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RESEARCH ARTICLE

An Improved Wireless Sensor Network Protocol to Increase the Network Throughput and Life

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Abstract- The most common problem in Sensor Network is Network Life. Either the network is clustered of not, each node release some amount of energy with each transmission. In a clustered network, the cluster selection is one of the major WSN protocol. In this existing work different approaches of cluster head selection based on distance, energy and other parameters. The cluster head selection is done on the basis of energy and distance parameters. In this present work we have improved the SPIN protocol for a clustered network. Here we have considered a congestion vector while selecting the cluster head for communication. Respective to this congestion vector the delayed communication is analyzed. We have selected a cluster for communication that is responding accurately and efficiently. We have implemented the work in Mat lab 7.8. The results shows that the presented work has improve the network life.

Keywords: WSN, Routing, Flooding, Sensors, IC, LEACH

I. INTRODUCTION

A Wireless Sensor Network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, enabling also to control the activity of the sensors. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer application, such as industrial process monitoring and control, machine health monitoring, environment and habitat monitoring, healthcare applications, home automation, and traffic control.

The WSN is built of "nodes" - from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from hundreds of dollars to a few pennies, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth... The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding.

WSN GOALS AND CHALLENGES

Goals

- Coverage and Connectivity.
- Lifetime.

Challenges

- Balance load evenly across network.
- Minimize unnecessary energy dissipation.
- Minimize cost and energy.
- Avoid long-range transmissions (multi-hop is less expensive).

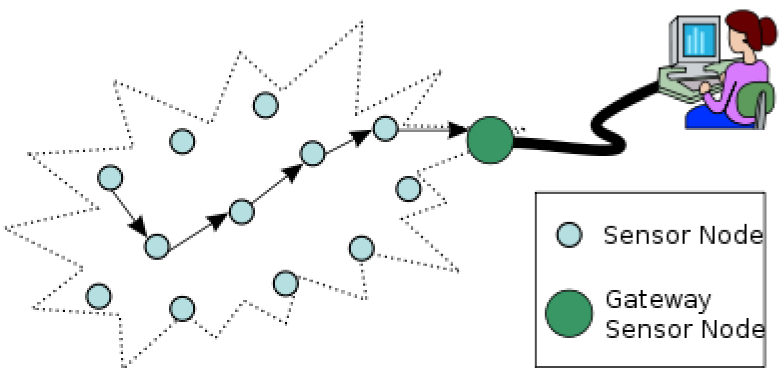

Figure 1: Typical Wireless Sensor Network Architecture

Wireless Sensor Networks (WSNs) are networks of light-weight sensors that are battery powered used majorly for monitoring purposes. The advances in micro-electromechanical technologies have made the improvising of such sensors a possibility. Recently, WSNs have been heavily researched by several organizations and by the military where we can find some of the applications in battle field surveillance and other security etiquettes. With the recent issues on climate change, WSNs can be utilized to track changes that affect the climate using a network of sensors to gather environmental variables such as temperature, humidity and pressure. One of the numerous advantages of these sensors is their ability to operate unattended which is ideal for inaccessible areas. However, while WSNs are increasingly equipped to handle some of these complex functions, in-network processing such as data aggregation, information fusion, computation and transmission activities requires these sensors to use their energy efficiently in order to extend their effective network life time. Sensor nodes are prone to energy drainage and failure, and their battery source might be irreplaceable, instead new sensors are deployed. Thus, the constant re-energizing of wireless sensor network as old sensor nodes die out and/or the uneven terrain of the region being sensed can lead to energy imbalances or heterogeneity among the sensor nodes. This can negatively impact the stability and performance of the network system if the extra energy is not properly utilized and leveraged. Several clustering schemes and algorithm such as LEACH, DEEC, have been proposed with varying objectives such as load balancing, fault- tolerance, increased connectivity with reduced delay and network longevity.

II. WSN TECHNOLOGY

WSN represent a paradigm shift in wireless networks. They are being regarded as the enabling technologies for future surveillance-oriented application.
A standard wireless sensor network consists of a large number of tiny sensor nodes.

- A sensor node basically consists of the following modules
- The sensing module that collects information from the environment.
- The communication module that sustains wireless data communication between nodes.
- The processing module that processes the information provided by the sensor module or received from neighbor nodes.

