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## REVIEW OF ENERGY MINIMIZATION TECHNIQUES IN WIRELESS SENSORS NETWORK

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### Abstract:

*The current decade of technology trends adopted the utilization of wireless sensors network. The wireless sensors network integrates with cloud based services and facilitate in every field of social engineering. The success story of sensors based network is utilization of energy. The sensor devices occupied tiny battery for energy. If the energy utilization is not maintained the life of network is expire. In this paper present the review of energy based protocol used in wireless sensor network. The maximum utilization of energy during the sensing of data of sensors node. Some authors used dual duty cycle for the sensing of sensor data and transmit data to sink node.*

**Keywords:** WSN; Energy; Duty Cycle; MAC; Clustering.

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### 1. Introduction

Wireless Sensor Networks (WSNs), a sort of physical checking framework, comprise of a self-composed and connected sensor broadly scattered in a scope territory. The gathering, correspondence, and treatment of detected data among different sensors is accomplished through specific correspondence conventions, and the information is transmitted by means of multi-jump directing to the sink. The sink capacities as the information, calculation and control focal point of the whole system. The head can speak with the sink through ordinary systems, for example, the Internet [5]. Remote Sensor Networks (WSNs) more often than not have to get by for quite a while in an extensive variety of uses, for example, natural observing, military location [1], crisis route and shrewd framework. In any case, the vitality of scaled down sensor hubs is for the most part constrained and difficult to be recharged. Along these lines, an obligation cycle (e.g., 5% or less) working mode has been proposed to decrease the vitality devoured by superfluous sit out of gear tuning in, accordingly expert aching the system lifetime. The obligation cycled WSNs empower hubs to remain lethargic more often than not and simply be alert when sending or getting bundles, which could be further classified into two classifications: non-concurrent and synchronous obligation cycled WSNs. In offbeat obligation cycled WSNs, hubs regularly work freely.

and look for transmission risks by low power tuning in. Interestingly, in synchronous obligation cycled WSNs, every hub can indicate its wakeup timetable to adjust to the dynamic time of its neighbors. For diminishing the vitality utilization and holding up deferral, the flooding-tree-based synchronous calendar where hubs having a similar parent wake up all the while to get communicate bundles is embraced and thought to be alluring in obligation cycled WSNs.

The hubs of remote sensor systems are battery driven and the substitution or revive of battery is not a simple undertaking for the sensor systems with a huge number of hubs installed physically in a vast detecting zone. The most critical target of remote sensor systems is to expand the framework lifetime to the extent that this would be possible. To overcome any issues between the framework lifetime necessity of utilizations and the compelled vitality of hubs, one prominent technique for expanding life span of remote sensor systems is to obligation cycle the hubs and let them rest a large portion of their operation time [2]. The rest of paper discuss as section II WSN Characteristics. In section III. Discuss the Related work. In section IV discuss problem analysis and in section V finally discuss conclusions

## 1. WSN Characteristics

Wireless sensor networks are in numerous perspectives very like Mobile Ad Hoc Networks and Wireless Mesh Networks, yet two unmistakable attributes require a different approach. To begin with, the requirement for vitality efficient operation extremely compels the capacities of individual sensor hubs; handling, memory, and correspondence are constrained assets, a great deal more so than in cell phones like portable PCs and PDAs. Second, WSN arrangement situations exceptionally structure the correspondence between hubs in the system; specifically, correspondence between two discretionary hubs in the system, being a piece of numerous impromptu and work situations, does not happen in WSNs where most data is handed-off either between neighbors or to/from the sink.

