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Design and Implementation of the SIRC Protocol for Achieving QOS Parameters in Wireless Sensor Networks

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Abstract: -The present invention relates to a technique for reliable data dissemination in wireless sensor networks. The aim behind the study is to achieve different quality of service parameters for wireless sensor networks using socially inspired, reliable communication to reduce energy consumption by the nodes. The total number of nodes is equally divided into clusters. One node works as a sink node and the sink nearest node works as a movable mobile data collector (MMDC) node for reliable data collection from cluster heads and common nodes. The nodes which are level 1 away from the sink node work as MMDC. When MMDC gets a congestion alert from the cluster heads, it searches and moves to the cluster heads for data collection and sends collected packets to the sink node. This strategy controls congestion and traffic at sink and cluster head nodes. This technique archives the reliability, packet delivery ratio, packet loss ratio, and energy efficiency parameters of wireless sensor networks. Other than those parameters, the SIRC protocol achieved delay and network throughput parameters of WSNs. This work shows the best method of reliable data collection in clustered WSNs.

Keywords*: Socially inspired reliable communication (SIRC),wireless sensor networks, sin node,reliability, Mobile data collector (MDC) node.*

1. Introduction

Sensor nodes in an environment gather and transmit the data to a sink either directly or indirectly through various nodes. The sensors nodes are grouped together by different sensors applications to achieve scalability, accuracy, and minimized network traffic. In sensor networks, reliable data delivery and gathering is a huge problem. Congestion at the link Sensor nodes are placed across wide areas of the field. The nodes will be unable to interact with the base station directly or indirectly. Clusters of sensor nodes are formed, and this sensor is joined to the Clustered Head. The information from member nodes is gathered by the cluster head and then sent to the base station. Clustering in networks is critical for addressing challenges such as network longevity and energy usage. When messages are sent through one node to another in sensor networks, congestion and node levels may rise as a large amount of data is delivered and gathered across channels of communication. Many QoS metrics, such as energy, time, and packet delivery, will be influenced. Congestion at the node level will influence the accuracy of transmission of data, and also congestion and traffic management.

on the system can be raised, and the QoS factor of the wsn applications can be influenced, due to the interference between two nodes.

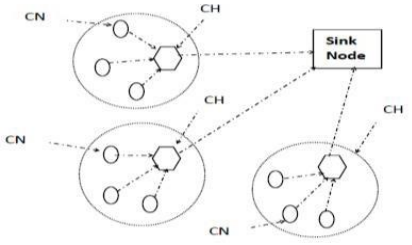

Fig 1: Clustered wireless sensor network

It can be affected by the resource utilization by the nodes and have an effect on the performance of the networks. Heavy traffic and congestion will deteriorate the performance and output of the

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network. Even network effects due to heavy traffic, packet loss ratio and energy efficiency will be degraded. The highest rate of packet transmission through a communication channel increases the link level congestion and faster data receiving at the node will increase buffer occupancy and this can have an This study gives a WSN clustering model based on optimization algorithms to enhance node efficiency and network life. Because of the large number of potential methods for combination optimization, H. [4] COCA is based on An approximation strategy is generally used to group WSNs applications with few variables and is also simple to implement with BPSO to address this problem. Choice CH should be given. The size of the particles in the coding system is equal to the number of nodes in the network. The node relating to that level is considered as CH if the element of the particle position in that level is 1. The node corresponding to that dimension is selected as CH. If the component of the particle position in a certain dimension is 0, the node corresponding to that dimension will be regarded as a member of the group. The selected adaptive function is based on the principle of minimum power consumption and balanced power consumption of the entire network. It was implemented by BPSO. Since the fitness function considers the influence of various factors on the efficiency of grouping and the constraints between these factors, it can ensure that the grouping result is the best. We explore a system based on the DBSCAN algorithm to detect selective forwarding threats on unstable lines in this article [5].We developed a completely descriptive, non-cooperative scheme in which attacker nodes coexist with regular nodes due to the lack of warnings in the design and the limited resources of WSN. The system can achieve Nash equilibrium, as we've shown. No one can change strategy or enhance the chance of action in the Nash equilibrium. Studies have shown that pushing malicious hosts to change their behaviour can enhance the performance of the network and lengthen the lifetime of the system.

