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RESEARCH ARTICLE

TO ENHANCE THE LIFETIME OF WIRELESS SENSOR NETWORK USING A NOVEL APPROACH BASED ON CLUSTERING

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Abstract - Sensor networks are dense wireless networks of small, low-cost sensors, which collect and disseminate environmental data. Wireless sensor networks facilitate monitoring and controlling of physical environments from remote locations with better accuracy. They have applications in a variety of fields such as environmental monitoring, military purposes and gathering sensing information in inhospitable locations. The sensor nodes in Wireless Sensor Network are battery powered devices which consumes energy during data transmission, processing, etc. The critical task in WSN is to deal with optimizing energy consumption. In this our main focus is for enhancing the energy levels in WSN nodes by saving energy using concept of multi sink scenario.

Keywords - WSN, Sink, Energy consumption, sensing devices

I. INTRODUCTION

Wireless sensor network is the collection of various sensing devices. These sensing devices are known as nodes. The nodes are communicates with each other, they does not required any wired connection for communication process. The wireless sensor network comes under the category of infrastructure-less networks. It is centralized system. Wireless Sensor networks are self organized network. Each node in wireless sensor is consist of multiple types of memory and processing elements ,RF transceiver ,a power source, sensors and actuators. Wireless Sensor Network is a latest technology that has an ability to coordinate a large network into a single network. It is also consist of large

number of low cost devices. Wireless Sensor Network is a Light weighted distributed system. There is no need of external infrastructures in wireless sensor network to communicate with other devices. [1]

The data transmission is takes place in WSN. It can be done in two ways. As,

1) Pull Mode
2) Push Mode

In the Pull mode, the data can be sends only when sink sends the request. In the push mode, data sends from source to sink with no request.

A wireless sensors device provides three basic functions that are: It provides efficient and reliable communications. The wireless sensor network has the ability to operate devices motors, sensors, actuators that control conditions. It also has the ability to provide physical and environmental conditions. [2] Wireless sensor network consist of several nodes. These nodes communicate with each other through wireless medium. The wireless medium may either of radio frequencies, infrared have no wired connection. The nodes are deployed in a randomly and to make an ad-hoc network communicate among themselves. If the node is not able to communicate with other through direct link, i.e. they are out of coverage area of each other. The data can be sending to the other node by using the nodes in between them. This property is referred as multi-hoping. [3] In wireless sensor networks, position of the nodes is not predetermined. Cooperative nature of sensor nodes is its unique feature in WSN.

A. ARCHITECTURE OF SENSOR NODE

The architecture of single node of wireless sensor network is given below:

