

# Improving Network Lifetime by Using Analytic Model in Wireless Sensor Networks

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**ABSTRACT:** In Wireless sensor networks, the sensors are connected with the devices to observe their performance and data. The Wireless sensor network, the energy consumed by the resources are measured across the remote location (base stations). There are varied performance metrics used like network life to evaluate battery powered sensor nodes. These nodes transfer the information packets from one station to a different. Because of energy hole in wireless sensor network, the entire network gets disabled. This technique determines the boundary of energy hole in information gathering wireless sensor network and estimate the traffic load, energy consumption and lifetime of sensor nodes throughout the entire network lifetime. This system defines the analytical model to balance the energy consumption and improve the network lifetime.

## I. INTRODUCTION

Wireless sensor Network (WSN) may be a collection of sensor nodes that are placed geographically in a very distributed environment. The nodes within the network are capable of performing sensing. Usually they capture information from surroundings and send to base station or sink. The sensor nodes so play important role in several world applications like temperature watching, surveillance, home monitoring, learning life environment besides serving different civilian and military purposes. A typical WSN appears as shown in Figure 1. The network may be connected to Internet servers and so individuals from remote places will view information collected by sensor network. The problem with such devices in WSN is that they need restricted energy with better power; once energy is completed, a sensor node gets changed. So the lifetime of the network goes down drastically.

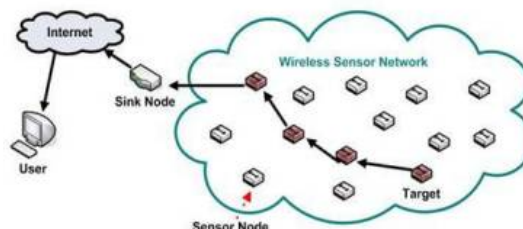


Figure 1: A typical WSN

As shown in Figure one, the WSN has to be supported with energy economical suggests that of communication so as to maximize network lifetime. There are several utilities once network lifetime is monitored and hyperbolic. Network lifetime is incredibly necessary for continued services rendered by deployed WSN. During this context, it's essential to monitor the network for energy economical approaches and optimizations. During this paper we tend to propose an analytical model that focuses on estimating network life time and energy efficiency so as to create well hip decisions. We tend to planned 2 algorithms towards this finish; we engineered WSN exploitation NS2 and also the proof of the construct is demonstrated. The results discovered that the proposed model is capable of shedding light into the

# International Journal of Innovative Research in Science, Engineering and Technology

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Vol. 6, Issue 8, August 2017

requirement for evaluating network life time and evolution of energy hole. As energy holes drain the energy of WSN, this study assumes significance. However, since the nodes close to the sink should forward the information packets from different nodes, they exhaust their energy quickly, resulting in an energy hole round the sink. As a result, the whole network is subject to premature death as a result of its separated by the energy hole. There are many existing works finding out the energy consumption and network time period analysis for WSNs. Most of them target the period from network data format to the time once the primary node dies (i.e., 1st Node Died Time, FNDDT), about to improve the network performances and optimize the FNDDT. although most of existing works are effective to estimate FNDDT, the amount from FNDDT to the time once all the sensor nodes are dead or the network is completely disabled (i.e., All Node Died Time, ANDDT) is relatively long. For most applications, little portion of dead nodes may not cause a network failure, though they'll impact the network performances. Energy hole is crucial and difficult for time period analysis in WSNs, as a result of it will cause a premature death of the network. Olariu et al. 1st prove that the energy hole drawback is inevitable within the WSN below some specific conditions. Perillo et al. analyze in what condition the energy holes may appear. Rahim et. al. discuss the load balancing techniques to mitigate energy hole drawback in large- scale WSNs, and propose a distributed heuristic answer to balance the energy consumption of sensor nodes by adjusting their transmission power. The energy hole drawback has additionally been studied in cluster-based WSNs. Most of the prevailing works, that energy hole locates round the sink, and style energy-efficient routing protocols to mitigate the unbalanced energy consumption and prolong the network lifetime. However, recent investigations mean that energy hole doesn't always emerge near the sink and extremely depends on some network parameters, like the energy consumption model and transmission vary of sensor nodes. However, theoretic analysis isn't provided in existing works to estimate the emerging time and location of the energy hole, also as its evolution method.

