Linear Architecture Mixed-Routing Scheme from Orchestrating to Reshaping Based Wireless Sensor Networks Communication

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Abstract

To reshape connected things to connected intelligence. And empower the communications beyond 5G with higher level of connectivity. A sustainable wireless sensor networks communications infrastructures for new generation environment. Need stringents energy efficiency, maximum network lifetime, and full coverage. Wherefore, our study focuses mainly on enhancing a reduction energy consumption of wireless sensor networks. In order to extend the lifetime of wireless sensor networks, while ensuring less holes than possible and improving the coverage. The research consists in the network performance analysis of linear architecture mixed-routing scheme with 3hops.

Fundamental Assumptions

Introduction

In the advent new generation era, users will expect seamless high-end services. The new platforms, have to provide seamless communication even in such harsh environments, without constraints of time and physical location [1], [2]. For instance, in a 6G environment, artificial intelligence (AI), could be a representation of a remotely controlled set of sensors management of real world and problem detection and mitigation can be done efficiently. Nevertheless, uneven energy depletion causes energy holes and leads to degrade network performance [5].

WSNS INFRASTRUCTURE SCENARIO

As can be observed in figure 1, sensors are randomly distributed in a two-dimensional (2D) area.

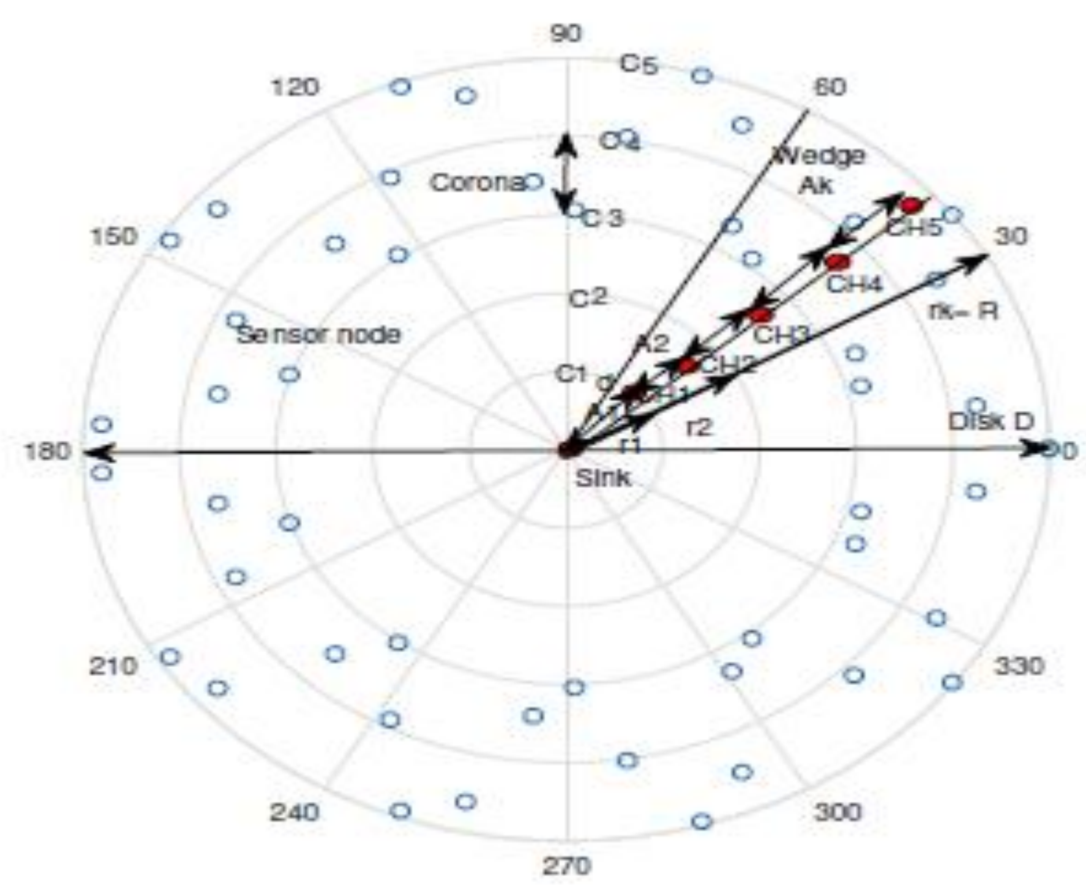

Fig. 1. A wedge W partitioned into k sectors in linear architecture

Network Model and Assumptions

A fundamental assumption here is, we adopt the following general power consumption model [3], $E_t(d) = ad^\alpha + b$, 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 ≤ α ≤ 6 .**