## 2. Related Work

Author	Title	Technique	Publication
Shaobo Wu, Jianwei Niu, Wusheng Chou, Mohsen Guizani	Delay-Aware Energy Optimization for Flooding in Duty- Cycled Wireless Sensor Networks	They examined a Delay-mindful Energy-improved Flooding calculation (DEF) for the as of late rising synchronous obligation cycled WSNs. As a typical vitality enhancement plot, DEF all- inclusive enhances the structure of a developed flooding tree in an appropriated way. The postponement mindful modifying approach successfully guarantees that the refreshed flooding deferral would not surpass the first esteem. In the meantime, the metric	IEEE, 2016

		Eimpro in view of hypothetical examinations can be used to expand the change of vitality efficiency.	
Guodong Sun, Bin Xu	Dynamic Routing Algorithm for Priority Guarantee in Low Duty-Cycled Wireless Sensor Networks	They examined an element steering calculation, called DRAG for enhancing the need ensure in low obligation cycled sensor systems. This work considers both the low obligation cycle of hubs and the shifting, untrustworthy remote connections. In DRAG outline, every hub advances parcels in light of an element for-warding applicant choice and two need based timetable plans. Broad recreations with a CC1000-based radio model are done to assess their calculation. The reenactment comes about demonstrate that DRAG accomplishes great execution over DSF in need based conveyance proportion and per-bounce delay.	WASA 2010
Messaoud Doudou, Djamel Djenouri and Nadjib Badache	Survey on Latency Issues of Asynchronous MAC Protocols in Delay-Sensitive Wireless Sensor Networks	The possibility of WSN MAC tradition accommodation has been examined in this paper, where a novel logical order has been displayed. Diverged from the standard order in light of medium get to principles, or on the issues centered by traditions, the one analyzed in this paper depends on the instruments presented by the arrangements that influence the transmission delay. Surely understood vitality efficient offbeat medium get to control conventions have been talked about from the dormancy perspective. Six distinct classes of offbeat MAC conventions have been accounted for; static wake-up prelude.	IEEE, 2013
KOEN LANGENDOEN	Medium Access Control In Wireless	This part gives a wide diagram of the MAC conventions particularly	Delft University of

	Sensor Networks	produced for sensor systems. These MAC conventions differ from run of the mill WLAN get to conventions in that they exchange off execution (dormancy and throughput) for a diminishment in vitality utilization to expand the lifetime of the system. This is by and large accomplished by obligation cycling the radio, and it is the MAC layer that controls when the radio is exchanged on and off. A vital outcome is that a MAC convention should know about its neighbors' dynamic timetables, since communicating something specific is just effective when the goal hub is alert.	Technology, 2007
Hang Shen, Guangwei Bai	Routing in wireless multimedia sensor networks: A survey and challenges ahead	The goal of this study is to highlight vital themes in WMSNs, i.e., the difficulties and current patterns in directing. The primary issues when de-marking the directing convention are investigated to give stable and asset efficient way with QoS/QoE bolster. Be that as it may, it is difficult to accomplish as a result of the limitations forced by the WMSN highlights.	Journal of Network and Computer Applications, 2016

Nessrine Chakchouk Et al. [6] In this paper, they give a thorough overview of sharp directing conventions. Specifically, they first present the principle elements and applications that prompt the improvement of the entrepreneurial directing worldview. Second, they break down the building squares of pioneering directing, its varieties, components and impediments. Third, they classify the sharp steering recommendations into five fundamental classes: geographic, connect state mindful, probabilistic, enhancement based and cross-layer deft directing. The geographic shrewd steering proposition is area driven. Henceforth, they are commonsense for situations where the learning of the hubs area is essential, for example, fire recognition, gas spillage checking, and safeguard operations. Be that as it may, these conventions may not be efficient as far as postponement and unwavering quality. This reality alongside the advances made in streamlining devices, similar to amusement hypothesis and machine learning, has prompted the outline of enhancement based shrewd steering conventions. Extra enhancements have additionally been brought to entrepreneurial directing by executing cross layer cooperation's that help facilitate the steering, planning and connection quality estimation operations.

