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Energy Efficient based Protocol in Wireless Network using Dynamic Cluster

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Abstract: The main concern of clustering approaches for mobile Wireless Sensor Networks (WSNs) is to prolong the battery life of the individual sensors and the network lifetime. The proposed homogeneous and secure weighted clustering algorithm which is an extended version of our previous algorithm (SWCA) for mobile WSNs using a combination of five metrics. Among these metrics lie the behavioural level metric which promotes a safe choice of a cluster head in the sense where this last one will never be a malicious node. The goals of the proposed algorithm are: offering better performance in terms of the number of re-affiliations which enables to generate a reduced number of balanced and homogeneous clusters. This algorithm, coupled with suitable routing protocols, aims to maintain stable clustering structure.

Keywords: WSN,SWCA, Cluster Head (CH), Security,QoS

I. Introduction

A WSN (Wireless Sensor Network) includes a massive quantity of sensors, each of which are physically small devices, and are equipped with the capability of sensing the physical environment, data processing, and speaking wirelessly with other sensors. Generally, every sensor in a WSN has positive constraints with respect to its strength supply, power, memory, and computational capabilities. The communication paradigm of WSN has its root in wi-fi advert hoc networks, where community nodes self-prepare in an ad hoc fashion, commonly on a brief basis. In a wi-fi advert hoc network, a set of wireless nodes spontaneously form a community with none fixed and centralized infrastructure. When two nodes want to communicate, intermediate nodes are called upon to ahead packets and to form a multi-hop wireless route. Due to opportunities of node mobility, the topology is dynamic and routing protocols are proposed to search for cease-to-cease paths. The community nodes rely on friends for all or maximum of the offerings wished and for fundamental needs of communications. Due to the shortage of centralized control and management, nodes rely upon fully distributed and self-organizing protocols to coordinate their activities.

In both scenarios, disbursed protocols need to deal with dynamically to the following changes a node may join or leave the network arbitrarily, links may be broken, and nodes may be powered down as a result of node screw ups or intentional consumer actions. With admire to the characteristics formerly discussed, wireless sensor networks (or sensor networks for simplicity) are very similar to wireless advert hoc networks, as sensors act as network nodes. Each sensor can simplest reach its neighbouring sensors directly. Intermediate sensors may relay the messages when supply sensors and destination sensors are far from one another.

A modern wireless sensor network consists of individual sensor nodes which measure various environmental variables. Most of the variables depend on the application and can range from physical parameters, such as temperature or humidity, to more abstract parameters. This information can be stored as data at the node or relayed through the network, using wireless communications, for access by the user. Recent advancements made in the miniaturization of electronics have sparked a growing interest into the vast possibilities and applications of wireless sensor networks.

This reduction of size, energy consumption and cost of the wireless sensor node components i.e. sensors, circuits, wireless communication; has made the vision of autonomous sensor networks deployed throughout the environment, a near reality. Clustering means grouping nodes that are close to each other, largely in ad-hoc networks and recently in WSNs is to reduce useful energy consumption and routing overhead.

The two kinds of nodes can be found inside the cluster, one node is called Cluster Head (CH) or coordinator (CH1, CH2 and CH3) that is responsible to coordinate the cluster activities, and several ordinary nodes are called cluster members (CMs) (CM1 and CM2) that have direct access only to one CH.

An ordinary node that is able to hear two or more CHs and it acts a gateway. For each communication initiated by a cluster member to a destination inside the cluster must pass by CH. If the destination is outside the cluster, the communication must be forwarded by a gateway and consequently consume more energy compared with CMs during the network operations and this will lead to untimely death causing network partition and therefore failure in communication link.

Unique Characteristics of Sensor Networks

The quantity of the nodes in a sensor network is significantly larger than that in an average wi-fi ad hoc network. The difference may be of several orders of magnitude. Sensors are normally low-cost devices with intense constraints with respect to power source, power, computation abilities and memory. Sensors are generally densely deployed.