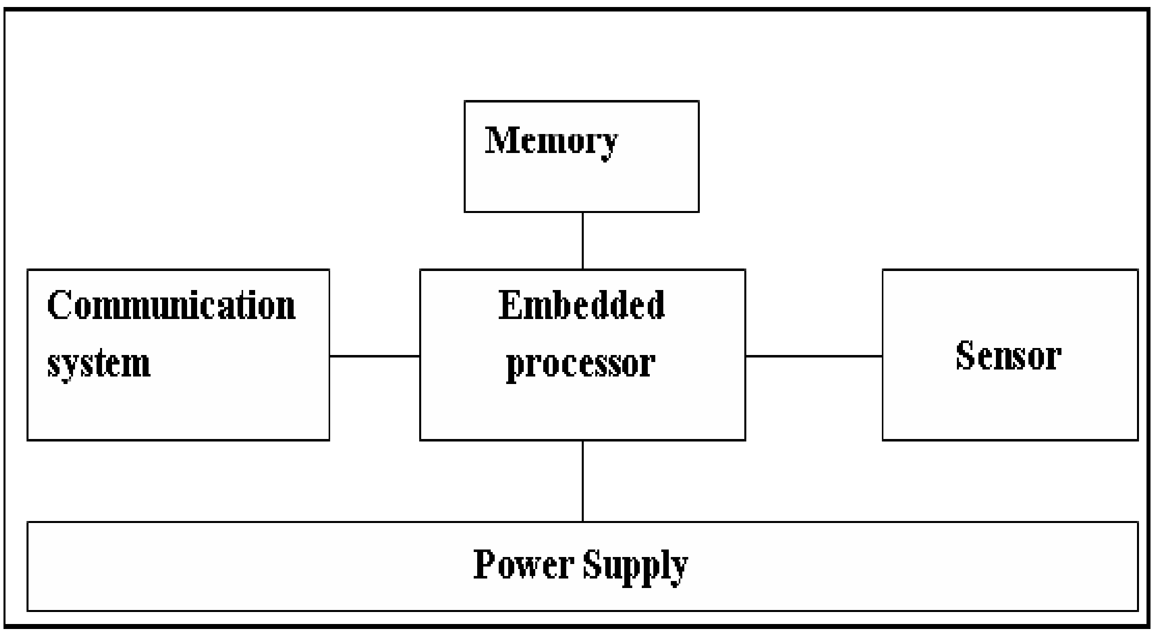

Figure 2: Architecture of a Sensor Node

These tiny sensor nodes work collaboratively to form a network (WSN). The network senses a given environment, perform in-network computation and communicate with a base station when a targeted event happens. The major handicap of these devices is resource constraint; low memory, limited power supply and limited processing capabilities.

This directly affects the WSN at large. Due to the limitations, detection capacity in sensors diminishes with the increasing distance between the node and the phenomena. A WSN is characterized by the following features:

- The network relay on a collection of tiny sensors to observe and influence the real world.
- The sensors have a modest and sometimes non-renewable power budget and do not necessarily need to be active at all times. So sensors can be dynamically added to or removed from the network.
- There is no infrastructure (wireless).
- It is a self-organized network.
- Multi-hop communication is used and the network topology changes dynamically.