2. Literature Survey

In this paper [1], we proposed a mobility-focused energy efficiency grouping for MANET, based on a biologic particle swarm technique. The coordinating center's members have a lot of time. Simply select nodes which use the minimum amount of resources and have the least variance in stability as CH.As a result, its lifespan may be increased. A multi function fitness function for the cluster will be

effect on packet loss ratio and network throughput. Simultaneously, packet transmission from source to destination can increase sink level congestion and the sink nearest node can be heavily loaded with packets.

developed based on the network's efficiency and the average distance of the sensor nodes to their specific devices.CH energy is measured by dividing the current battery life by the variation from its normal condition. The optimum distance among cluster members can be obtained by estimating the distance between the sensor node and their relevant CHs. Since most of the revised MANET difficulties are handled concurrently, from channel selection to clustering, the dynamic function combining these two variables surely improves the persistence of channel and sensor node.The network's overall usage time.PSO is used in the MANET technique to improve cluster traffic.In WSN, clustering is a typical topology strategic approach. [2]Clustering was initially assumed to be a technique for reducing energy usage, but now it can be used to tackle a variety of network problems, including resource allocation, QoS, safety, and load balancing. In this research, we'll explore the goals of clustering innovation in WSN, as well as the current situation of clustering techniques, over twenty years after the first significant clustering technology was invented.We'll also look into several network functions that even the cluster can support, including B. Mobility and heterogeneity 210 clustering methods were analyzed in order to do scientific analysis on clustering goals and networks features.The results indicate that energy usage is most key aim while using cluster technologies, but it can also be used it to assist fulfill over Seventeen additional objectives.Importantly, the results indicate that too many previous clustering strategies are incapable of supporting diverse and mobility infrastructure.Because many applications require such network services, significant focus is required to eliminate diversity and movement via cluster.Moreover, the findings show that, while clustering methods are aimed at reducing energy usage and enhance resource utilization, it can tackle a broader variety of issues, motivating experts to apply clustering to other connection problems. We initially review the factors and aspects that usually affect WSN resource limitations in this paper [3].Some characteristics of cluster-based WSN are discussed, all of which have significant effects on

sensor node energy consumption.The article then gives a review of several energy-saving mechanisms. Above-the energy-efficient solutions have been classified into six groups in this study. These categories, as well as their protocol examples, as well as their benefits and drawbacks, will be covered in depth here.The overall capacity of the cluster configuration phase, the number of sensor nodes, and the provision of the data collection payload size.

3. Proposed System

i) SIRC Algorithm:

Step 1: Initialization

Step 2: Deploy sensor nodes in a sensor field in randomly.

Step 3: From the sink node, divide the total number of sensors into equal clusters.

Step 4: Assign a mobile Data Collector node for level 1 nodes.

Step 5: Assign a cluster head node for Level 2 nodes.

Step 6: Assign level 0 nodes as a sink node i.e., sink node = level 0 node. = L0.

Step 7: Assign thresholds for buffer to cluster heads according the algorithm as in case of network congestion.

then

If B0 is more than T

i.e.if B0 > T

Then,

MDC is notified.

For data gathering, the MDC node might be moved to CH.

else.

The MDC node can behave as a commonly used data collection node at the sink node.

Step 8: stop.