Applications of Wireless Sensor Networks

Development of WSNs was usually motivated by their need for navy surveillance. With the availability of low fee sensors, these networks are no longer confined to army programs however are utilized in a big range of programs along with habitat monitoring, industrial system monitoring, site visitors control, etc

A. Military Applications

Military missions often involve high risk to human personnel. Thus, unmanned surveillance missions using WSN have wide applications for military purposes such as surveillance, enquiry of opposing forces, targeting, damage assessment, etc. WSNs developed for military purposes should be rapidly deployed in an ad-hoc fashion such as by an aircraft. They should also be energy-efficient, fault tolerant, disposable and support network dynamics. Destruction of a few nodes by enemy forces should not hamper the operation of such networks.

B. Habitat Monitoring

Monitoring plant and animal habitats on a long-term basis is widely employed by researchers in Life Sciences. However, human presence in such monitoring often causes disturbances in plant and animal conditions, increases stress, reduces breeding successes, etc. WSNs provide a non-invasive and economical method of long-term monitoring of habitats. Such a network was used to monitor the Storm Petrel seabirds in the Great Duck Island in Maine. Wireless sensors were used to measure temperature, pressure, humidity was used to track zebra and other animals in Kenya.

C. Environment Monitoring

WSN can be used in a wide range of environmental monitoring applications such as forest fire monitoring, air pollution monitoring, greenhouse gas monitoring etc. WSNs to monitor dangerous gases such as CO, NO2, and CH4 have already been deployed in some cities.

D. Agriculture

Wireless sensors may be deployed across large areas of crop fields and can monitor different parameters like moisture and fertilizer content of soil, temperature this can automate the processes of irrigation application of fertilizer and pesticides, among others, minimizing human intervention and maximizing yield.

E. Industrial Monitoring

Industrial machineries need condition-based maintenance. Wired infrastructure for such maintenance is costly due to the cost of wiring and the inaccessible locations, such as rotating machinery. Wireless sensors are beneficial in such cases, providing greater accessibility, improved monitoring and maintenance at lower costs. WSNs are also widely employed in industry for product monitoring as well as quality control.

F. Health Monitoring

Wireless personal area or body networks may revolutionize the way we monitor health conditions by providing a non-invasive, inexpensive, continuous and ambulatory health monitoring. Patients wear small body sensors that monitor the patients bio-signals such as heart rate, and the collected data are transmitted over a hand held device. Alarms and bio-signals may be transmitted over the Internet to a health professional for real-time diagnosis.

II. CHALLENGES IN WIRELESS SENSOR NETWORKS

Some of the major challenges that prevent the wide spread adoption of WSNs are listed below:

[1] Energy Constraint

Wireless sensor nodes are battery-powered and often deployed in remote and inhospitable locations. As such, battery replacement or any other human intervention is either not possible or extremely difficult. Therefore, these nodes are required to function for months or years at a time on the same power source to maintain the application Quality of Service (QoS). As a result, energy conservation is of the utmost importance in WSNs, and much research has been done on the development of energy efficient protocols and hardware for WSNs.

[2] Fault Tolerance
Often a sensor node may be destroyed or stop functioning, such as when a sensor node is destroyed in a forest fire or by the enemy in a battlefield. The remaining nodes must adapt dynamically in real time and convey the data to the base stations or sinks. Thus, WSN protocols for the MAC and routing layers must have a certain level of robustness.

[3] Computation Capability
Sensor nodes are small devices with very limited memory and processing power. Thus, often at times large scale processing is not possible in sensor nodes, and the data must be transmitted to a base station to be processed. However with the advancement of semiconductor technology, this drawback has been greatly reduced.

[4] Security
WSNs are lightweight networks with limits on the transmitting data rate and capacity. Thus, conventional security measures such as private keys are not readily applicable to such networks, as these may increase the network overhead and in turn decrease the network lifetime. However, security is an important requirement in applications such as surveillance. Thus, another area of research in WSNs is providing security and privacy.

