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Energy Efficient Approach for Solar Energy Harvesting in WSNs

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Abstract: *The wireless sensor network is the self configuring type of network which is used to sense the environment conditions like temperature, pressure etc. The sensor network is deployed in the far places like forests, deserts .The sensor nodes have limited size and limited battery life. It is very difficult to recharge or replace the battery. The solar energy harvesting is the approach through which we can recharge the sensor nodes from the sun light. The battery of the sensor nodes will also be consumed when the recharging process is going on. The solar energy harvesting approach will also be the inefficient approach if the available energy is less and energy will be consumed more in recharging. In our paper, we are proposing a new task scheduling approach which is the energy efficient approach for solar energy harvesting.*

Keywords*: Solar energy harvesting, task scheduling, energy, harvesting.*

1. INTRODUCTION

A wireless sensor network is collections of sensing device that can be wirelessly communicate. Each device is capable of talk to its peer, sense, process. It is centralized system. It is inexpensive to install and no wiring is required for data transfer. A wireless sensor network is a technology that provides monitoring. Wireless sensor play an important role in the processing of structural response data. In a wireless sensor networks nodes are organized in a cooperative manner [1]. Wireless sensor nodes offering impressive computational resources for processing data. Wireless Sensor networks are self organizer and are deployed in ad-hoc systems. Each node in wireless sensor is consist of multiple types of memory and processing elements, RF transceiver ,a power source, sensors and actuators[4].Wireless sensor node is microelectronic device means it is equipped with a limited number of power source. Nodes are dependent on battery for their power. Hence power conservation and power management is an important issue in wireless sensor network. Due to this reason researchers are focusing on the design of power aware protocols and algorithm for sensors network. It is difficult to recharge or replace the battery of the sensor node. The process in which energy is stored, captured and managed is called energy harvesting. It is also known as power harvesting. In this process energy is derived from external sources like wind energy, thermal energy, solar energy. Each harvesting devices converts its energy into electrical energy according to applications. There are some systems also that coverts its motion into electrical energy. The battery of the sensor node can be recharge from the solar energy this approach is called solar energy harvesting [5]. Solar energy is one of the most important and effective outdoor application. It exhibits a non-linear characteristics and extraction of energy is difficult in non-stationary environment [2]. To grant effective wide spread technology, energy harvesting is the primary issue. Environmental condition changes are the major issues which are responsible for the degradation of the performance in wireless sensor networks. Energy transfer mechanism is influenced by the conditions and the direction of the sun and

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angle made by it [2]. In sensor nodes sensing task is allocated and processed in minimum time so that users can easily analyzed it and draw useful conclusions. It saves more energy, if finishing timing is fast in wireless sensor networks. Optimal scheduling algorithms are used to get results in minimum execution time [3].In a wireless sensor networks, optimal task scheduling algorithms are based upon load divisible theory. Scheduling and mapping solution for wired networks cannot be implemented directly in wireless sensor networks because point-to-point which is assumed cannot be possible in wireless sensor networks. It can be achieved either localized manner or wide network in wireless sensor network. Localized task mapping and scheduling is more suitable for large scale wireless sensor networks. Task scheduling and mapping is generally comes under mobile computing but nowadays it can be generally used in heterogeneous ad-hoc mobile grid environment [3].

