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A REVIEW ON WIRELESS SENSOR NETWORKS WITH ENERGY OPTIMIZATION AND ASSOCIATED ISSUES

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ABSTRACT

Energy consumption, conservation and optimization are major challenges in wireless sensor networks particularly in outlining a directing convention. Many research literature focus and point out on energy efficient paths with the use of efficient routing algorithms. The classical protocols are not designed as per the specific requirements of WSN in the current and upcoming scenarios. Therefore, the energy efficient protocols and paradigms are the major area of active research. This paper reviewed and characterized various energy optimization directing plans. This paper surveys different energy preservation aspects and additionally introduces well known available methods that can be used to save energy. Later on work and proposed examination work, an experimental algorithmic methodology should be produced and actualized for vitality protection in the remote situation.

Keywords – Wireless Sensor Networks, Geocast, Energy Optimization

1. INTRODUCTION

A wireless Sensor Network is a network of tiny embedded devices that are called sensors. They communicate to each other wirelessly without any physical connection constructing an ad hoc network. These are deployed inside a physical medium for interacting with physical medium to measure physical characteristics from the environment and transmit the measured information. These intelligent nodes generally use a broadcast communication and the network structure or topology keeps on changing frequently because of the fact that nodes are very much prone to failure. These devices are having limited power capacity, low processing power and limited memory. Issues which should be focused and analyzed in WSNs is their scalability feature, strategy for the communication, quality of service, coverage, fault tolerance, network dynamics and limited energy to drive the device.

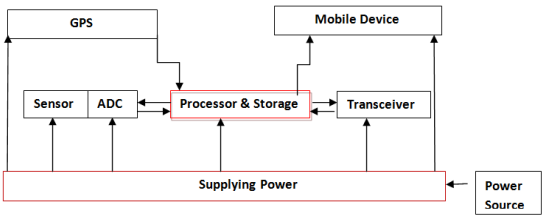

Figure 1 : Basic Architecture of WSN

The significant destination of Wireless Sensor Network is to minimize the energy utilization and to augment the use and expand the sensors lifetime. The situation of sensors in remote sensor system framework assumes a noteworthy part in system execution, for example, sensing, correspondence and building a network. Sensors must be conveyed before gathering information. Lifetime of a sensor is constrained by the battery and number of hubs close by nature's turf. Throughout functioning of sensors it's profoundly difficult to supplant the power hence it's extremely vital to minimize the vitality utilization and boosting the sensors lifetime. The hubs are self organized and sense huge information from the remote locations which is reported to remote sink. One of the objectives is to adjust the clashing of the targets to boost the system scope and to minimize the energy utilization of the system. Micro servers function is to amplify the lifetime of a sensor network. The hierarchal challenges are met by following some steps. The first one in this hierarchy is to choose the best ones from the relevant quantities. This data is also monitored and is accumulated. Later it is assessed and then evaluated leading to some meaningful data which will be displayed in various formats. Using this meaningful data decisions are made and any relevant functions may be generating an alarm. A constraint observed in Underwater Sensor Network (UWSN as compared to the classical network is while making realistic applications. This sensor cannot be used very effectively in the applications. These constraints come from the limitations regarding sensor nodes, memory, energy, transmission, processing power, ad hoc nature and wireless channel.

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A sensor node necessitates the requirement of flash memory and RAM. This storage of the downloaded code is done in the flash memory. The application code, sensor data and the in between computes are being stored in the RAM. As already an operating system as well as application code has been loaded so to run very tedious algorithms is not feasible. A majority of recent security algorithms are not practical for implementation as it can be seen in the Smart Dust project wherein the Tiny OS consumes around 3500 bytes of the instruction memory, leaving behind only 4500 bytes for security and applications [1].

A number of energy efficient sensor networks were studied, analyzed and experimented upon and for having an effective topology numerous algorithms have been proposed which can conserve energy making them power efficient. There are flaws in the existing approaches of developing specific applications using sensor networks relating to the principles, paradigms, characteristics and requirements.

1.1. Limited Energy Aspect

Energy utilization in the sensor hubs are arranged into the three parts, i.e. Energy for the sensor transducer, Energy for correspondence among sensor hubs and Energy for the microchip calculation. From the study it is found that every bit which is being transmitted in the WSNs devours to the extent of processing in 800–1000 directions. Accordingly, the correspondence is more immoderate than the processing in WSN. Any message extension brought about by security components takes a stab at a critical expense of power consumption. Further, higher security levels in WSN normally relate to more energy utilization for cryptographic capacities. Consequently, the WSN could be separated into distinctive security levels contingent upon the energy cost .The embedded computing devices in sensor nodes are generally not as powerful as those in nodes of a wired network. As such, typical cryptographic algorithms cannot be used in WSN's.

