International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 9, Issue 7, July 2022

A Study of Wireless Sensor Nodes and Transmission Operations for Energy Balancing Using Statistical Approach

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Abstract: Sensor node failures and path unavailability are the major sources of retransmission in the context of wireless communication. Subsequently, it drains energy and leaves sensors with inadequate energy for reporting data. Assigning a stable period and acquiring a link might result in delayed reporting time. Simulation is the preferred tool for validation of this work using open source NS2 scripting. Evaluation is done to reduce energy rate in communication by pairwise assigning sinks to sensors. Communication overused routes leads to draining of energy is avoided based on statistical theory priorly to transmission of packets.

Keywords: Pearsons Correlation coefficient, Pairwise sink assignment.

I. INTRODUCTION

Assigning a hard computing model using LEACH variant favours communication insensitive to reporting times and is better than soft computing models [4]. Compressive sensing based approaches to conserve transmission in considering underdetermined system might reduce energy as in [5]. An exhaustive survey had been provided from data aggregation to load balancing [6]. Determination of clustering is suitable by prior knowledge of network configuration which saves a considerable amount of energy [11].

Simulation of MATLAB based execution describes effect of Monte carleo and its non open source. Hence, this investigation are incorporated with open source NS2 a discrete event simulator. The paper is organized as follows. Section 2 describes with variants of "Low Energy Adaptive Clustering Hierarchy" used in wsn. Section 3 denotes the procedure used for data transfer in wsn and section 4 denotes the simulation results. Section 5 concludes the overall work done.

II. RELATED WORKS

Sectored LEACH [1], states where there is a reduction in energy consumed based "square symmetry" concept wherein transmission distance is reduced. In [2], constituting Inter and Intra sensor communication had been done for multi-hop communication. The work segregates nodes based on distance and assigns duty cycling for larger distance and shorter transmit abundant packets. However, both approaches require localization.

Dual band antennas with massive strategies had been used for localization free communication as in the context of mobile communication [3]. However, small size of wireless sensor and working in harsh environment does not favour reception in all scenarios. In [7], priority based packet transmission is stated with optimization theory. The discussed work states the need of multi dimension resources and minimal transmission delay.

Node empirical values and its related errors in position might impact the transit strategies in [8]. Hence any transmission has to confine to upper bounds in error values. In [9] Packet corruption is higher due to interference and imposes major constrain on the Medium Access control layer. So need of optimal packet size is must for communication. In [10] need of transmission time intervals are stated where the approach uses channel occupancy and data rate for analysing specific event.

III. PROPOSED WORK

3.1 Pearson's Sensor Sink Correlation Route (PSSCR)

A total of 8 sinks are positioned at the terrain involved in data transfers. Every sensor deployed in simulation area 0f 1000 × 1000 m^2 is not associated with more than 2 sinks. Sensors are confined to a maximum of two hop communication to sink. Both sensors and sink remain static throughput the duration of simulation.

The independent variable is the distance between sensors and dependant variable is energy involved in transmitting packet. Each sensor is associated with two sinks and confined to communication. Sensors calculate the Pearson's correlation coefficient associated with both sinks separately then it decides which is suitable based on

higher values. This is repeated after every 15s unnecessary transmissions are alleviated as both distance of sensor and energy from trace file are used to associate path availability frequently.

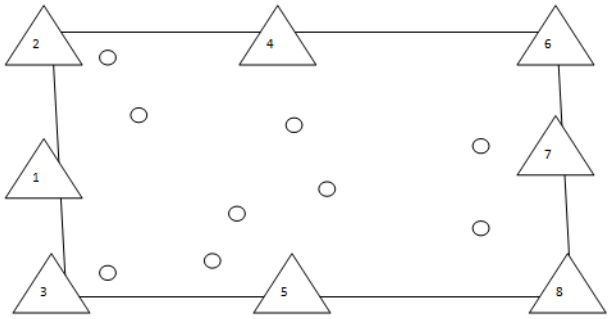

Figure 1, Model Scenario for routing packets.

Figure 1 shows the terrain wherein 8 sinks are placed at the corners represented in triangle and numbered. Two sinks are paired for each transmission sensor priorly assigned. Twenty five sensor nodes are assigned to sink 1 to sink 8.

IV. RESULTS

The following parameters from table 1 are used in NS2 Simulator.

Parameters	Values
Terrain	1000 × 1000 m^2
Sensors count	200
Sensing range	25 m
Communication range	100 m
Initial energy	5 J
Transmit Power	1 W
Receive Power	0.15W
Idle Power	0.05 W

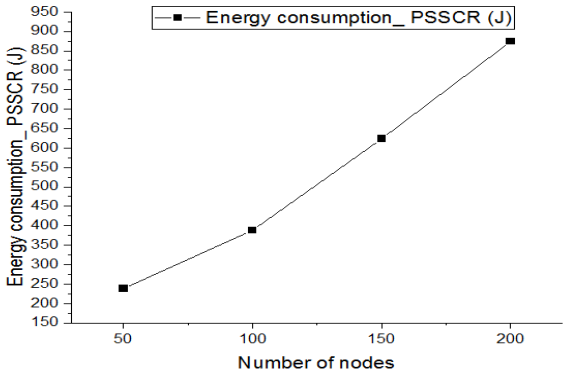

Figure2. Number of nodes versus Energy consumption.

Number of nodes	Energy consumption_ PSSCR (J)
50	238.45
100	388.45
150	623.78
200	873.93

The overall energy consumed is calculated in Figure 2 using the equation 1 below.

$$Energy\ Consumption = Overall\ energy\ of\ nodes\ during\ deployment - Energy\ at\ the\ end\ of\ simulation \quad (1)$$

The scenario is examined by increasing the scalability of 50 nodes to a maximum of 200 nodes.

V. CONCLUSION

Energy consumption model is stated in this work assign each sensor with a pair of sink and does transmits packets until a predetermined interval. Once the energy in transit does not favour the routing process an alternate sink is selected. Determining a correlation with sink which is resourceful avoids bottleneck and funnelling effects. Present study does not consider any energy harvesting feature and relies of simulations. Further works will provide insightful emulation in harsh environment status and incorporating movement of sensors.

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