4. SIRC Architecture

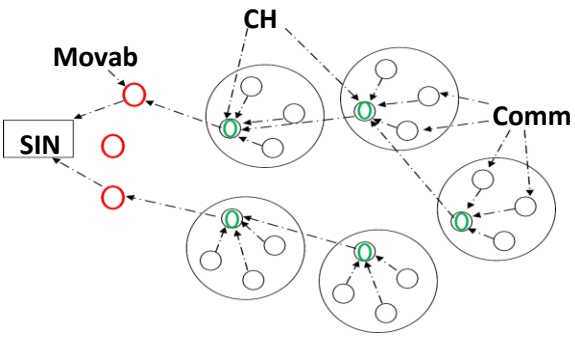

Fig 2. Architecture of reliable data collection in wireless sensor networks using MMDC node

Figure 2 shows one node performing as a destination node, sink nearby nodes functioning as movable MDC nodes, level 2 nodes acting as cluster heads, and the other nodes acting as common cluster nodes. which are used to collect information and transfer it to a destination node.

5. Result Analysis

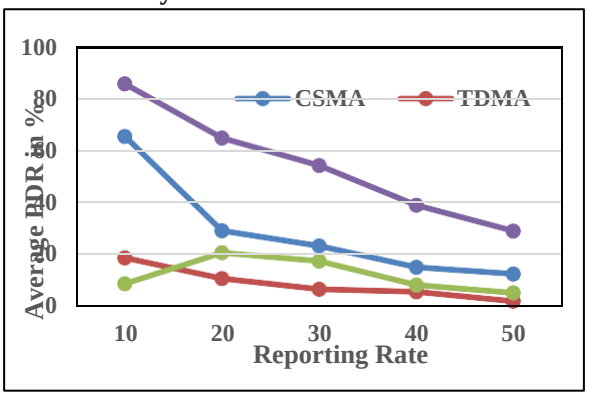

Fig 3. Average PDR for reporting rate

The average PDR reporting rate is depicted in Figure 3.The maximum number of packets effectively delivered from transmitter to receiver is known as the packet delivery ratio.The network performance of PDR influences the network's reliability.The quality of the SIRC protocol is really great in comparison to all other protocols with changing reporting rates, as shown in the graph above.When compared to CSMA, it performs 20 to 30 percent higher, and 70 percent superior to 802.15.4 & TDMA.The MDC Clustering technique helps in obtaining a better PDR for the SIRC technique.

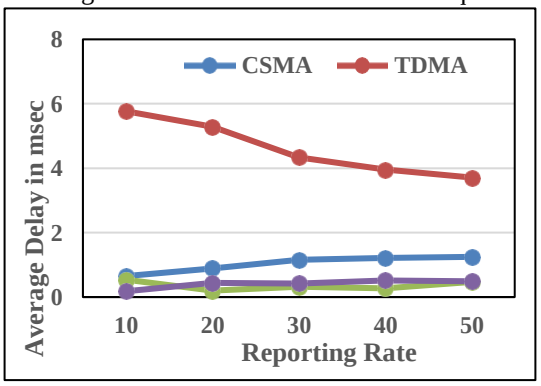

Fig 4. Average Delay for reporting rate

The average reporting rate for delays is presented in Figure 4. An end-to-end delay in a network is the average time required to deliver packets from one end to another. As compared to other protocols, the SIRC protocol performs exceptionally well in terms of latency. SIRC utilizes

a clustering strategy, and the MDC node of SIRC contributes to the reduction of congestion as well as the reliable delivery of packets to the destination node. SIRC's congestion-free delivery helps to fulfill delay parameters. When it comes to delays, the SIRC performs 30 to 40 percent better than CSMA and 45 percent better than TDMA and 802.15. 4.As packets travel through one place to the other, the time slot technique in TDMA raises the latency, while the collision avoidance approach in CSMA minimizes the latency.

