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Analysis of Various Energy Efficient Technique of Wireless sensor Networks

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Abstract: **The wireless sensor networks is the localised sort of network within which sensor nodes will be part of or leave the network after they need. Due to such type of network routing, security are the major issue which affect network performance. The various techniques has been designed to improve lifetime of the wireless sensor networks. Among the various energy efficient techniques, clustering is the most energy efficient approach of wireless sensor networks. The LEACH is the energy efficient protocol of wireless sensor networks. In the review paper various energy efficient techniques are reviewed in terms of certain parameters.**

Keywords: **Energy Efficient, LEACH Protocol, LEACH-TLCH Protocol, TH-LEACH Protocol, WSN.**

1. INTRODUCTION

The wireless sensor networks is that the foremost important technology throughout this century. WSN could be a network during which numerous variety of sensor nodes are deployed in physical space for observation that individual space. Embedded microprocessors and radio transceivers are combined with sensors nodes. Sensors nodes are used for sensing the information, process the information and for communication purpose. These deployed sensors are connected with wireless link. Sensors sense data of specific space during which they are deployed and forward that data to the common purpose for additional process on it information.[1]

Fig.1 Basic Diagram of WSN

1.1 CHALLENGES OF WSN

i. Network lifetime

Network life is that the main challenge of the wireless sensing element networks. The life of a sensing element node depends powerfully on the battery power. A tiny low portion of "dead" sensing element nodes may directly have an effect on the complete network life, and probably result in an enormous loss within the network because of the routing path reallocation and failure of sensing and reporting events within the environment. Therefore, so as to prolong network life and guarantee the lustiness of the sensing element network, efficient energy consumption and energy conservation are of great importance in wireless sensing element networks once planning and deploying networks for sensible use.

ii. Redundancy

Due to the frequent node failures and inconvenience of failing nodes, WSNs square measure needed to possess high redundancy of nodes so the failure of few nodes may be negligible.

iii. Limited battery supplies

Sensor nodes that area unit around the sink node use energy at terribly high rate as a result of the traffic of alternative nodes is additionally forward by this node. Sensing element node around the sink, drain their energy resources at quicker rate than alternative nodes that ends up in the decreasing in network period of time.

iv. Energy consumption

Sensor nodes that are deployed above all region to perform any application of wireless sensor network should consume energy at high rate. If the energy consumption rate becomes completely different, then anyone of the node depletes their batter at quick rate which specific node becomes useless and network can dead. To avoid this, energy consumption rate should be equal.

1.2 ENERGY CONSUMPTION ISSUES IN WIRELESS SENSOR NETWORK

Energy consumption is that most vital issue to work out the lifetime of a sensor network as a result of sometimes sensors nodes area unit driven by battery. Typically energy improvement is additional sophisticated in sensor networks as a result of it concerned not solely reduction of energy consumption however additionally prolonging the life of the network that maximum amount as doable. The improvement is often done by having energy awareness in each facet of style and operation.

i. a computing subsystem

It consists of a micro chip (microcontroller unit, MCU) which is liable for the management of the sensors and implementation of communication protocols. MCUs sometimes operate below numerous modes for power management purposes. As these operative modes involves consumption of power, the energy consumption levels of the varied modes ought to be thought-about whereas staring at the battery time period of every node.

ii. a communication subsystem

It consists of a brief vary radio that communicate with neighboring nodes and also the outside world. Radios will operate beneath the various modes. It is vital to fully clean up the radio instead of putt it within the Idle mode once it is not transmission or receiving for saving power.

iii. a sensing subsystem

It consists of a gaggle of sensors and actuators and link the node to the surface world. Energy consumption is reduced by mistreatment low power elements and saving power at the value of performance that is not needed.

iv. a power supply subsystem

It consists of a battery that provides power to the node. It ought to be seen that the number of power drawn from a battery is protracted time, battery can die quicker even supposing it may have gone on for a extended time. Sometimes the rated current capacity of a battery being employed for a sensor node is smaller amount than the minimum energy consumption. The lifespan of a battery will be increased by reducing the present drastically or perhaps turning it off often.