III. LITERATURE SURVEY

K. Amudha , C. Nelson Kennady Babu and S. Balu(2017): A security issues are raised when transferring medical images from one place to another place like confidentiality, integrity and authenticity. Combined encryption and watermarking technique used to verify the integrity and authenticity of medical images. To increase the security proposed technique uses baker key in original images before applying the AES algorithm. Based on the baker key the image pixel position has been changed to increase the data hiding capacity.

K. Amudha , C. Nelson Kennady Babu and S. Balu(2016): The main objective is watermarking is to cover a message in some audio or video information. In general, digital video was hold and processed in an encoded format for protection. During this method, information in encrypted domain while not secret writing information hide, maintain the confidentiality of the content.

K. Amudha , C. Nelson Kennady Babu and S. Balu(2016): A new technique based on reversible watermarking to improve information embedding capacity and security level in medical images. This technique uses two methods namely Image compression and image partitioning techniques. Original image is converted into R-S Vector interms of ones and zeros and it is compressed to provide space for embedding more information. Image partitioning technique divides the image into two parts then secret information is embedded into LSB bits.

Benjie Chen et-al(2012): A power saving technique for multi-hop ad hoc wireless networks that reduces energy consumption without significantly diminishing the capacity or connectivity of the network.

Haowen Chan, Adrian Perrig(2012): The efficient subdivision of a sensor network into uniform, mostly non-overlapping clusters of physically close nodes is an important building block in the design of efficient upper layer network functions such as routing, broadcast, data aggregation, and query processing. ACE, an algorithm that results in highly uniform cluster formation that can achieve a packing efficiency close to hexagonal close-packing.

IV. WORKING OF WSNs

WSN mechanism is quite easy, simple and applicable to a variety of fields. It is based on smaller nodes, controller, radio transceiver, and battery. The system is totally dependent on the nodes and the harmony established between them through proper frequency. These nodes are of different sizes according to the function they perform. To activate the monitoring or tracking function of these nodes a radio transmitter is attached to forward the information signals in the form of waves. They are controlled by the microcontroller according to the function and device in which they are used. All the system remains in working condition with the help of energy supply which is in the form of battery.
The WSNs perform function concurrently where nodes are autonomous bodies incorporated in the field spatially for the accurate results. The information transmits through proper channel taking the information collecting it in the form of data and send to the base.
Depending to their types WSNs are used by different organizations and fields to monitor a specific task. WSN are incorporated at different point to monitor a specific area a common known example is that of military communication either land or water. Major issues which are becoming a possible threat to life are environmental and industrial issues. WSNs are doing great job in the relevant fields to sense to temperature for greenhouse gasses and similarly earthquake detectors are implanted to detect the land sliding phenomenon for precautionary measurements etc.

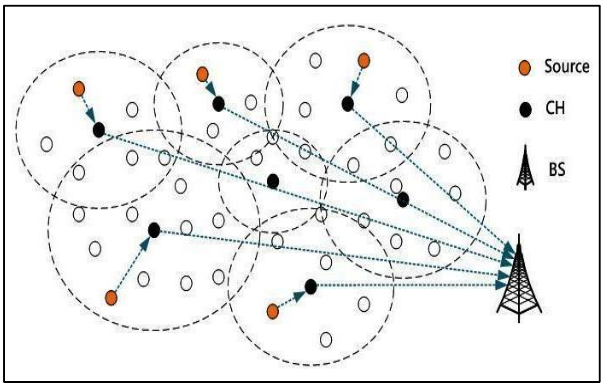

Fig 1 Working of a WSN

V. EXISTING SYSTEM

In existing system is decisive and allows the energy and bandwidth management clustering algorithm to avoid any malicious node in the neighbourhood to become a CH, even if the remaining metrics are in its favor. The election of fixed CHs is carried out using weights of neighbouring nodes which are computed based on selected metrics. So this strategy ensures the election of legitimate CHs with high weights. The preliminary results obtained through simulation study demonstrate the effectiveness of our algorithm in terms of the number of equilibrate clusters and the number of reaffiliations, compared to WCA (Weighted Clustering Algorithm), DWCA (Distributed Weighted Clustering Algorithm), and SDCA (Secure Distributed Clustering Algorithm). These results also reveal that our approach is suitable if we plan to use it in network layer reactive routing protocols instead of proactive ones once the clustering mechanism is launched.

