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Increasing Lifetime of Wireless Sensor Network with MDP Algorithm: A Survey

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ABSTRACT: Wireless Sensor Network(WSN) is a network which is having sensing nodes that can sense the environment and send information through wireless links to sink. Concrete and efficient scheme is provided to prove its security and implementation to show its practicality in this paper. WSN consist of different subsystems such as sensing, transmission, reception power and processing systems. A cluster is a group of sensor nodes with one central entity named Cluster Head(CH). This paper addresses the problem of lifetime maximization of WSN network which is based on data collection tree. According to the limitation of energy of each sensor node, maximum of network with minimum sensors. A detailed analysis has been performed along with simulation results to show its efficacy of proposed approach.

KEYWORDS: Wireless Sensor Network, Cluster Head.

I. INTRODUCTION

Wireless Sensor Network (WSN) is a network with collection of sensor nodes which are used for various kinds of sensing information to a base station. In general a sensor network consists of transmission power, reception power in which the sensing nodes sense and collect the data and related information is transmitted to the base station. Sensor nodes are small battery powered devices having very limited resources with wireless communications. MDP(Markov Decision Process) is having applications in transmission policies. transmission scheduling, transmit power so it is very useful in wireless sensor network[2].

WSN plays a major role in internet application to develop and introduce new technologies in various fields like military, transport, medical, environmental management etc. Because of low powered sensor nodes of WSN network they can not transmit the large amount of data through network and this is the main issue of WSN. It also causes the other issues like coverage problem which is most important and widely discussed issue in WSN. The coverage problem can be of area, barrier, target coverage problems[4]. The WSN can not support the large networks because of limited resources of sensor nodes.

There are more methods and algorithms are introduced to increase the lifetime and battery power of WSN with the help of new technologies. There are some protocols also present to help in increasing the battery power of WSN.

II. LITERATURE SURVEY

Existing work has proposed techniques such as data aggregation and sleep states of sensor nodes. The Data aggregation is the technique in which the data is collected from different nodes and aggregate the data so that the redundancy of data can be avoided. Thus the aggregation of data minimizes the consumption of energy and it leads to minimize the network traffic. This technique can be efficiently explained with cluster based network in which the Cluster Head(CH)receives the all data from different members and aggregate it. In cluster based network is tree like structured in which the sleep state is assigned to Leaf Nodes(LN) to perform operation, where the leaf nodes wake up, sense and transmit the data to cluster head. While in other hand CH keeps awake to gather information. That means the cluster head drain the battery which indirectly affects the network lifetime[11].



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For large scale WSN clustering provides another solution for collection of data. The technique is sensor nodes are grouped in to clusters members and their head is called cluster head. In this technique at first the data is collected by cluster members and forwarded to sink through multi-hop routing. To balance the heavy traffic load of CH the cluster based network topology is recognized[8].

Unequal sizes of cluster make network load unbalanced and it degrades the performance of clustering algorithms. So far the distributed clustering approaches the concept or the balanced cluster method is introduced. In this balanced cluster method some phases are used: cluster head selection, cluster formation, Rescue phase, TDMA scheduling, Data transmission and re-clustering. By using these phases the network load can be balanced[3].

Another important technique in energy saving is backbone scheduling in which the turn off and turn on mechanism is used. This mechanism is based on necessity of required applications, so that the sensor nodes turn off or turn on based on their usage this leads to increase the lifetime of network. The Virtual Backbone Scheduling(VBS) technique is the part of backbone scheduling technique to increase the lifetime of network[10].

Reduction of data is a technique to reduce the energy consumed by communication between sensor node and sink node. Data reduction can be classified in to three types: data compression, in-network processing and data prediction. First data compression which is mostly used in information and communication technologies which involves encode and decode mechanism. The encoded data is sensed from source node and decode it at the sink node so that the amount of information sent has a space to reduce. While traversing the data between nodes, the scheme data aggregation is referred to reduce the size of data in network processing. Apart from above two techniques data prediction maintains model deployed at both sensor and sink node. The model can predict the values sensed by sensor nodes within the certain error bounds. In one hand, if error is acceptable then sensor nodes and sink node can use the prediction values instead of original data so it avoid the communication between them. On the other hand the actual measurements must be delivered to the sink by sensor nodes when the prediction is not accurate enough[4].

A randomized switching algorithm called Randomized Switching for maximizing lifetime(RaSMaLai) to extend network lifetime based on the concept of bound balanced trees. RaSMaLai applies controlled exploration of data collection trees to find the most balanced ones, thus maximizing the network lifetime[6].

Limited energy resources of the sensor nodes are most important constraints in WSN. Therefore, the energy efficient MAC protocols have been developed for WSN. In WSN MAC protocol the large amount of energy is wasted during sleep state or duty cycling mechanism where it is necessary to reduce the energy consumption. Some MAC protocols are introduced here so that the traffic of network can be controlled and wake up sink node can be scheduled[5].

Sensing Radius Adaption(SRA) mechanism is introduced to prolong the network. In SRA mechanism the area problem for WSN. In SRA mechanism the area problem for WSN is considered. According to this mechanism each area has variable sensing radius and Weighted Voronoi Diagram(WVD) proposes a tool determine responsible sensing region of each sensor according to its remaining energy in distributed manner. In SRA mechanism each sensor node applies the proposed WVD and REP schemes to adjust the sensing range in distributed manner, achieving the goal of prolonging the network lifetime and full coverage[12].

III. RELATED MDP WORK

A. Markov Decision Process: The MDP describes a stochastic decision process of an agent interacting for an environment or system. The MDP is used to model the interaction between wireless sensor node and their system to achieve some objectives.

Energy consumption, potential energy, residual energy can be find out by algorithm for switching of nodes. To get harvested energy the day is divided in to 24 time slot is of one four. That means there is one data collection round at each hour. The solar energy is available for 12 hours in day time but it is not available at night so day 1 is considered as sunny and day 2 is considered as cloudy.



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V. CONCLUSION

This paper provided an extensive literature review related to energy efficiency and improving the lifetime of network topology of wireless sensor network. Many wireless communications need energy efficient communication for various applications to improve life span of the network. WSN plays a main role in sensing and monitoring applications in various fields. Motivated by the practical needs in data sharing, we discussed about proposed node residual energy and node distance based algorithm for clustering of nodes to minimize the average energy consumption in WSN. Finally, the paper has been discussed about a few interesting research directions.

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