2. LEACH PROTOCOL

LEACH stands for Low Energy Adaptive Clustering Hierarchy. This is often a TDMA primarily based mackintosh protocol for wireless sensor networks with uniform nodes. LEACH is a self-organizing, adaptive clustering protocol. LEACH aims to distribute energy consumption at each node within the sensor network uniformly, aggregate information i.e. support information fusion and localized coordination, between nodes to create and operate cluster. All the nodes within the network organize themselves into native cluster acting as cluster head. All nodes communicate only to the cluster head, and therefore the cluster head conveys information to the base station. Nodes with higher capability advertise themselves as cluster head, alternative nodes be part of the cluster head that is nearest to them. As cluster head must spend heap of energy, after certain time, irregular rotation of cluster head is completed, in order that node does not drain its energy. Each cluster head can prepare a schedule, to every of its members. The members communicate with the head only throughout that period and sleep for the remainder of the time. The most operating of this protocol is to boost the period of time of wireless sensor networks by lowering the energy.

i. Architecture of Leach Protocol

The operation of LEACH is broken into rounds. Every round beginning with setup phase, throughout that cluster are formed and steady phase throughout that data is transferred to base station. Steady phase is longer than setup phase. Initially at the beginning of each round, every node decides if it is to be cluster head or not. The node that decides to be cluster head sends broadcasts a message. All alternative nodes can keep their receiver on and choose to that cluster head they have to join. Each node selects a cluster head that is nearest to it.

All nodes send messages to individual cluster heads. The cluster head supported the quantity of requesting nodes creates a TDMA schedule for all the nodes. Only throughout their individual schedules nodes move with the cluster head, else the node can sleep. The cluster head receives data form all nodes in its cluster, aggregates the information and send to the base station. The phase once schedule is announced, is that the steady phase and phase before schedule is announced, is setup phase.

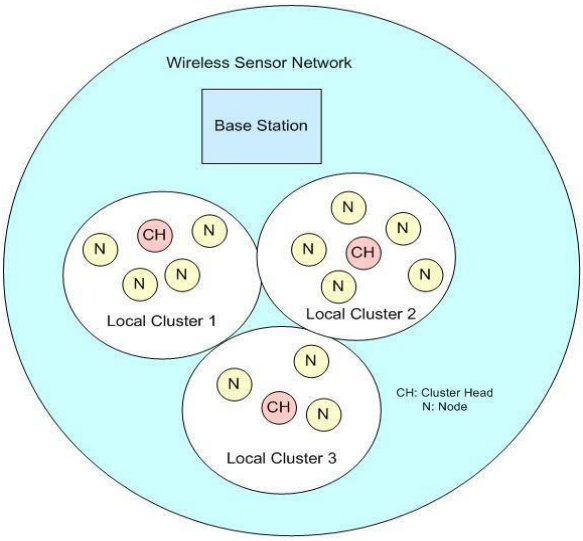

Fig.2 A Basic Structure and function of LEACH

2.1 LEACH-TLCH PROTOCOL (LEACH Protocol with Two Levels Cluster Head)

It is an improved protocol supported on leach protocol, the ways of cluster head choice and cluster forming are same as LEACH protocol.

i. The stage of cluster forming

The nodes chooses variety 0 or 1, if the quantity is smaller amount the t(n) value, node becomes cluster head otherwise it becomes normal node. Cluster broadcast their own data to the all different nodes, and also all different nodes can listen this message.

All normal nodes verify that cluster they must take part in this round. After deciding that cluster they will be part of CSMA protocol are be used send a confirmation message to their cluster head. At this point, the cluster forming stage is completed.