DRAWBACKS**:**
- Fixed cluster head cannot manage bandwidth levels all the time.
- Low data and energy management.
- No proper maintaining stable clustering structure and offering a better performance.
- Not showing clearly the interest of the routing protocols in energy saving and therefore maximizing the lifetime of the global network.

VI. PROPOSED SYSTEM

The main objective ESWCA (Extended Version of Weighted Clustering Algorithm with DSDV Routing) with DSDV (Destination sequenced distance vector routing) Routing in WSN which are made of low-cost, low-power, small in size, and multifunctional sensor nodes. Thus, one of the important issues in wireless sensor network is the inherent limited battery power within the sensor nodes. Therefore, battery power is crucial parameter in the algorithm design in maximizing the lifespan of sensor nodes. It is also preferable to distribute the energy dissipated throughout the wireless sensor network in order to maximize overall network performance.

Much research has been done in recent years in the area of low power routing protocol, but, there are still many design options open for improvement, and for further research targeted to the specific applications, need to be done. In this project, we propose a new approach of an energy-efficient homogeneous clustering algorithm for wireless sensor networks in which the lifespan of the network is increased by ensuring a homogeneous distribution of nodes in the clusters.

In this clustering algorithm, energy efficiency is distributed and network performance is improved by selecting cluster heads on the basis of
- the residual energy of existing cluster heads,
- holdback value, and
- nearest hop distance of the node. In the proposed clustering algorithm, the cluster members are uniformly distributed and the life of the network is further extended

VII. IMPLEMENTATIONS

In this module to assemble an accurate energy model, behavior a sequence of measurements on the Object Energy Profiler to obtain a fixed of strength intake records. Based on the facts set, analyze the power consumption of different states and country transitions. where a transmission system refers to the trade in strength nation from low to excessive

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and then returned to low. To identify the parameters of energy model, behavior measurement experiments. Next a message from on the node is started on the only end. Then send messages to the vacation spot from any other node and hold the nation device within the minimum kingdom even as strength consumption is measured.

A. RANDOM CLUSTER NODE DESIGNING

In this module to distinguish exclusive requests described via applications, Random cluster gives a customized API for such applications. An application informs Random cluster the way to technique a request via a easy API Submit Request(r _ put off). If r_ postpone is zero, the request may be a real-time or an unsuccessfully prefetched request (efficiently perfected request would no longer be submitted) that must be transmitted instantaneously. If r_ delay is a fantastic value, the request is delay-tolerant and can for this reason be behind schedule for r_ put off time units. If r_ put off is a poor value, the request is a previous try that likewise can be delayed for -r_ postpone time units. However, the difference between put off-tolerant request and previous try is that the latter might be discarded as the deadline approaches. Random cluster schedules requests as indicated by way of the parameter r_ put off.

B. DATA TRANSMISSION AND VERIFICATION

In this module two tail times can be without delay applied to one tail time. Thus, consider only the previous separate the two tail instances primarily due to the fact the scheduling charges in these two intervals are distinct. Two mechanisms are employed for online dedication of whether now is the tail time.

Power-based totally state inference mechanism is used to deduce the current RRC nation based on electricity intake. Determining the present day RRC country is the muse of distinguishing between the 2 types of tail time. Moreover, a power-based totally country inference mechanism has been proven effective with excessive accuracy. Given that it is able to exhibit excessive accuracy (greater than 95%), the error estimate of this mechanism is disregarded.