Yanchao Zhou, Wei Liu, Wenjing Lou, Yuguang Fang Et al. [7] They talked about a suite of area based trade off tolerant security instruments. In view of another cryptographic idea called matching, they examined the thought of area based keys (LBKs) by restricting private keys of individual hubs to both their IDs and geographic areas. They then build up a LBK-based neighborhood validation plan to limit the effect of bargained hubs to their region. They likewise show efficient ways to deal with set up a common key between any two system hubs. Rather than past key foundation arrangements, their methodologies highlight about flawless strength to hub trade off, low correspondence and calculation overhead, low memory prerequisites, and high system versatility. Additionally, they show the efficacy of LBKs in neutralizing a few famous assaults against sensor systems. At long last, they talked about an area based limit support plot, called LTE, to foil the notorious fake information infusion assault, in which enemies infuse loads of counterfeit information into the system. The utility of LTE in accomplishing momentous vitality reserve funds is approved by point by point execution assessment.

Jennifer Yick, Biswanath Mukherjee, Dipak Ghosal Et al. [8] A remote sensor organize (WSN) has essential applications, for example, remote environmental observing and target following. This has been empowered by the accessibility, especially as of late, of sensors that are littler, less expensive, and astute. These sensors are furnished with remote interfaces with which they can speak with each other to frame a system. The plan of a WSN depends significantly on the application, and it must consider variables, for example, the earth, the application's outline targets, cost, equipment, and framework limitations.

Dan Chen, Zhixin Liu, Lizhe Wang, Minggang Dou, Jingying Chen, Hui Li Et al. [9] they initially evaluated delegate works around there by arranging those in the areas of use of WSNs for calamities and streamlining advances fundamentally recognizing these from broadly useful WSNs. They then portrayed the outline of an early cautioning system for geo risks in repository locale, which depends on the WSN innovation propelled by the current work with spotlights on issues of supporting strong data transmission, dealing with colossal data of heterogeneous sources and sorts and limiting vitality utilization. This review talked about an element directing convention, a strategy for net-work recuperation, and a technique for overseeing versatile hubs to empower continuous and solid information transmission. The framework fuses information combination and recreation ways to deal with unite all information into a solitary perspective of the geohazard under checking.

Jinfang Jiang, Guangjie Han, Hui Guo, Lei Shu, Joel J.P.C Rodrigues Et al. [10] In this paper, they examined two multipath steering calculations that can be connected in submerged situations to cooperatively transmit information data. They first isolate the 3D submerged system into little block spaces, and after that visibly transmit information parcels as unit of little solid shape spaces by choosing one ideal sensor hub as next bounce hub in one little 3D shape space. The choice procedure relies on upon the sensor hubs' capacity which depends on the hub's remaining vitality, transmission deferral, and way misfortune, and so on. Besides, they accept that all the sensor hubs in the system are obligation cycled.

Oswald Jumira, Riaan Wolhuter, Sherali Zeadally Et al. [11] In the paper, they introduced in detail an online geographic directing plan called EBGRES, which can give completely stateless, vitality efficient source-to-sink, and versatile steering approach that has communication

overheads without the need to keep up neighborhood data with unending vitality supply. EBGRES settles on directing choices locally by mutually considering different elements, for example, vitality accessibility, parcel headway to goal, vitality accessible on the hub with vitality gathering ability, hub positions, and obligation cycle of the hub. They demonstrate that the amplified calculation EBGRES-2 hypothetically performs comparably to EBGRES. Accessibility of interminable vitality has an impact of keeping up the upper and lower limits for vitality utilization, yet it will encourage an expansion in the workload and lifetime of the sensor hubs.

Xuan Hung Le, Sungyoung Lee, Ismail Butun, Murad Khalid, Ravi Sankar, Miso Kim, Manhyung Han, Young-Koo Lee, and Heejo Lee Et al. [12] This paper displays a vitality efficient get to control plot in view of ECC to beat these issues and all the more significantly to master vide predominant vitality efficiency. Open key cryptography based get to control plot has a bigger number of points of interest than symmetric-key cryptography based plan due to better versatility, low memory necessity, simple arrangement of new hubs, and no key pre-dissemination. HBQ is a promising open key get to control conspire in light of elliptic bend cryptography yet it is appeared to have some significant restrictions

Dianbo Zhao, Kwan-Wu Chin and Raad Raad Et al. [13] they have one or more radios, and communicate with each other via multi-hop, as these radios have a bounded and short transmission range. In addition, there exists one or more sinks which collect sensed data and also issue commands to affect the operation of sensor nodes. To date, WSNs have found a myriad of applications. For example, precision agriculture, monitoring of pests and volcanology to name a few.

