the existing method DSOA. The greater value of PDR means the better performance of the protocol.

The Packet Loss Rate (PLR) is the proportion of the number of packets dropped to the number of data packets sent. The formula used to calculate the PLR is given in equation 2.

$$PLR = \frac{\sum_0^n Packets\ Dropped}{\sum_0^n Packets\ Sent} \quad (2)$$

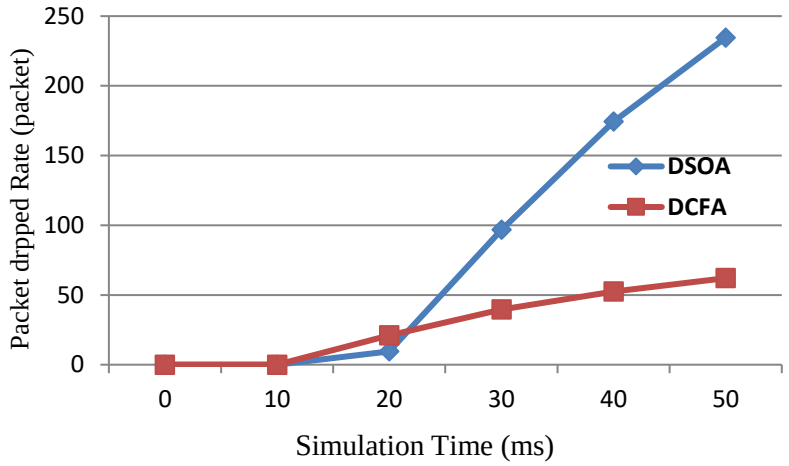

Figure 3. Packet Loss Rate

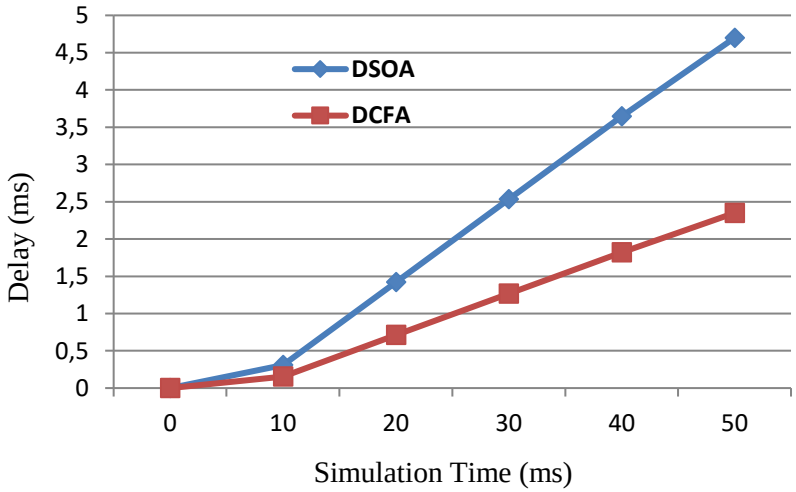

Figure 4. Delay Rate

The loss ratio of LFTR is lower than the existing scheme DSOA which is shown in Figure 3. Lower the PLR indicates the higher performance of the network.

The average delay is defined as the time difference between the current packets received and the previous packet received. It is measured by the equation 3.

$$Average\ Delay = \frac{\sum_0^n Pkt\ Recvd\ Time - Pkt\ Sent\ Time}{n} \quad (3)$$

Figure 4 shows that the average delay performance of the proposed scheme, the achieved delay value is low for the proposed scheme LFTR than the existing scheme DSOA.

4. Conclusion:

Diminishing Connectivity Failures by Auto-Reconfiguration in WSN to reduce connectivity failures is proposed to overcome the frequent node connectivity failures and to provide the steadfast data communication among the nodes in the network. In WSN, the total communication get collapsed if there is the reduction in the quality of communication between the sensor nodes or from the sensor nodes to the sink nodes and this leads to failure of connectivity's these can be overcome by using the proposed technique. The simulation results are analysed and the proposed DCFA mechanism achieves the greater packet delivery rate.

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