1.2. Network Constraints

Sensor system inherits all the requirements of portable impromptu systems, for example, questionable system correspondence, impact related issue and their absence of physical foundation.

1.2.1Unreliable communication:

Wireless correspondence is characteristically untrustworthy and can result in data to be harmed or dropped. The instability in correspondence approaches inhibits extra dangers which then tributes if dropped bundles are assumed to be controlled by foes.

1.2.2 Impacts and Latency:

Sensor systems use a thick plan of hubs conceivably sending countless hubs in a delicate provision. This raises the probability of crash and idleness in bundles. Unlike the conventional systems, the energy constraints of sensor hubs make it impracticable to resend bundle in case of crash.

Sensor systems are every now and again introduced in broad daylight and conceivably threatening situations which make some of their parts very powerless against catch and vandalism. To physically secure sensor hubs with carefully designed material builds the expense.

1.2.3 Unattended after Deployment:

The way that sensor systems are situated in provisions where they will be left unattended, permits enemies more amazing access and opportunity to physically mess with the hubs. Great climate conditions and characteristic fiascos, for example, storms, surges, seismic tremors and shrubbery blazes can likewise obstruct their working.

1.2.4 Remote Management:

Being remotely overseen makes it very troublesome to catch physical messing with the sensor systems; different issues, for example, supplanting the batteries, redeployment and cryptographic keys are additionally impracticable to do remotely.

2. RELATED WORK AND REVIEW OF LITERATURE

Lot of work concerning to power conservation techniques:-

G.P Halkes et al., made a contrast between MAC layer protocols S-MAC and T-MAC , as these are used to save power by introducing a duty-cycle to reduce idle listening period in WSN networks where sensing nodes are not continuously communicating to each other. [2] Author's comparison observed that while using T-MAC protocol less power is consumed as compared to S-MAC which suffers from some over-provision of avoidance to drop some packets at peak load which deteriorates S-MAC's idle listening during heavy loads. T-MAC represents a time-out policy for typical WSN applications with the result of which T-MAC was considered better for energy conservation.

N.A Pantazis et al., worked on basic concept of power management in WSN and highlighted the effects of power management by describing various methods for same [3]. It is focused that management is necessary for drafting the performance of a energy control system. Energy conservation system is divided into categories. Various algorithms on clustering, PCMs Distributed and Backbone –based algos. ,were studied and verified for different layers i.e. MAC, Network and Transport , in terms of objective, application, system and performance. Power – aware Qos in WSN will surely guarantee life-time, bandwidth, delay and provide power efficient routes.

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S.Saxena et al., presented a method of characterizing the communication among different protocols and exploited cross-layer communication [4]. The author proposed that theoretical assumptions have been made to provide different solutions for power conservation that radio power consumption is more than packet sampling and processing consumption while in fact more power in consumed in packet sampling and processing rather than radio transmission in some of the applications . Packet acquisition can be other field to explore where there can be lot of provisions of power conversation. Finally author reached at the result that lot of interest is being developed towards MAC protocol for energy conservation and energy optimization.

Antimo Barbato et al., presented a coordinated framework at present being worked on inside the European venture for profiling and decreasing home energy utilization , specifically, on the key pretended by remote sensor systems to consequently control home machines as indicated by client propensities [5]. To make a framework where client doesn't have to waste a ton of time in unpredictable settings of framework parameters one of the difficulties of AIM task is to robotize the setup of a piece of these parameters with a framework ready to foresee real client inclination on the premise of past watched conduct. This work proposes heterogeneous progressive sensor system building design to assemble physical parameters and to screen client conduct.

Sidra Aslam et al., highlights the power management and thus, investigates techniques for the reduction of sensor nodes failure which by turn minimizes probability of failure of WSN [6]. This manuscript concludes that sensors wireless communication ability facilitates dispersed sensing and makes WSNs distributed.

Marco Conti et al., allude essentially to the sensor system model and comprising of one sink hub (or base station) and an (extensive) number of sensor hubs sent over an expansive geographic zone (sensing field) [7]. Information are exchanged from sensor hubs to the sink through a multi-jump correspondence ideal model. It considers first the case in which both the sink and the sensor hubs are (static sensor system). At that point they additionally talk about energy protection plans for sensor systems with versatile components in which a meager sensor system structural engineering where persistent end-to-end ways between sensor hubs and the sink may not be accessible will be accounted too. The lifetime of a sensor system might be reached out by together applying distinctive procedures.