Guangjie Han, Yuhui Dong, HuiGuo, Lei Shu and Dapeng Wu Et al. [14]This paper concentrates on planning a cross-layer upgraded geographic steering that additionally adjusts the vitality utilization in EC-CKN-connected obligation cycled WSNs with environ-mental vitality reaping. Its principle commitments are the accompanying. Initially, geographic directing in obligation cycled WSNs ought to be 2-bounce based however not 1-jump based, due to the accompanying: in most existing rest planning calculations, it is obligatory for social occasion 2-jump neighborhood data and reenactment brings about this paper additionally bolster this point. Second, cross-layer advanced directing enables more hubs to rest while accomplishing the same wanted steering execution.

Zhuangbin Chen, Anfeng Liu, Zhetao Li, Young-June Choi, Hiroo Sekiya and Jie Li Et al. [15] In this paper, a novel Energy-effective Broadcast conspire with customizable telecom sweep is examined expecting to enhance the execution of system update. In their plan, the nonhot spots sensor hubs take full favorable position of their leftover vitality caused in information accumulation period to enhance the bundle gathering likelihood and decrease the telecom deferral of code parcel transmission by extending the telecom range, that is, the transmitting power. The hypothetical investigations and exploratory outcomes demonstrate that, contrasted and past work, their approach can averagely diminish the Network Upgrade Delay (NUD) by 14.8%– 45.2% and at the same time increment the unwavering quality without hurting the lifetime of system.

Messaoud Doudou, Djamel Djenouri and Nadjib Badache Et al. [16] This paper surveys current nonconcurrent WSN MAC conventions. Its primary commitment is to contemplate these conventions from the postpone proficiency point of view, and to research on their inertness. The nonconcurrent conventions are separated into six classifications: static wake-up prelude, versatile wake-up introduction, cooperative timetable setting, impacts determination, collector started, and foresight based. A few best in class conventions are portrayed after the talked about scientific classification, with exhaustive exchanges and correlations regarding their dormancy.

Mohammad Hossein Anisi, Gaddafi Abdul-Salaam, Mohd. Yamani Idna Idris, Ainuddin Wahid Abdul Wahab and Ismail Ahmedy Et al. [17] This paper, presents a brief summary of routing and related issues in WSNs. The most recent energy-efficient data routing approaches are reviewed and categorized based on their aims and methodologies. The traditional battery based energy sources for sensor nodes and the conventional energy harvesting mechanisms that are widely used to in energy replenishment in WSN are reviewed. Then a new emerging energy harvesting technology that uses piezo-electric nanogenerators to supply power to nano-sensor; the type of sensors that cannot be charged by conventional energy harvesters are explained. The energy consumption reduction routing strategies in WSN are also discussed.

Gaddafi Abdul-Salaam, Abdul Hanan Abdullah, Mohammad Hossein Anisi, Abdullah Gani and Abdulhameed Alelaiwi Et al. [18] they have introduced an original taxonomy of energy conservation approaches in hybrid WSN. Then they reviewed and summarized hybrid WSN data collections approaches that integrate the different techniques in their operations. Again, they presented a qualitative comparison of the various energy conservation approaches and highlighted the pros and cons of each. Additionally, they have presented an evaluation of energy-efficiency of the various data collection approaches and remark on their strengths and weakness to prolonging the lifetime of hybrid WSN.

Aiswarya Das, Kulamala Vinod Kumar and Madhuri Rao Et al. [19] They encourage checking for different applications like sea testing system, submarine discovery, debacle avoidance, observation and insurance of harbor and seaward business offices, outskirt security, living space and contamination observing, pirating and in fighting fear based oppression, and so forth. The paper gives the perusers an underlying comprehension of what submerged sensors are; their difficulties and the present condition of craftsmanship procedures created here.