Virtual tail time that is used to determine whether now's the tail time, which corresponds to the original inaction timers maintained by way of the RNC. After transmitting records in the tail time, the inactiveness timers are reset, such that the bodily tail time is broken. It consult with the used tail time as the digital tail time.

A timer is needed to determine whether now's the virtual tail time within the contemporary RRC nation. The virtual tail timer, performs operations that are much like those accomplished by means of the state of no activity timer maintained through the RNC. Two timers correspond to the virtual tail instances of the DCH and ACK states, which can be denoted as γ and δ, respectively.

Similar to the state of being inactive timer α, the virtual tail timer γ is activated whilst the throughput is zero or below the configured threshold

1. If timer γ is activated when the throughput is zero, Random cluster can start transmitting records after the timer γ is activated and stop when the timer γ expires or is reset.

2. If timer γ is activated when the throughput is underneath the configured threshold however more than zero, Random cluster can't transmit facts after the timer γ is activated.

If Random cluster transmits information underneath this circumstance, the transmission of real-time statistics may be ongoing whilst the timer γ expires, and demotion at the moment would trigger extra nation promotions. Thus, having no transmission at the second one circumstance could no longer reset the inaction timer α, and the country is demoted to the ACK kingdom after the expiry of timer α. When in the ACK kingdom, the virtual tail timer δ might be activated simplest while the throughput is zero. Random cluster can begin transmitting statistics after timer δ is activated and stop while the timer δ expires or is reset.

C. DATA QUEUING MANAGEMENT

In this module to handle the scheduling requests feasibly, is another problem to be discussed in this section. Applications submit CH requests by calling the API. Requests that can be delayed, referred to as Random cluster requests, include delay-tolerant requests and previous attempts. Random cluster employs a dual queue scheduling algorithm for scheduling these two categories of requests.

Random cluster schedules requests by maintaining two queues:

1.Real-time queue for requests that must be scheduled instantaneously, and

2.Random cluster queue for Random cluster requests.

Random cluster schedules requests in the real-time queue if requests are present in this queue and schedules those in the Random cluster queue if the real-time queue is empty or if the deadline of the first request in the Random cluster queue approaches.

D. HANDLING RANDOM CLUSTER REQUESTS

Random cluster is feasible if and only if it not only transmits requests in the real-time queue as soon as they are inserted, but also processes requests in the Random cluster queue before their deadlines. Specifically, delay-tolerant requests should be scheduled before their deadlines, and previous attempts should be scheduled before their deadlines or discarded as their deadlines approach. To meet the deadlines indicated by requests, the dual queue scheduling algorithm introduces a new timer θ.

After being delivered by applications, Random cluster requests are added to the queue from small to large, according to the time between tnow and di, where tnow is the current time, and di equals to the sum of the arrival time ai and the absolute value of r_delay of request i. The first request in the Random cluster queue is assigned with the latest deadline and is the first to be transmitted.

After each enqueue operation, Random cluster derives the latest deadline, denoted as dl, and restarts the timer θ, the end time of which is dl −tnow. When now is the virtual tail time, the first request in the queue is dequeued first. Timer θ is cancelled before the first request is dequeued and reactivated according to the deadline of the next request in the queue after dequeuing.

E. TRANSMISSION CONTROLLING MODULE

In the virtual tail time of the ACK state, excessively high transmission speed expands the occupancy of the RLC buffer to a level greater than the threshold set by the RNC. This expansion results in ACK→DCH promotion, thereby causing additional energy consumption. To prevent triggering promotions when transmitting requests in the ACK state,

VIII. CONCLUSION

In this project, proposed a new algorithm called "MACWWSN "is proposed for the specificities and constraints of sensor networks. Using MACWWSN aimed at creating a virtual topology to minimize frequent re-election and avoid overall restructuring of the entire network.

The first objective is to reduce energy consumption in all levels. As a result of this work, plan to exploit the concept of redundancy to enhance results that are related to energy conservation. Another interesting work that remains to do is to provide in-network processing by aggregating correlated data in the routing protocol and reduces the amount of data that are transported in the network.

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