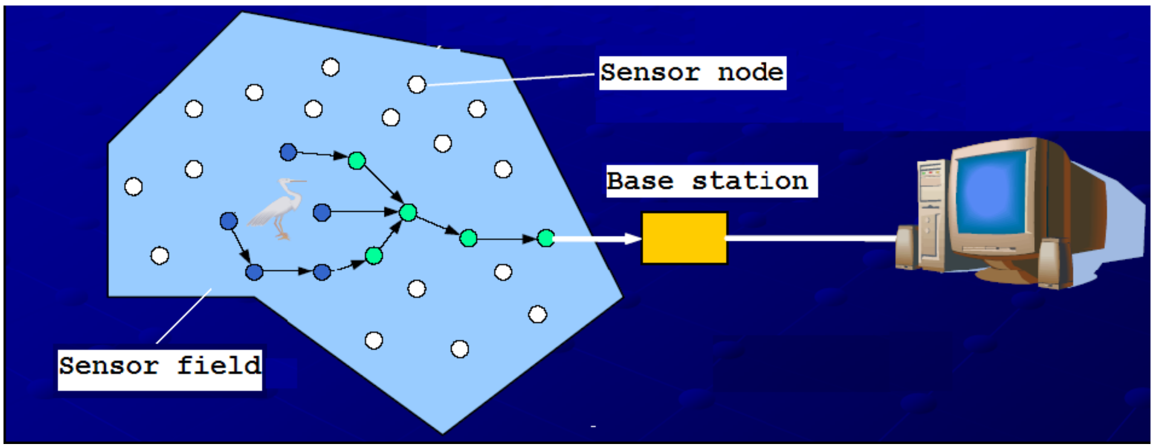

Figure 3: Architecture of a Wireless Sensor Network

COMPARISON:

Among contemporary networks, WSN are closely related to Mobile Ad hoc Networks (MANETs).

They have a number of characteristics in common; network topology is not fixed, power is an expensive resource and nodes are connected to each other by wireless communication links.

- WSNs are mainly used to collect information whilst MANETs are designed for distributed computing rather than information gathering.
- Usually a WSN is deployed by the owner whilst MANET could be run by several unrelated units.
- The number of nodes in WSNs can be several orders of magnitude higher than that in
- MANETs.
- WSN nodes are quite cheaper than those in MANETs, and are usually deployed in thousands.
- Power resource of WSN nodes could be very limited; however nodes in MANETs can be recharged.
- WSNs are more limited in their computational and communication capabilities compared to MANET.

Due to some of these differences, protocols used in MANETs cannot be applied directly in WSNs.

III. APPLICATION OF WIRELESS SENSOR NETWORK

Wireless sensor networks (WSN) consist of a great deal of sensor nodes with limited power, computation, storage, sensing and communication capabilities. WSN will have broad applications in either controlled environments (such as home, office, warehouse, etc) or uncontrolled environments (such as hostile or disaster areas, toxic regions, etc).
Wireless sensor networks have broadly utilized in a variety of industrial, medical, consumer and military applications. Such applications are classified them based on their modes of acquiring and propagating sensor data. We find the following three classes:

- Periodic Sampling - For applications where a certain condition or process needs to be monitored constantly, such as temperature in a conditioned space or pressure in a process pipeline, sensor data is acquired from a number of remote points and forwarded to a data collection center on a periodical basis.
- Event Driven - There are many cases that require monitoring one or more crucial variables and transmit only when a certain threshold is reached. Common examples include fire alarms, door and window sensors, or instruments that are used intermittently.
- Store-and-Forward - In many applications sensor data can be captured and stored or even processed by a remote node before it is transmitted to the central base station. For example, a temperature sensor that periodically senses and records the cargo temperature during transit for several days, and when the cargo gets to its loading dock for unloading, the device can detect the presence of a network and transmit all the accumulated temperature data to the network base station.