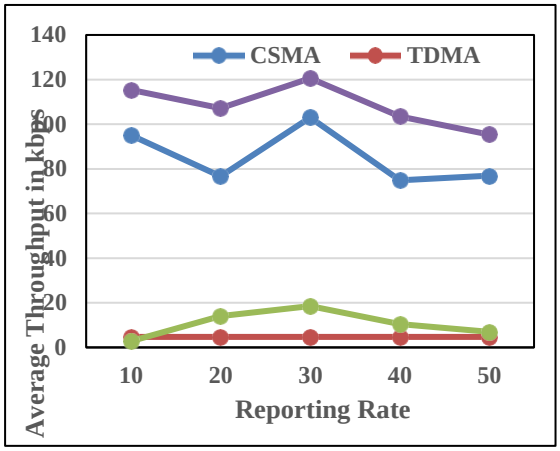

Fig 5. Average throughput for reporting rate

Figure 5 depicts the average throughput for reporting rate .The throughput of a networks is determined by the number of messages delivered per second via a transmission medium.The use of transmission medium and bandwidth for packet delivery influences network throughput significantly.SIRC cluster based protocols help in the delivery of data from one place to the other without causing collisions or congestion.SIRC's Clustering method helps to prevent node interference and packet collisions.The SIRC protocol outperforms CSMA by 20% and 802.15.4 and TDMA by 70-75 percent in terms of network throughput.CSMA also allows for collision-free data transmission over the network, hence it performs better than TDMA and 802.15.4.

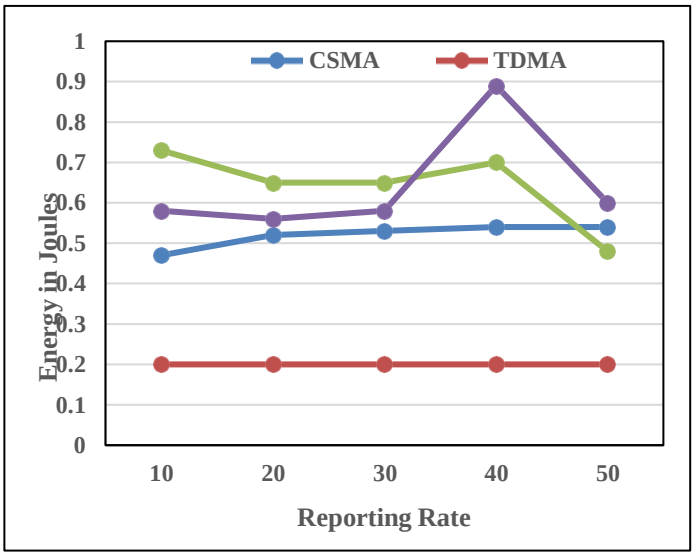

Fig 6. Average energy consumption for reporting rate

Figure 6 depicts the average energy use at the reporting rate. The TDMA performs significantly better in terms of network energy parameters.Once a node transmits a packet to some other node, the sleep –active mechanism in TDMA helps to save energy. When compared to CSMA, TDMA provides 20 to 30% better results, and 40 percent better results for energy parameters compared to 802.15.4 and the SIRC protocol. The SIRC protocol originally performed better in terms of reporting rates, but after 30 reporting rates, it began to use more energy.

6. Conclusion

The transmission of data from one place to another requires MAC protocols. A reliable MAC protocol is essential in sensor networks.SIRC (Socially inspired reliable communication protocol) is a protocol for secure transmission of data from one station to another which is collision free and congestion free.SIRC is a cluster-based protocol for reliable data collection using mobile data collector nodes in order to relieve network congestion.When compared to other protocols, the SIRC performs significantly better.When the packet rate varies from 10 to 50 packets per second, SIRC produces 30 to 50% greater benefits for PDR.SIRC recommends 10 to 20 seconds for latency factors.However, the SIRC performs 10percent greater than 802.15.4 and 30percent worse than TDMA when it comes to energy parameter efficiency.As a result, SIRC is an excellent protocol for achieving various sensor networks qos metrics.In the future, we will implement a revolutionary hybrid protocol to improve the network's energy efficiency.

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