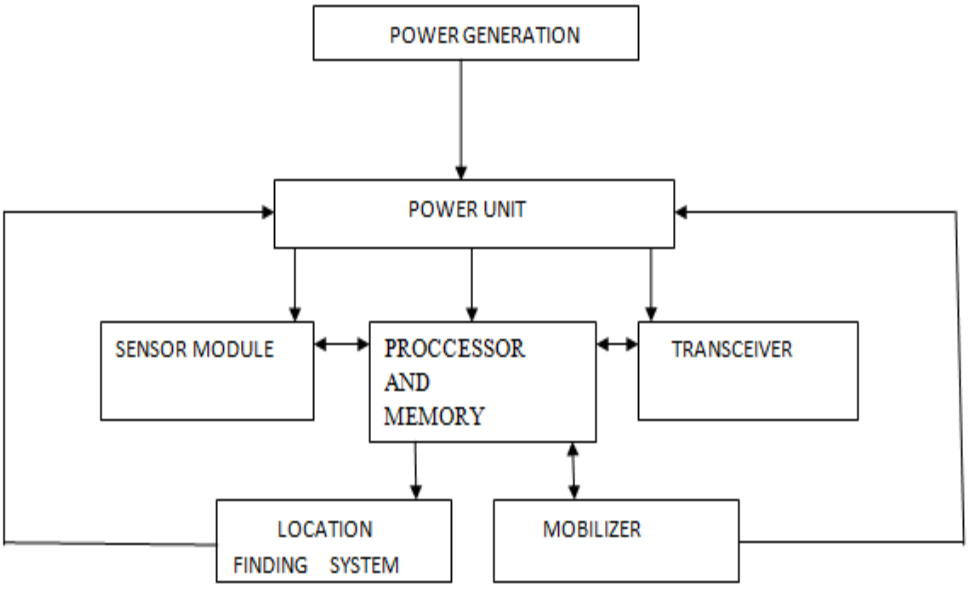

Fig 1: Block Diagram of Single Node

1) Processor and Memory

This component is suited for the sensor nodes, because it is flexible in nature and it can be connect to other devices. It controls the functionality of other components.

2) Transceivers

It provides the functionality of transmitter and receiver. It provides the radio frequency communication. It is well suited for sensor networks. it uses the frequency between the range of 433MHZ and 2.4GHZ.

3) Power Source

Batteries are the main source for sensor networks. Sensors can sense, store and gather information. For all this they consume power.

4) Sensors

These are the small tiny particles. These particles are use to sense, store and gather the information. These nodes consist of three components: sensing, processing and communicating. There are two types of sensors active and passive. Active sensor gathers data by probing into the environment, while passive sensors gather data without actually disturbing the environment.

5) ADC

ADC is an analog to digital convertor that allows exploiting the information-theoretic redundancy of the input signal for increasing the efficiency of operation and reducing the power consumption of the converter [4].

6) Mobilize

It is an optional part in wireless sensor networks. A mobilize is needed in cases where a sensor node has to move from one location to another [5].

II. LITERATURE REVIEW

Kiran Maraiya *et.al* (2011),"Application based Study on Wireless Sensor Network" has described overview of wireless sensor network and how it is different from traditional network and advantage over it [6]. How wireless sensor network works and its silent features all are discussed in it. They also discussed about the design challenges and key features of the protocol used in this network. What is the different network topologies used in the network, what are the different types of its applications, types of its constrain and protocol stack architecture all are studied in this paper. Wireless sensor networking has a bright future in the field of computer networking because we can solve the monitoring problems at an advanced level in the future with the help of such technology of networking.

Yuan Tian *et.al* (2010)," Real-Time Task Mapping and Scheduling for Collaborative In-Network Processing in DVS-Enabled Wireless Sensor Networks" has discussed about the importance of energy consumption, their requirements. In this paper real time scheduling and mapping is presented and give solution for collaborative systems. The real time task mapping and scheduling for collaborative in network processing in DVS-enabled wireless sensor networks is required for this. Concurrent mapping, communication and computation scheduling is also mapped in this paper. DVS technique is implemented to further reduce energy consumptions. Simulations show

superior performance improvements of RT-Maps compared with existing solutions in terms of guarantee deadline constrains with minimum energy consumption. To remove the dead constraints scheduling is used [7]. The wireless channel is modeled as a virtual node to execute communication tasks, and a communication scheduling algorithm is presented with the broadcast leverage feature.

L. Daiz *et.al* (2011),"An Optimal Task Scheduling Algorithm in Wireless Sensor Networks" presented about the sensing task in wireless sensor networks and analyzed it. On the basis of load divisible theory thy proposed optimal task scheduling algorithm in clustered wireless sensor networks [8]. It removing performance degradation caused by communication interference and reduced finish time and improved network resource utilization can be achieved. The optimal number of rounds and the most reasonable load allocation ratio on each node could be derived. In this paper, we present a multi-round task scheduling algorithm (OTSA-WSN) in clustered wireless sensor networks. The goal of this algorithm is to minimize the make span and fully utilize network resources, by finding an optimal strategy of splitting the original load received by SINK into a number of chunks as well as distributing these chunks to the clusters in the right order.