## II. RELATED WORK

In wireless sensor networks, sensor nodes with regards to the sink node consume additional energy than others as a result of their forced to relaying packet traffic towards for the sink and end in premature death of network resources. Energy hole is major drawback for lifetime analysis in WSNs, as a result of it will cause early die of the network nodes and results into whole network failure. In existing system network is divided into a number of annulus whose widths are capable the transmission vary of the sensor nodes, and every one the sensor nodes within the same bandwidth are assumed to die one by one. In existing WSN sensor nodes transmit the information packet via hop to hop communication. In this case all sensor nodes nearest node got to spatially aware to require path towards transmission. Defines the building area network for high-traffic advanced metering infrastructure in sensible grid applications; using multi-interface ZigBee, high-traffic communication in these building area networks (BANs), a multi-interface management framework defined; This method provides the look engineer with seven recommendations for a generic MIZBAN style. Smart grid communication technology supports advanced metering infrastructure. The sensible metering, AMI (advanced metering infrastructure) additionally facilitates utilities to perform demand response, and so energy demand is reduced. So numerous AMI pilot comes are created round the world, e.g. in Australia, Japan, the U. S., and Europe, and most of those are designed for individual homes. This system has edges The RTT measure is barely carried by sender then no further network traffic has been generated. RTT provides the Updated transmission condition of the whole path as a result of the trail price cannot be updated frequently as a result of it will only be updated by activity route discovery, which can degrade the network performance. This system includes Channel choice algorithmic program and Interface choice algorithmic program. In, author describes a ZigBee In-Patient observance system embedded with a replacement ZigBee quality management solution. This method permits ZigBee device quality in an exceedingly fastened ZigBee network. This method provides valuation that shows that the new algorithmic program offers a decent potency, leading to a coffee management price. The system will save lives by supporting a push and might be used as a location discover service. A case study stress on the Princes of Wales Hospital in port is enlisted and findings are given. This investigation reveals that the developed mobile solutions supply promising added services for several potential ZigBee applications. Author planned the wireless detector networks, the nodes have restricted power offer and typically network lifetime expected as per the necessity. Therefore the energy consumption and network lifetime are the key factors to realize in WSN. This paper proposes associate overlay, energy optimized, and detector network to increase the practical lifespan of associate energyintensive sensor network application. The overlay network consistsof extra nodes that expose recent advances in energy harvest home and wake-up radio technologies, including

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an application specific, complementary and ultra-low power detector. The experimental results and simulations prove that this study will guarantee survivability of energy inefficient sensor networks. This paper exploits these techniques to require advantage of the advantages to increase the lifetime of the network whereas maintaining similar (or improved) security.

### III. FRAME WORK

In this section, we tend to in theory estimate the traffic load and energy consumption of detector nodes, similarly because the period of each network stage supported our system model.

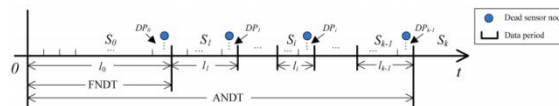


Fig: 1. Description of the entire process of network lifetime

The main plan of the analytic model is represented as follows. We have a tendency to initially divide the network into a variety of tiny regions wherever the nodes have similar distances to the sink. Since the energy consumption of the detector nodes within the same region (i.e., with the similar distances to the sink) should be the same from a statistical purpose of view, we use the common energy consumption of this region because the nodal energy consumption of this region. Fig. 2 shows a sector zone of the network, wherever  $A_x$  could be a region with the width of  $\epsilon$  and  $\theta$  is that the angle shaped by  $A_x$  and therefore the sink. The nodes' distances to the sink in  $A_x$  equal or are near  $x$ . Since the nodal transmission radius is  $r$ ,  $A_x$  is meant to forward the information from  $A_{x+r}$ , whose distance to  $A_x$  is  $r$ . Likewise,  $A_{x+r}$  relays the information from  $A_{x+2r}$ . However, if the divided region is comparatively large (i.e.,  $\epsilon$  is relatively large), the energy consumption of the sensor nodes in it can't be balanced. On the opposite hand, if the divided region is just too small, there can be no node during this region.

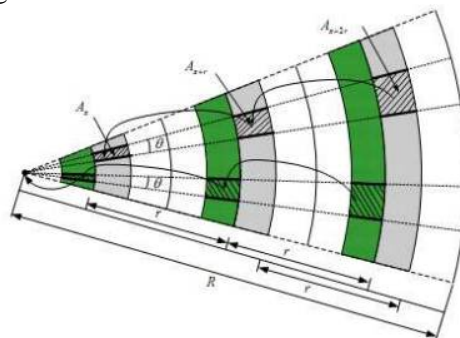


Fig: 2 Data forwarding model

**3.1 Traffic Load Analysis at  $S_0$**  indicates a stage once no node dies, and therefore is that the most important stage with the simplest performance. We initially analyze the traffic load of sensor nodes supported our analytic model described higher than, by the subsequent theorem.