Hang Shen and Guangwei Bai Et al. [20] This paper begins with the challenges and requirements in the design of WMSN routing, followed by an exhaustive survey on routing from the perspective of application requirements and key techniques. The objective of this survey is to highlight important topics in WMSNs, i.e., the challenges and current trends in routing. The main issues when de-signing the routing protocol are explored to provide stable and resource-efficient path with QoS/QoE support. This paper extracts the particularities and challenges in the design of routing for WMSNs, and then provides an exhaustive survey of recent research progress in this area.

Metin Tekkalmaz and Ibrahim Korpeoglu Et al. [21] In this paper, they described a routing approach and discussed a distributed routing algorithm (PSABR) based on this approach, which is able to increase the lifetime of WSNs where different power-source types for nodes exist. their

PSABR algorithm first forms a backbone in a distributed fashion to relay the data packets. The backbone consists of mains-powered nodes that are assumed to coexist with battery-powered nodes. In addition to the theoretical analysis of PSABR, they also presented the simulation results. As the results show, distinguishing between sensor nodes according to their power source types increases network lifetime by as much as 40 %.

Zhong Shen, Hai Jiang and Zhongjiang Yan Et al. [22] They study fast data collection in linear duty-cycled wireless sensor networks. they first present a benchmark algorithm that can achieve optimality in a general case. their results will provide theoretical performance bounds for information gathering time in direct WSNs. The bits of knowledge picked up in their talked about calculations can be useful for creating information accumulation calculations for WSNs with other topologies.

Kai Han, Jun Luo, Yang Liu and Athanasios V. Vasilakos Et al. [23] In this article, they have surveyed the algorithms designed for data communication in DC-WSNs. they have discussed different duty-cycling models used by existing approaches, as well as data communication protocols discussed for DC-WSNs under five categoris: unicast, anycast, broadcast, multicast, and converge-cast. The main insight revealed by their survey is twofold: i) a well characterized problem space, distinguishing well-studied aspects from potential future research directions, and ii) a concise exposition of the key techniques behind the discussed algorithms.

Shuo Guo, Liang He, Yu Gu, Bo Jiang and Tian He Et al. [24] They present Opportunistic Flooding, a novel outline custom fitted for low-obligation cycle systems with problematic remote connections and foreordained working calendars. they appear by broad reproductions and proving ground executions that Opportunistic Flooding is near the ideal execution achievable by prophet flooding plans. Contrasted and Improved Traditional Flooding, their outline accomplishes significantly shorter flooding delay while devouring just 20-60% of the transmission vitality.

Rashmi Ranjan Rout and Soumya K. Ghosh Et al. [25] in this paper, Simulation results reveal that there is an increase of 2.5% to 9.5% of network lifetime by using the discussed network coding based algorithm for 1% to 10% duty cycle respectively in a duty cycled WSN. It has been shown that the per node energy consumption in case of a WSN with duty cycle is more than a WSN with duty cycle and network coding. The Sink receives approximately 50% more data with same energy consumption in the bottleneck zone. The packet delivery ratio and packet latency for the discussed approach have also been investigated with packet losses at the Sink. A significant improvement in packet delivery ratio has been achieved with the discussed network coding approach.

Joaquim Oller, Ilker Demirkol, Jordi Casademont, Josep Paradells, Gerd Ulrich Gamm and Leonhard Reindl Et al. [26] The paper demonstrates how the use of their WuR platform presents numerous benefits in several areas, from energy-efficiency and latency to packet delivery ratio and applicability, and provides the essential information for serious consideration of switching duty-cycled MAC-based networks to WuR. The results presented in this paper furnish network designers with the fundamentals for seriously considering switching from currently dominant

duty-cycled networks to a WuR approach, as the authors have already done for several projects deployed around Europe.