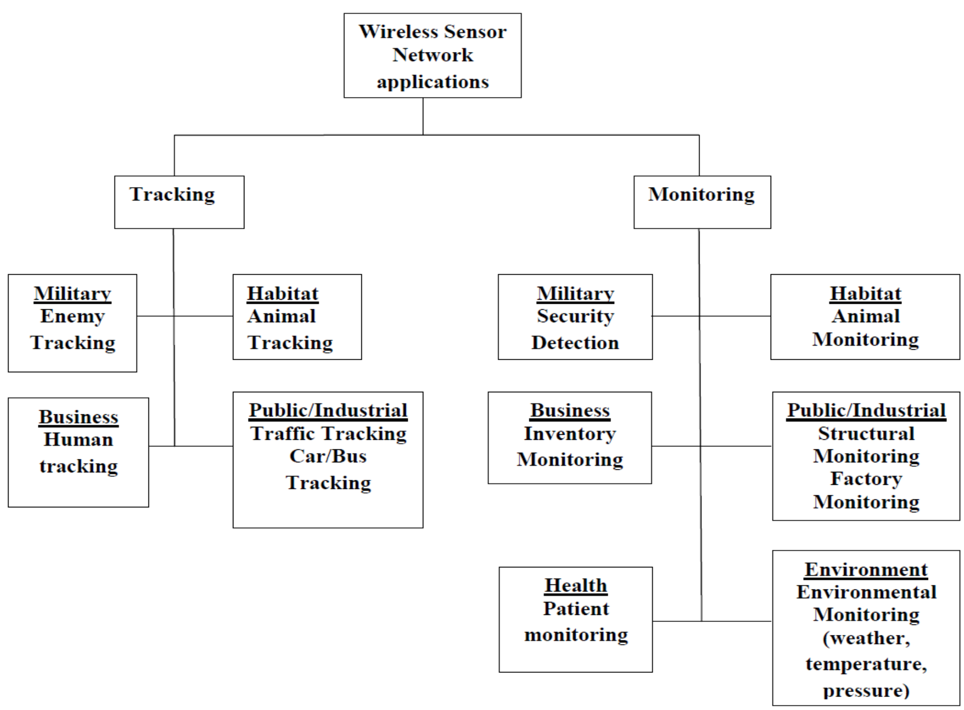

Figure 4: Wireless Sensor Network Applications

Some of the applications of wireless sensor network:

- Area monitoring
- Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. A military example is the use of sensors to detect enemy intrusion; a civilian example is the geo-fencing of gas or oil pipelines.
- When the sensors detect the event being monitored (heat, pressure), the event is reported to one of the base stations, which then takes appropriate action (e.g., send a message on the internet or to a satellite).
- Environmental sensing
- The term Environmental Sensor Networks has evolved to cover many applications of WSNs to earth science research. This includes sensing volcanoes, oceans, glaciers, forests, etc.
- Air pollution monitoring
- Wireless sensor networks have been deployed in several cities (Stockholm, London or Brisbane) to monitor the concentration of dangerous gases for citizens. These can take advantage of the ad-hoc wireless links rather than wired installations, which also make them more mobile for testing readings in different areas.
- Forest fires detection
- A network of Sensor Nodes can be installed in a forest to detect when a fire has started. The nodes can be equipped with sensors to measure temperature, humidity and gases which are produced by fires in the trees or vegetation. The early detection is crucial for a successful action of the firefighters; thanks to Wireless Sensor Networks, the fire brigade will be able to know when a fire is started and how it is spreading.
- Greenhouse monitoring
- Wireless sensor networks are also used to control the temperature and humidity levels inside commercial greenhouses. When the temperature and humidity drops below specific levels, the greenhouse manager must be notified via e-mail or cell phone text message, or host systems can trigger misting systems, open ventilators, turn on fans, or control a wide variety of system responses.
- A landslide detection system makes use of a wireless sensor network to detect the slight movements of soil and changes in various parameters that may occur before or during a landslide. And through the data gathered it may be possible to know the occurrence of landslides long before it actually happens.

IV. CLUSTERING OBJECTIVE

This section present three main objectives that are relevant to the focus of this thesis.

Maximizing network Life-time: Unlike in cellular networks, where mobile gadgets (e.g. phones) can easily be recharged constantly after battery drainage, thus power management in these networks remains a secondary issue. However, WSN is heavily constrained in this regard, apart from being infrastructure-less system; their battery power is very limited. Most of the sensor nodes are equipped with minimal power source; for example the Berkeley's MICA motes are powered by two AA alkaline batteries. Thus, power efficiency will continue to be of growing concern and will remain one of the main design objectives of WSN. In order to cope with energy management in WSN, clustering scheme has been pursued, to extend network life-time and help ease the burden of each node transmitting directly to BS as in conventional protocols like Direct Transmission.

Fault-tolerance: The failure of a sensor node should have a minimal effect on the overall network system. The fact that sensor nodes will be deployed in harsh environmental conditions, there is tendency that some nodes may fail or be physically damaged. Some clustering techniques have been proposed to address the problem of node failure by using proxy cluster-heads, in the event of failure of the original elected cluster-head or have minimal power for transmission. Adaptive clustering scheme is also employed to deal with node failures such as rotating the cluster-head. Tolerating node failure is one of the other design goals of clustering protocols.