**3.2 Energy Consumption Analysis at  $S_0$  and Estimation of  $I_0$**  The traffic load of detector nodes at  $S_0$ . If every information packet contains  $\tau$  bits, the total amount of transmitted information is  $PX_0\tau$ . During this paper, energy consumption for network management isn't thought of since it's almost a similar for every node and comparatively tiny in greedy geographic routing. Therefore, we have a tendency to confirm the energy consumption of detector nodes at  $S_0$  within the following theorem. The energy consumption of node  $j$  consists of the subsequent three elements:

- (a) Energy consumption for information receiving
- (b) Energy consumption for information transmission
- (c) Energy consumption for idle listening

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### 3.3 Estimation on Traffic Load, Energy Consumption and Network lifetime from S1 to Sk-1

In the previous subsections, we've determined the traffic load and energy consumption of detector nodes at S0. In this subsection, we have a tendency to analyze the traffic load and energy consumption of the sensor nodes once S0, which is complicated as a result of network routing methods changed dynamically once S0. At first, we should always decide that a part of sensor nodes die first. In step with the sensor nodes with the utmost energy consumption can die initially. In step with our analytic model, the energy consumption of the sensor nodes during a region with width of  $\epsilon$  are similar and therefore the energy consumption of the regions with a similar distance to the sink should be similar too. Therefore, the network is divided into variety of ring regions with similar energy consumption and therefore the width of  $\epsilon$ .

### 3.4 Energy Hole and Network Characteristics

#### 3.4.1 Analysis on the Energy Hole Evolution

In this section, we have a tendency to investigate the temporal and spatial evolution of energy hole supported our analytical result. The traffic load and energy consumption of the sensor nodes and the network period of time are determined, where the termination condition is that the sink cannot receive any information in a information amount, that consists of 2 cases. One is all nodes die as a result of energy exhaustion. the opposite is a few nodes still have remaining energy, however the sink is separated from the outer nodes once the formation of the energy hole. Thus, even if the network still has remaining energy, the network becomes useless and is additionally thought of as disabled.

#### 3.4.2 Observation on Network characteristics

The higher than analysis provides a comprehensive answer to determine the traffic load, energy consumption, and network lifetime, similarly because the energy hole boundary for a WSN; Based on these analytical results, we have a tendency to conclude 2 observations on network characteristics as follows.

(1) If the sensor nodes are uniformly deployed within the network, the node density has no impact on the FNDDT. In step with our analytical results, FNDDT depends on most nodal energy consumption at S0, whereas nodal energy consumption is decided by the traffic load of sensor nodes. Consistent with Thm. 1, traffic load is unrelated to node density, which proves that node density has very little impact on traffic load. It additionally indicates that it's useless to improve the period of time by increasing the node density.

(2) There exists a best transmission vary  $r$  to maximize the network lifetime. In step with thm 1, the transmission varies of the detector nodes  $r$  directly impacts the traffic loads of detector nodes, which determines the energy consumption and lifetime of the network. Therefore, we will set the best transmission vary  $r$  for the detector nodes to maximize the network lifetime. Since network lifetime is estimated under a needed death ratio in the middle of Corollary, and therefore the choices of  $r$  are restricted, the best  $r$  is found to maximize  $I^{i\%}$  with brute-force testing. Here density management protocol is introduced for reducing the energy consumption and increase the network lifetime. It consists of that the node density will increase means that network coverage are going to be lesser and therefore the node density decreases means that network coverage are going to be higher. Due to the method, we can reduce the energy consumption and increase the lifetime of the sensor network. Density management during a wireless sensor network refers to the method of deciding that node is eligible to sleep (enter power-saving mode) once random deployment to conserve energy whereas holding network coverage. A replacement density management protocol that desires no location data; It attempts to approach a best sensor choice pattern that demands the smallest amount range of working (awake) sensors;

## IV. EXPERIMENTAL RESULTS

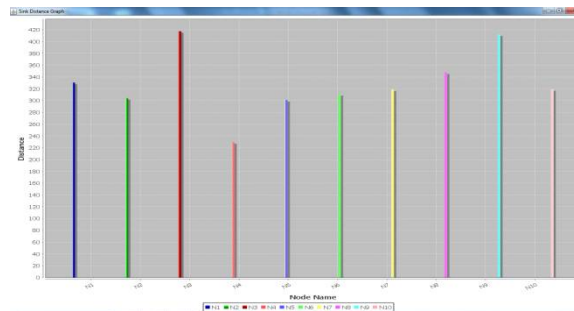
enter the network size (the total no. of nodes to be created) and region size (the covering area of each region (here we are creating 2 regions) the node which is nearer to the sink node will act as the energy hole in every region and the data transmitted from every node to base station will be send through energy hole, sending the data to sink node. determine energy hole with this the node which is nearer to sink node will become energy hole and the next nearest will send the data to sink node. Display sink node distance graph.

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Vol. 6, Issue 8, August 2017



## V. CONCLUSION

Proposed system performs planning to overcome the network traffic load, reduce energy consumption, and lifetime of sensor nodes in a very information assortment. During this system, we've evaluated the network lifetime under failing nodes, and analyzed the rising time and placement of energy hole, similarly as its evolution method. Additionally to the present, two network characteristics are found supported our analytic results, which might be leveraged to guide the WSN design and optimization. Our simulation results demonstrate that the planned analytic model will estimate the network lifetime and energy hole evolution method inside an error rate smaller than five-hitter. Finally, we've applied our analytic results to WSN routing. Proposed routing scheme is leads to results of with efficiency balance the energy consumption and increase the network lifetime.

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