Euhanna Ghadimi, Olaf Landsiedel, Pablo Soldati and Mikael Johansson Et al. [27] This paper presented a novel directing metric, Estimated Duty Cycled wake-ups (EDC), for sharp steering in obligation cycled WSNs. Decreasing radio obligation cycles specifically impacts the key asset in battery-fueled sensor arranges: the extremely constrained vitality supplies. they built up key properties of EDC as steering metric and demonstrated that it can be registered dispersed and prompts a circle free topology. Correlations with a nitty gritty expository model set up that EDC is an exact guess of the genuine number of obligation cycled wakeups required to forward the parcel. At long last, they appeared in the two recreations and beginning organizations that EDC yields fundamentally enhanced radio-obligation cycle tallies and postpones contrasted with ETX.

Chunsheng Zhu, Laurence T. Yang, Lei Shu, Victor C. M. Leung, Joel J.P.C. Rodrigues and Lei Wang Et al. [28] In this paper, they have investigated geographic directing in obligation cycled portable WSNs and examined two geographic-remove based associated k neighborhood (GCKN) rest booking calculations for geographic steering plans to be connected into obligation cycled versatile WSNs which can consolidate the benefit of rest planning and portability. They exhibit that GCKNF and GCKNA are exceptionally viable in shortening the length of the transmission way investigated by geographic directing in obligation cycled versatile WSNs contrasted and the CKN rest planning calculation and the GSS calculation. their work has demonstrated that rest planning is a commendable research bearing to adjust geographic sending techniques into obligation cycled portable WSNs.

Hongseok Yoo, Moonjoo Shim and Dongkyun Kim Et al. [29] they observed that both of DSR and DSP have bring down end-to-end defer and higher bundle conveyance proportion than the static obligation cycle planning plan of RI-MAC. In the meantime, they can contribute to balancing energy consumption among sensor nodes. In particular, DSP has better performance than DSR in regards to all performance metrics because of its aggressive behavior. In current version, their schemes adjust duty-cycle based on a linear decision graph.

Yunhao Liu, Yuan He, Mo Li, Jiliang Wang, Kebin Liu, Lufeng Mo, Wei Dong, Zheng Yang, Min Xi, Jizhong Zhao and Xiang-Yang Et al. [30] they discussed and make initial efforts to validate three conjectures that give potential guidelines for future designs of large scale sensor networks. A small portion of nodes bottlenecks the entire network, and most of the existing network indicators may not accurately capture them. The network dynamics mainly come from the inherent concurrency of network operations instead of environment changes. The environment, although the dynamics are not as significant as they assumed, has an unpredictable impact on the sensor network. they suggest that an event-based routing structure can be trained optimal and thus better adapt to the wild environment when building a large-scale sensor network.

### 3. Problem Analysis

In this section discuss the problem related to use of vitality in remote sensor organize. In remote sensors arrange vitality is real issue because of constrained size of battery. Presently a day's different creators proposed vitality proficient directing convention for remote sensor systems. The sensors networks consumed the maximum energy during the sensing of data and transmission of data to sink node. For betterment of energy utilization some authors used duty cycle based protocol in routing of sensors node.

#### 4. Proposed Work

The Q-LEACH protocols not measure the prior knowledge of cluster head selection during transmission of data for base station. The selection of cluster head process done by using EM estimation technique. The EM technique estimate the energy level and consumption level during transmission and selection of cluster node in individual cluster group. The process of individual group of nodes for selecting the cluster head depends on minimum energy required for the formation process. Now process of that reduces the energy consumption and increase the life time of the network. In each area of cluster head selection using the grouping of node using estimation of maximum entropy for the generation of information during selection of cluster head and data aggregation for the transmission of data form sensor node to base station. The working algorithm discuss in two phases in first phase discuss the estimation technique of energy and second phase discuss the process of data aggregation of algorithm.

#### 5. Conclusions

Energy is important factor in wireless sensors network. The utilization of energy decide the life of sensor network. The sensor occupied tiny small battery without charging. The tiny battery drained very fast due to searching of communication path and sensing data. in this paper present the review of energy efficient routing protocol for wireless sensor networks. Some authors used clustering technique for clustering the sensor nodes and some authors are used energy optimization function on the bases of the geometrical structure of routing path in sensors network. In future modified the process of full duty cycle and reduces the utilization of energy in sensors network.

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