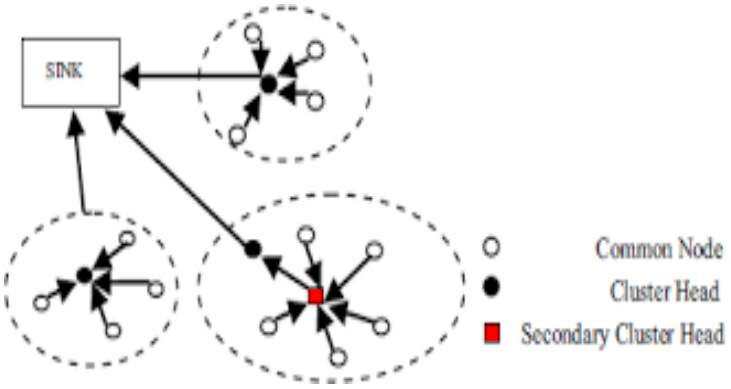

Fig 2.1 Structure of LEACH-TLCH

ii. The selecting of secondary cluster head

Every cluster head node decides whether or not to line a secondary cluster head according to the current energy itself and

also the distance of the base station from itself. If its energy is low then its option for a secondary cluster head with the utmost energy node within the cluster. If it has sufficient energy then there is no have to compelled to option for secondary cluster head.

iii. To create transport schedule

All clusters are isolated into two classes, in clusters with secondary cluster heads, the secondary cluster head broadcasts message of being secondary cluster head to the other ordinary nodes and builds a schedule (utilizes TDMA get to channel, a interval is designated to every node), informs the schedule to the other nodes. In clusters while not secondary cluster head, the cluster head appropriate sending time slot to the others after get the join information of normal nodes. The steady stage begins once every node have gotten its sending time slot.

iv. Data transferring

When clusters have formed and thus the TDMA schedule is ready, the nodes begin to transfer the monitoring data. The secondary cluster heads receive data from the other nodes and fuse these data, these amalgamated data was sent to the cluster heads, then cluster heads send these data to base station by single-hop technique[2].

2.2 TH-LEACH PROTOCOL

In this protocol focuses on variety of alive nodes remains and energy consumption/residual energy of the nodes/network at last of communication. The projected work emphasizes on up the quantity of alive nodes and energy consumption within the network at the top of communication. The Tertiary Cluster Head should be having highest energy among all the nodes of cluster likewise as ought to be nearest to the base station among cluster head, Secondary cluster head. The network period of time is analyzed on the idea of alive nodes remains in the end of communication. The working phases of communication in TH-LEACH protocol are as same as of LEACH protocol. The distinction between these protocols is simply within the selection of tertiary cluster head. The structure and function of TH-LEACH is :

i. Advertisement Phase

The structure of cluster with the terminology of nodes as a Cluster Head, Secondary Cluster Head, a Tertiary Cluster Head and sensing nodes. The selection of tertiary cluster head additionally depends on the distance between the base station and current node, and the maximum residual energy among the remaining nodes of the cluster.

