Contribution to the Analysis of the Lifetimes of well Functioning of Wireless Sensor Networks

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Abstract

Uneven energy depletion causes energy holes and leads to degraded network performance then the entire network fails. This investigation aims to introduce the first implementation of our a new protocol network to become challenge faced to overcome the scalability issues inherent to multi - hop dense low power networks. The main contribution of this work is to provide a theoretical explanation of the uneven energy depletion phenomenon detected in sink - based wireless sensor networks. Further more, the experimental results will vouch that in order to improve these developments and launch path to wireless industry grade.

Fundamental Assumptions

Introduction

- To seek the ways to avoid the creation an energy hole around the sink the most obvious strategy is to mandate the sinks to move around in such a way that some load balancing is obtained across the deployment area. This solution works especially well in autonomous sensor networks.
- Even another solution involves establishing temporary sinks that act as Ad-Hoc aggregation points. However, power consumption is an important issue for this type of aggregations because the terminals of Ad - Hoc networks are lightweight and low capacity.
- Finally, as discussed in [5], a certain amount of load balancing is obtained by overlapping the disks around the sinks. Although it may produce an array of ambiguous areas.

Basic Elements Concept

- The two expressions lifetime network and splitting determine the essential features of the WSNs concept.
- A specific wedge subtended by an angle of **θ** will be used to show how can be effected in a working system. With **k** concentric circles of radii $0 < r_1 < r_2 < \dots < r_k = R$. And involves partitioning the disk D of radius R into disjoint concentric sets termed **coronas**.

Network Model and Assumptions

A fundamental assumption here is, we adopt the following general power consumption model, $E_t(d) = ad^{\alpha} + b$, where **a > 0** is a constant standing for the transmitter amplifier, **b > 0** is a constant representing energy for running electronic circuit, and path loss **α**, is $2 \le \alpha \le 6$ **.**

Network Lifetime Maximization

We can implement the areas of clustering sectors into following a state transition equations:

$$S_{(i)} = \theta/2 * (R_{(i)}^2 - r_{i-1}^2) \quad (1)$$

$$A_{(i)} = S_{(i)} + A_{(i+1)} \quad ; \quad 1 \le i \le 3 \quad (2)$$

To solve this equations consist in hybrid-routing, in which each node (CHs) alternates between hop – by - hop transmission mode and direct transmission mode to report data.

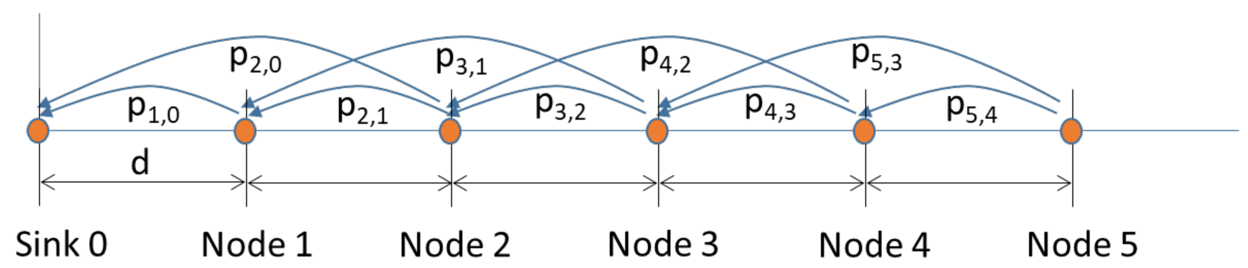

Figure1: Hybrid_Routing

Technical Method and Results

Tables of Routing Probabilities Results:

De\a	0	1	2	3	4	5
0						
1	1.000					
2	0.875	0.125				
3	0	0.6250	0.3750			
4	0	0	0.3750	0.6250		
5	0	0	0	0.1250	0.8750	