S. Swapna Kumar *et.al* (2012) discussed about the fundamental issues of wireless sensor network that is power management and makes it more efficient. Their main concern was to make energy efficient system [5]. The hierarchal clustering with sleep scheduling is also defined in this paper. They also explained the novel architecture of the layers. A performance analysis model with DV-Hop, APIT, ROCRSS and amorphous techniques are mentioned.. Individual research has been carried out for routing path optimization, clustering, routing and sleep scheduling towards meeting the goals of QoS. The challenge remains unsolved for optimal cluster building because of pros and cons of two distinguished methods of cluster building namely centralized and distributed. The ideal listening consumes more energy. Based on all the above novel approach the new architecture for cross-layer protocol is formed that have great deal of optimizing energy consumptions and provide a better QoS. The proposed architecture is ready be made available in the Firmware for the new design of sensor hardware.

III. PROPOSED WORK

Now days, energy consumption in wireless sensor network is a big problem. Energy consumption is considered as the important factor in WSN. It helps to determine the life of a sensor network. Energy optimization becomes more complicated in sensor networks because it involved not only reduction of energy consumption but also prolonging the life of the network as much as possible. The optimization can be done by having energy awareness in every aspect of design and operation. This ensures that energy awareness is also incorporated into groups of communicating sensor nodes and the entire network and not only in the individual nodes.

In single sink, there is more energy consumption as there is more multi hopping which reduces the lifetime of the sensor nodes. To overcome this problem we use multi- sink which reduces the energy consumption.

The energy levels in the wireless sensor network can be enhanced by saving the energy between nodes. The energy can be saved by using the concept of multi sink scenario. Here in this paper, we use the wi-max. Wi-max is helps in communicating between sink nodes to pass the data. When the data is pass through the sink, two queries are generated. The first one is known as local query and the other one is known as the global query. Local query is generated within its TTL i.e. time to live period. In this case, data is taken by any randomly selected source and placed in cache layer nearby the sink to use in future. The concept of global query comes into picture, when the query is generated by any source node and source node is far away from first sink but it nearer to second sink. By using the global query, the second sink will take data through valid routing algorithm and will pass same data to first sink using Wi-Max concept and also saves data in its caching layer too for future use. Hence, energy consumption can be reduced.

IV. METHODOLOGY

We can only make an energy efficient WSN, when the load is equally distributed in the network so that all the nodes consumes power equally and network becomes operational as:

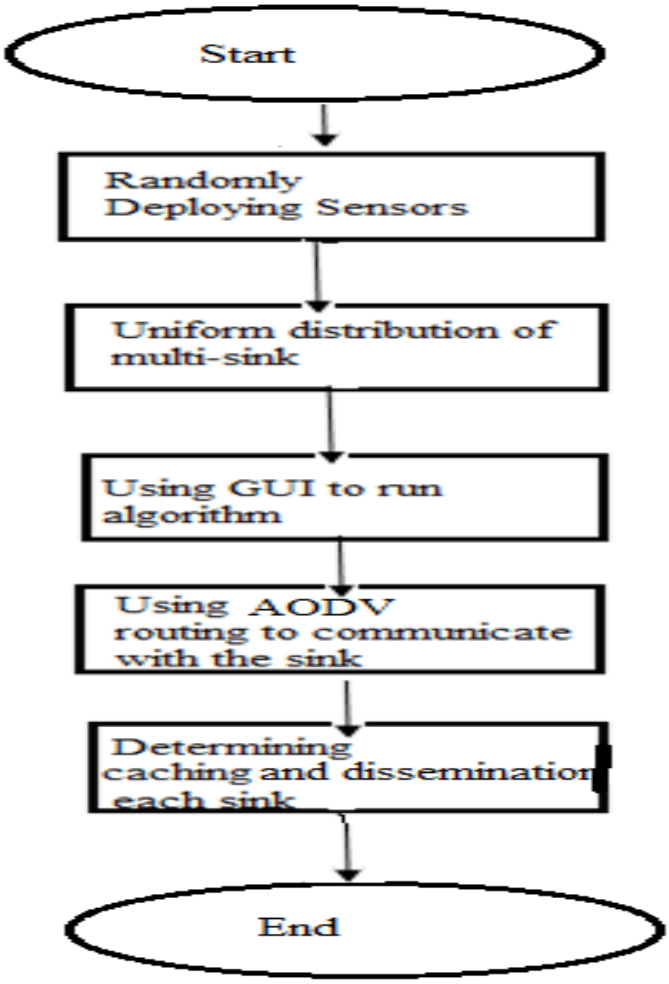

Fig 2: Flow chart

This paper exploits following engineering efforts to make a highly efficient Wireless sensor network:

- To utilize the benefits of deploying cluster in the network.
- To reduce number of hops during transmission by utilizing dual radio based sensor nodes.
- To increase the efficiency and to reduce the obsolete network traffic a novel caching technique is used which enhances the network performance.
- To optimally utilize the limited cache memory, a cache invalidation scheme is developed which removes the obsolete entries from it.
- To utilize all the above effort in multiple sink environment.

Providing continuous information to mobile sinks with uninterrupted communication is a big challenge in designing large-scale sensor networks. A lot of research in data routing, data compression and in-network aggregation has been proposed in recent years. Caching if implemented optimally can reduce a lot of network traffic and helps in providing higher data availability to the users (sink). In this work a new data caching technique is proposed which caches data nearer to the sink.

Main focus is for enhancing the energy levels in WSN nodes by saving energy using concept of multi sink scenario using Wi-Max communication channel in each sink. Firstly, we will deploy sensor nodes randomly in the environment. Then distributing the multi-sink by dividing the whole area in quadrants and providing individual sinks to each quadrant. Then by forming diagonal routing for communication of sensor nodes with the sink. Determining the caching layers nearer to the sink for providing data to the nodes when query is not expired which reduces the path and energy consumption and improving nodes energy thus improving network lifetime. Local query are those which is generated within the TTL (time to live) period of the data taken by any randomly selected source and placed in cache layer nearby the sink to use in future. If query generated by any source and that source is very much far away from first sink but nearby second sink then we will use the concept of global query, here second sink will take data through valid routing algorithm and will pass same data to first sink using Wi-Max concept and also saves data in its caching layer too for future use. And finally compare the results with the previous results.

REFERENCES

[1]. S. Swapna Kumar, M. Nanda Kumar, V. S. Sheeba ,K. R. Kashwan, "Power Management of Hybrid Scheduling Routing in Cluster Based Wireless Sensor Networks" , Journal of Information & Computational Science 9: 6 (2012) 1555–1575

[2]. Sudhanshu, Pant Naveen, Chauhan Prashant Kumar, "Effective Cache based Policies in Wireless Sensor Networks: A Survey" , International Journal of Computer Applications (0975 – 8887)Volume 11– No.10, December 2010

[3]. I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, E. Cayirci , "Wireless sensor networks: a survey" ,Elsevier 2002

[4]. Raymond, R.C. Marchany, M.I. Brownfield, and S.F. Midkiff. Effects of Denial-of-Sleep Attacks on Wireless Sensor Network MAC Protocols. IEEE Transactions on Vehicular Technology, vol. 58, no. 1, pp. 367-380, 2009

[5]. M.A. Matin and M.M. Islam , Overview of Wireless Sensor Network, © 2012 Matin and Islam, licensee InTech

[6]. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci. Wireless sensor networks: A survey. Computer Networks, 38(4):393–422, 2002.
[7]. Zia, T.; Zomaya, A., "Security Issues in Wireless Sensor Networks", Systems and Networks Communications (ICSNC) Page(s):40 – 40, year 2010.
[8]. Raymond, R.C. Marchany, M.I. Brownfield, and S.F. Midkiff. Effects of Denial-of-Sleep Attacks on Wireless Sensor Network MAC Protocols. IEEE Transactions on Vehicular Technology, vol. 58, no. 1, pp. 367-380, 2009