Load balancing: Load balancing technique could be another design goal of clustering schemes. It is always necessary not to over burden the cluster-heads as this may deplete their energies faster. So, it is important to have even distribution of nodes in each cluster. Especially in cases where cluster-heads are performing data aggregation or other signal processing task, an uneven characterization can extend the latency or communication delay to the BS.

- Each node communicates only with close neighbor and takes turn to send to base station.
- Each node has the ability to transmit to any other node and to Base Station.
- Assume node have location information about each node.
- The base station is fixed and far from nodes network.
- The sensor nodes are homogeneous and energy constrained with uniform energy.
- In each round all data from all node and transmit to base station.
- Data fusion help to reduce amount of data transmitted between sensor node and BS.

Transmitting

ETx (k, d) = ETx– elec (k) + ETx–amp (k,d)

ETx (k, d) = amp * k* d2 Eelec*k +

Receiving

ERx(k) = ERx-elec(k)

- ERx(k) = Eelec*
- Packet length 2000 bit
- The main idea for each node to receive from and transmit to close neighbors and take turns being the leader for transmission to the BS.
- The nodes will be organized to form chain which can either be accomplished by sensor nodes themselves using greedy algorithm starting from some node, the BS can compute this chain and broadcast it to all sensor nodes.
- When a node dies, the chain reconstructed in the same manner to bypass the dead node.
- Nodes take turns transmitting to the BS and we will use node number I mod N (N represents the number of nodes) to transmit to the BS in round i.
- The leader in each round of communication will be at a random position on the chain.
- We can use simple control token passing approach initiated by leader to start the data transmission from the ends of the chain.
- Each node will use its neighbor’s data with its own to generate a single packet of the same length and then transmit that to its other neighbor.
- Each node will receive and transmit one packet in each round and be the leader once every 100 rounds.

V. CONCLUSION

The proposed work is implemented on Wireless Sensor network to improve the network life in case of clustered Network. The main problem with cluster network is to find the cluster head for each cluster. Here the improvement is done for Spin protocol. In this work we have include one parameter to select the cluster head and the vice cluster head. This parameter is represented by Ideal Time Analysis. The work has considered the concept of congestion parameter along with effective throughput for that instance. The node will be selected that is working with low congestion and better throughput over the network.

REFERENCES

1. Kun Zhang and Cong Wang , "A Secure Routing Protocol for Cluster-Based Wireless Sensor Networks Using Group Key Manag ement ," IEEE Xplore,vol.37, pp. 178-185, jan.-2008.
2. Bolian Yin, Hongchi Shi, and Yi Shang ,"Analysis of Energy Consumption in Clustered Wireless Sensor Networks" IEEE Transactions on Mobile Computing, vol. 3, pp. 272–285, July 2007
3. Zhao Yulan and Jiang Chunfeng,"Research about Improvement of LEACH Protocol", An Energy Efficient Protocol for Wireless Sensor Network". Application Research of Computers, No.2 pp: 209-211, Jan. 2005.
4. Stephan Olariu and Qingwen Xu, I"nformation Assurance In Wireless Sensor Networks", IEEE Transactions on Mobile Computing, 3(4), pp. 317-331 , Dec.2004.
5. Zenon Chaczko, Ryszard Klempous and Jan Nikodem," Methods of Sensors Localization in Wireless Sensor Network", IEEE Transactions On Mobile Computing, VOL. 3, pp. 3, Jul-Sep 2004.
6. Adrian Perrig , John Stankovic and David Wagner," Security in wireless sensor network",. Vol. 47, pp.6-9 ,June 2004.
7. Jan Steffan ,Ludger Fiege, Mariano Cilia and Alejandro Buchmann, "Scoping in Wireless Sensor Networks", IEEE Network, 18(1), pp.15–21, May 2004.
8. Zhiwei Zhao, Xinming Zhang, Peng Sun and Pengxi Liu," A Transmission Power Control MAC Protocol for Wireless Sensor Networks", IEEE/ACM Tran. on Networking, , 12(3), pp.493-506,April 2004.
9. Shao-Long and Xing Tao, "Cluster-based power efficient time synchronization in wireless sensor networks", IEEE INFOCOM Conf, Mar. 2004.