Network Lifetime Maximization

A specific wedge used to show how can be affected in a working system. And can cover a plane with no gaps or overlaps. The sensor network model consider for example, an area the disk D of radius R partitioned into five coronas C1, C2, C3, C4 and C5 as illustrated in the figure 1. Then, also an arbitrary wedge subtended by an angle of θ. W(wedge) is partitioned into K sectors as A1, A2,..., AK, by its intersection with K concentric circles, centered at the sink, and of monotonically increasing radii R = rk [3]. Then, we can implement the areas of clustering sectors into following a probability transition equations:

Technical Method and Results

$$S_{(i)} = \frac{\theta}{2} * (r_{(i)}^2 - r_{i-1}^2) \qquad (1)$$

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

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[3] : $r_1 = \Delta_1 < \Delta_2 < \dots < \Delta_i < \dots < \Delta_k \le t_x$. **(3)**

Energy Expenditure Results and Analysis

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

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. [3]

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

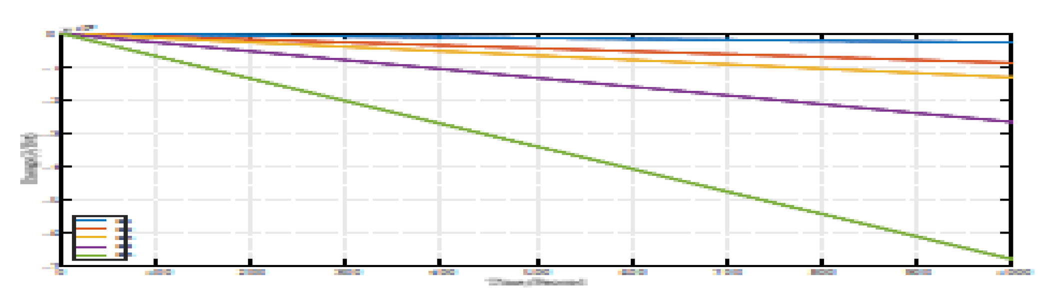

Fig. 2. Expenditure energy with 2 hops

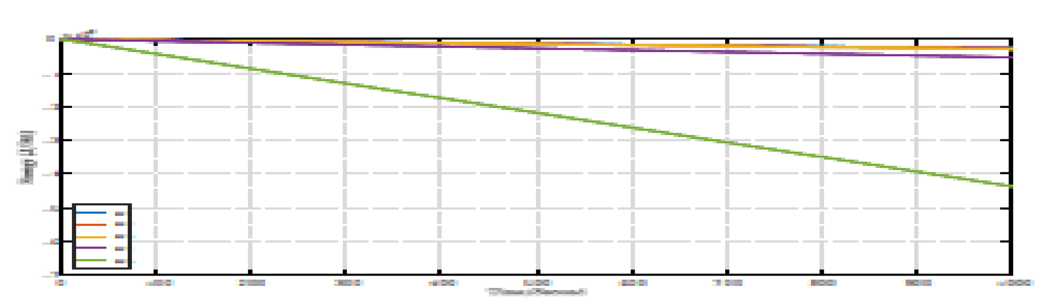

Fig. 3. Expenditure energy with 3 hops

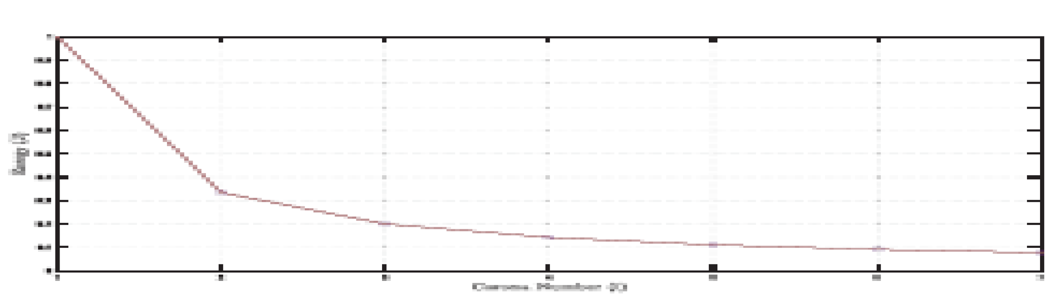

Fig. 4. Optimizing expenditure energy per path

Then, the energy consumption per (CH) significantly low has been ascertained. As synopsis of energy expenditure in a linear architecture [3], to minimize the total energy spent per routing path. Once again, r0 = 0 with A0 the sink itself has been assumed. In the last corona, the energy expended by a node (CH) is less than 10% of the energy expended by a node (CH) in the first corona [4] . As shown in the figure 4.

References

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