2. LITERATURE REVIEW

Wireless Sensor Networks has presented solutions of Wireless sensor networks and solutions of MAC layer protocol, power management, clock synchronization, routing. It also described about the two major applications of wireless sensor networks. The privacy and security of the system and also mentioned about the improved development models and their solutions [1].Data caching techniques is used for the faster access. Caching schemes are used to improve performance in wireless sensor networks. Energy can be making efficient if all the nodes in the networks are distributed equally and consume equally energy and network become operational as longer as possible [6].Adaptive clustering in Wireless Sensor Network had discussed in this paper how to increase network life time with low energy nodes. This paper presents an algorithm, first it has consider to the nodes with low energy and these nodes determines which nodes become cluster-head, The cluster head selection based on the weighting of the neighboring nodes that the weights were calculated based on the energy residual and distance between nodes. Then it shows Simulation for 100 nodes had showed better performance than two well-known protocols, LEACH and LEACH-C. In all cases, the proposed algorithm show better performance than LEACH and it has result almost like LEACH-C. LEACH-C is a centralized algorithm and the proposed algorithm is distributed algorithm without need any global information [7].An Optimal Task Scheduling Algorithm in Wireless Sensor Networks" have presented about the sensing task in wireless sensor networks and analyzed it. On the basis of load divisible theory they proposed optimal task scheduling algorithm in clustered wireless sensor networks. It removing performance degradation caused by communication interference and reduced finish time and improved network resource utilization can be achieved [3].

Multiple Task Scheduling for Low-Duty-Cycled Wireless Sensor Networks, had discussed about the applications where with high data rates and time constraints multiple data delivery tasks, low-duty-cycle working mode may cause severe transmission congestion and data loss. This paper represents the technique to tackle multiple task scheduling. The algorithms proposed in this paper mainly apply to application scenarios with static routing and foreseeable data rates of the tasks [8].

3. SOLAR ENERGY HARVESTING

Solar energy is one of the most important and effective outdoor application. It exhibits a non-linear characteristics and extraction of energy is difficult in non-stationary environment [2]. To grant effective wide spread technology, energy harvesting is the primary issue. Environmental condition changes are the major issues which are responsible for the degradation of the performance in wireless sensor networks. Energy transfer mechanism is influenced by the conditions and the direction of the sun and angle made by it [2]. Solutions of energy harvesting are based upon the on and off threshold charge mechanism. In this process a diode is connect with the cell. A low cost solution is a diode based solution and set to transfer maximum energy to the environment. Energy harvesting systems provide optimal online scheduling of activities to get the best solution and it also optimizes the long term decision of the system. The energy which is harvest to generate electrical from solar system, water, wind, thermal energy is called renewable energy. Energy harvesting with low power generate a new challenge in wireless sensor network. During the designing of energy harvesting circuits there are many complex trades off which are considered in wireless sensor networks [2].These are arise due to the interaction of various factors like energy sources, energy sources devices which are used, its functionality of

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management used in nodes and protocols and its applications requirements.

4. TASK SCHEDULING

The Process of scheduling the tasks is called task scheduling. Optimal task scheduling algorithms are used for the task scheduling. The task scheduling is divided into two categories:

i. Intra-clustering task scheduling.
ii. Inter –clustering task scheduling

Intra clustering task scheduling different sensing tasks are assign to nodes in each cluster and in inter-cluster task scheduling involves the assignment of sensing tasks among all clusters in multiple rounds to improve overlap of communication with computation. Improved network utilization can be gained by reducing performance degradation caused by interference [3]. Although task scheduling is an important part in wireless sensor network but till now research its counterpart is still unexplored. Task scheduling is an expensive task in larger scale wireless sensor networks. The frequency of each sensor is optimized and evaluated according to the previous executed frequencies.

5. NEW PROPOSED TECHNIQUE

The battery of the sensor nodes are difficult to recharge or replace .we can eliminate this problem by using solar energy harvesting In this technique the battery of the sensor nodes are recharged from the solar energy. But as the environment conditions are changed .Let us suppose at the day time maximum solar energy is available as compared to the evening time for recharging the battery .The battery of the sensor nodes are also consumed while recharging its battery. If the energy available for harvesting is less and energy consumption for recharging the battery is more than this approach is an inefficient .To enhance the efficient of energy harvesting we need task scheduling .In the task scheduling approach ,we schedule tasks. According to environment conditions the sensor nodes can change its states .These states are sleep state, active state and ready state. In sleep state the node will do nothing. The active state is the state in which nodes will charge itself. In ready state node will charge itself and also participate in data transmission.

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