If we require energy expenditure balanced across all the coronas, $E_1 = E_2 = \dots = E_K$. We propose to determine every r_i, $2 \le i \le k$, as a function of r_1 and R. This will be done by setting for all i, $2 \le i \le k$, $\Delta_i = r_i - r_{i-1}$. The widths of the coronas must satisfy the following inequality[6] : $r_1 = \Delta_1 < \Delta_2 < \dots < \Delta_i < \dots < \Delta_k \le t_x$. **(3)**

Energy Expenditure Results and Analysis

$$E_i = \frac{T}{\pi\rho}\left[1 - \frac{r_{i-1}^2}{r_k^2}\right]\frac{(r_i - r_{i-1})^{\alpha} + c}{r_i^2 - r_{i-1}^2}$$

The assumed system parameters are, R = 225m, c =4500, α = 4, density (ρ)=35, and Let T denote the number of sector-to-sink paths Thus, T equals the total number of tasks that the wedge can handle during the lifetime of the network. [6]

We can illustrate E_1, E_2, ... E_K, by a numerical example:

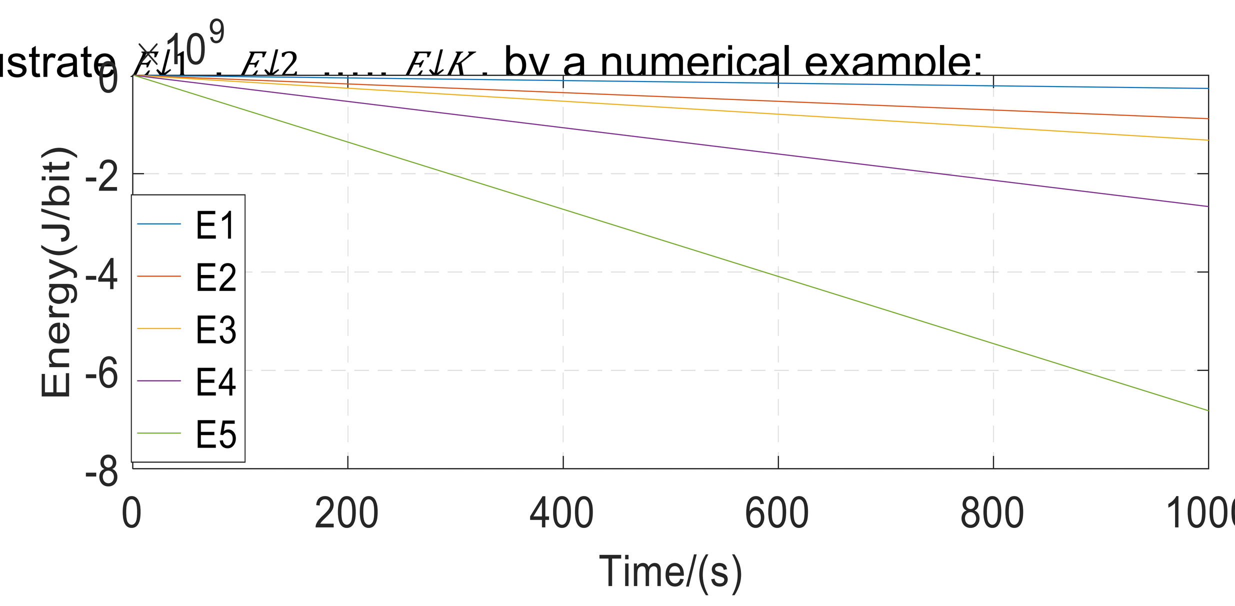

Figure 2: Energy Expenditure

The Network Lifetime Maximization Framework

- To compute the optimal number of coronas in terms of maximizing the network lifetime,
- Determining r_2, r_3, ...r_k as a function of r1, involved of course, r_k = R and must satisfy equation (3).
- This also indirectly, determines the number of coronas k.

Conclusion

✓ The method presented is investigated with regard to the strategic locations of (CHs) [5].

✓ The results simulations show that the novel technique presented above is effective method to settle problems aspects of the uneven energy depletion phenomenon of balancing energy consumption and maximizing network lifetime.

References

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