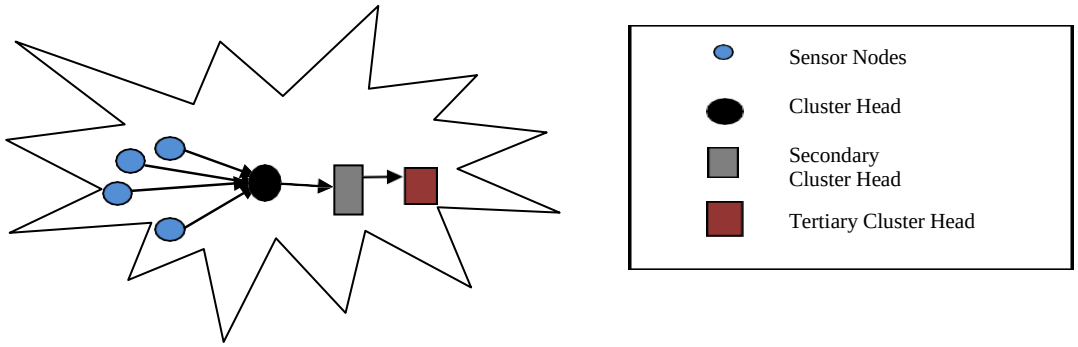

Fig.2.2 Structure and function of TH-LEACH Protocol

The distance between the current node and base station ought to be minimum among the cluster head and secondary cluster head for current round I of communication. If the residual energy of secondary cluster head is more than the average energy of the network and also more than the threshold then there is no got to elect tertiary cluster head. Once the cluster head are fashioned, the cluster head advertise itself to the remaining nodes of cluster exploitation CSMA-MAC scheme. After receiving advertise frame from cluster head all the nodes including secondary cluster head, tertiary cluster head and remaining sensor nodes informs themselves to cluster head about its membership into the cluster.

ii. Cluster Setup and Schedule Creation Phase

Once the information concerning the nodes present within the cluster is known to cluster head, it design TDMA slots, which reduce the sleep mode delay, for the remaining nodes excluding secondary cluster head and tertiary cluster head.

iii. Data transmission phase

The main role of cluster head is to aggregate the detected information that can be static or dynamic depends on application, from alternative sensor nodes of the cluster, process it and eventually send to the next intermediate node i.e. secondary cluster head. The process of collective information could be the calculation of average, maximum or minimum of collected information. The responsibility of secondary cluster head to receive the information from cluster head, add the detected information of its own so forward a similar to tertiary cluster head. Finally the Tertiary cluster head forward a similar to the base station or sink by adding its detected data[2].

3. LITERATURE SURVEY

Author	Year	Description	Outcomes
WU Xiaoping et al.	2010	This paper proposed an improved routing algorithm based on LEACH protocol which involves choosing of cluster head, multi-hop routing and the building of its path.	Energy utilizing rate is higher in this improved routing algorithm, and network's lifetime is increased.[3]
Maciej Nikodem et al.	2011	The paper investigates whether clustering itself (with no data aggregation) can improve network lifetime in particular application when compared to non-clustered networks.	Results show that clustering itself cannot improve network lifetime so additional techniques and means are required to be used in synergy with clustering.[4]
Chi-Tsun Cheng et al.	2011	This paper proposed a delay-aware data collection network structure for wireless sensor networks. Delays in the data collection processes of wireless sensor networks are minimized with the help this proposed network structure.	Recreation results demonstrate that, when comparing with other common network structures in wireless sensor networks, the proposed network structure is able to shorten the delays in the data collection process essentially.[5]
Chu-Fu Wang et al.	2014	This paper proposed a network lifetime enhancement method for sink relocation. Energy-Aware Sink Relocation (EASR) is a strategy which is utilized to improve the lifetime of wireless sensor network. The main focus in this paper is on residual energy of sensor node.	According to that residual energy of sensor node the transmission scope of sensor would change and furthermore the relocation of sink is occurred by the residual energy of sensor node.[6]
Seyyit Alper Sert, et.al	2015	A distribution-independent approach is proposed here in this paper for clustering in WSN. A multi-objective fuzzy clustering algorithm (MOFCA) is proposed which addresses both hotspots and energy hole problems in stationary and evolving networks.	In terms of efficiency metrics such as First Node Dies (FND), Half of Nodes Alive (HNA) and Total Remaining Energy (TRE) are used for estimating the lifetime of WSNs which proved that MOFCA outperforms other techniques.[7]

M. Guerroumi et.al	2015	This paper proposed new data dissemination protocol based energy-efficient called energy-based data dissemination protocol.	In this stage, sensor sink may move toward any cluster based on its sensed data frequency to minimize energy consumption of sensor nodes near the fixed sinks due to relaying of large amount of data.[8]

4. CONCLUSION

In this review paper, it is concluded that wireless sensor networks is the decentralized type of network in which no central controller is present. The energy consumption is the major issue of wireless sensor networks which affect its performance. In this review paper, various energy efficient techniques are reviewed in terms of certain parameters. In future the most efficient energy efficient protocol will be improved for the fault reduction in the network.

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