3. GEOCASTING AND ENERGY UTILIAZTION

Geocast technique not only enhances network performance but also reduces power usage as compared to existing techniques. Geocast is a special technique to send the data to all sensing nodes within the particular geographical area. It functions to collect data from sensing nodes in that area . Large number of protocols has been proposed to reduce the power consumption during the phase of transmission of commands and responses to the sensing nodes in a geocast area. It also performs in-network data aggregation and hence helps save power during the data reporting period**.** Geocast adds each packet with the location details of its destination. A forwarding node can opt for, greedy choice by selecting one of its closet neighbors that is nearer to the destination. It is assumed that each sensing device has the location details of all of its neighbors.

Classically, geocast protocols can be divided into two phases. The first phase consists of delivering a packet from the source to one or more nodes in the geocast area. Then in the second phase the packet is broadcasted to all the nodes in the geocast area or some of the protocols use flooding for the second phase. Yao et al described geocast protocols into three categories: flooding-based protocols, routing-based protocols, and cluster-based protocols [8] .

4. CLASSICAL APPROACH FOR ENERGY MANAGEMENT

In the classical technique, many authors and researchers follows sleep/power down mode approach. This approach makes use of minimizing the battery energy consumption of mobile node to a specific limit. The steps involved in this approach are as –

Step1 The sensor nodes participating in the network having two modes - sleep mode and active mode.

Step2 Initially all nodes are in sleep mode. The nodes that need to transfer packet to destination node are activated in active mode.

Step3 Once the sender sensor node starts sending the packets to its neighboring node, then it moves to sleep mode. The neighboring node or simply adjacent node comes to the *active* state to transfer the packets until it moves the destination node.

Step4 The sensor nodes having the packet and node moving to receive the packet are in the *active* state. All other nodes are sent back to the *sleep* mode.

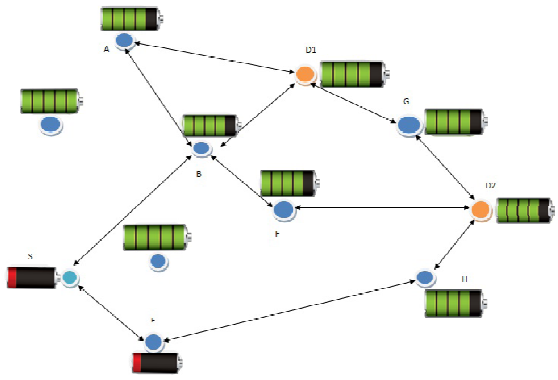

Fig 2: Classical Approach

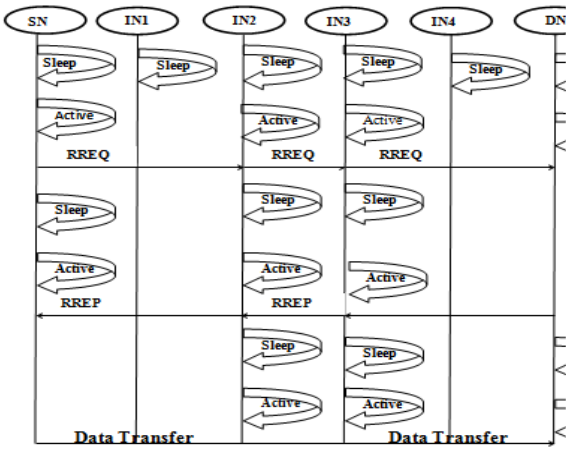

Fig 3: Sensor Node Execution Sequence Diagram

The major disadvantage and issue in this system is the sensor nodes are spending a lot of energy to amplify the signal to send to the adjacent node, rather than selecting the path from all the nearby nodes. Therefore it leads to the more energy loss to that specific node.

5. CONCLUSION AND FUTURE WORK

In scenario of mobile networks, the nodes are involved in communication initially having full battery backup once it started performing packet transfer. The battery or energy diminishes immensely, at one point the system separates as a result of vacant battery reinforcement of sender hub or any possible hub in that system. The significant goal of this venture is to settle the battery reinforcement of every last one of hubs in a system. So that no hub is running beneath the normal battery control, this could be attained through the energy proficient steering strategy for the versatile system. In this paper, different aspects of energy optimization are covered in the wireless sensor network scenarios along with the detailed architecture of the sensor nodes. In the future research work, a specific and dedicated algorithm shall be developed for WSN scenario that shall be used for energy optimization with very less packet loss and more energy conservation The use of metaheuristic techniques including genetic algorithms, neural networks, ant colony optimization, simulated annealing can be implemented for efficient and optimal results as the future scope of the work.

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