

Route Optimization in WSN for Efficient Data Collection using AODV

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ABSTRACT: The main motive of this research is to study energy-efficient data-gathering mechanisms to detect sensor data irregularities. To detect the sensor data irregularities is useful for practical applications as well as for management of network, because the patterns found can be used for both decision making in applications and system performance tuning.

Keywords— WSN, ,Mobile Ad-hoc Network ,AODV,DSR

I.INTRODUCTION

1.1. WIRELESS SENSOR NETWORK

A Wireless sensor network is composed of tens to thousands of sensor nodes which are densely deployed in a sensor field and have the capability to collect data and route data back to its base station. Wireless Sensor Network is used in different application now a days [1], such as detecting and tanks on a battlefield, measuring traffic flow on roads, measuring humidity and other factors in fields, tracking in buildings. Sensors nodes consists of sensing unit, processing unit, and power unit. The “many - tiny” principle: wireless networks of thousands of inexpensive miniature devices capable of computation, communication and sensing A WSN application there are two types of nodes: source node – the node which actually sense and collect data – and sink node – the node to which the collected data is sent. The sinks can be part of the network or outside the wireless sensor networks. Usually, there is great number of source nodes than sink nodes. Therefore the two disciple sensor network and data mining can be combined. Knowledge from sensor data (Sensor-KDD) is important. Clustering of sensory data act as a nucleus job of data mining in KDD.

1.2 CHALLENGES FOR WSN

The main aim of WSN is to transmit data by increasing the lifetime of the network and by employing energy efficient routing protocols. WSN face rigorous resource constraints in communication bandwidth, power supply, storage and processor capacity. Again, the performance of a routing protocol depends on the architecture and design of the network, so the architecture and design of the network is very important features in WSNs. The pattern of the wireless sensor network is affect by many factors which must be overcome before an effective network can be achieved in WSNs.

Node Distribution: Higher-capability mobile robots may be dispatched to gather more accurate temperature or humidity readings Node distribution [placed and gathered data is transmitted through pre-defined areas. The sensor nodes are distributed over the area of interest randomly thus 12] in WSNs is either deterministic or self-organizing and application based. The uniformity of the cluster head directly affects the performance of the routing protocol used for this network. In case of deterministic node distribution, the sensor nodes are differently creating an infrastructure in an ad hoc manner. Each sensor node consists of four major components: sensor, processing unit, power unit and transceiver.

Dynamicity: Since the nodes in WSNs may be fixed or variable, dynamicity of the network is a challenging issue they are static, but in the case of dynamic BS or nodes routes from one node to another must be reported periodically within the network so that all nodes can transmit data via the reported route. Again depending on the application, the sensed event can be dynamic or static.

Energy efficiency: The sensor nodes in WSNs have minimum energy and they use their energy for communication and sensing, so energy consumption is an important point in WSNs. According to various

routing protocols nodes take part in data fusion and expend more energy. In this regard, direct communication is efficient. Since most of the times sensor nodes are distributed randomly, multi-hop routing is preferable.

Scalability: A WSN consists many sensor nodes. Routing protocols must be workable with this large number of nodes *i.e.*, these protocols can be able to handle all of the functionalities of the sensor nodes so that the lifetime of the network can be stable.

Data Fusion: Data fusion [13] is a process of combining of data from different sources according to some function. This is achieved by signal processing methods. This technique is used by some routing protocols for energy efficiency and data transfer optimization.

II. RELATED STUDY

In [2], S. Nithyakalyani and S. Suresh Kumar in 2012, proposed that nowadays sensors are very essential for today life to monitor environment where human cannot get involved very often. Wireless Sensor Networks (WSN) are used in many real world applications like environmental monitoring, traffic control, trajectory monitoring. It is more challenging for sensor network to sense and collect a large amount of data which are continuous over time, which in turn need to be forwarded to sink for further decision making process.

In [3], Bo Yuan, Maria Orłowska and Shazia Sadiq, in Sep 2007, proposed that given a set of sparsely distributed sensors in the euclidean plane, a mobile robot is required to visit all sensors to download the data and finally return to its base. The effective range of each sensor is specified by a disk, and the robot must at least reach the boundary to start communication. The primary goal of optimization in this scenario is to minimize the travelling distance by the robot. Many research activities have been carried out on the research issue. Since the fundamental task of WSN is to gather data efficiently with less resource consumption, to address the problem, there are two threads of research to improve the performance of data collecting: optimized data-gathering schemes and mobile collector assisted data-gathering in WSNs. For the first thread, most data-gathering algorithms aim to prolong lifetime with some optimized schemes. To balance load within each cluster, an even energy dissipation protocol (EEDP) was proposed for efficient cluster-based data-gathering in WSNs. In [7] a new proposal is to gather data in high-density WSNs in real-time, which determines network topology by hierarchical clustering to avoid radio collision and enables to gather data with minimum data latency from numerous high-density sensor nodes. To address the problem of gathering information in WSNs, the work in [4] took into account the fact that interference can occur at the reception of a message at the receiver sensor. However it assumes the distribution of sources are known. Another way to save energy is to decrease data transmitting with some schemes. A new distributed framework to achieve minimum energy data-gathering was proposed in [4]. To minimize the total energy for compressing and transporting information, the problem of constructing a data-gathering tree over a WSN was studied in [14]. To some extent, all those schemes require the node has extra computation to optimize the data transmission or compress and decompress data. For the second thread, nodes in WSNs are in multihop and mobile environment in general. The characteristic of each link will change timely. In the content of the WSNs where each node only has a partial view of the network, it is very important for each node to estimate the system status by a simple and accurate method [13]. Especially for data transmission with less power consumption, a mobile data collector is more perfectly suited to such applications, for the collector can be equipped with a powerful transceiver and battery. Instead, it is effective to collect data by assisted mobile collector which can achieve better power saving performance [11]. A new data-gathering mechanism called M-collector for large-scale wireless sensor networks was proposed in [14] by introducing mobility into the network. However, it just considers the single-hop data gathering problem. An adaptive data-gathering protocol was proposed in [15] that employs multiple mobile collectors (instead of sinks) to help an existing WSN achieve such requirements, which adopts a virtual elastic-force model to help mobile collectors adjust their moving speed and direction while adapting to changes within the network. In [7], Tzung-Cheng Chen, Tzung-Shi Chen, and Ping-Wen Wu, in NOVEMBER 2011 proposed that A novel data-collecting algorithm using a mobile robot to acquire sensed data from a wireless sensor network (WSN) that possesses partitioned/islanded WSNs is proposed in this paper. This algorithm permits the improvement of data collecting performance by the base station by identifying the locations of partitioned/islanded WSNs and navigating a mobile robot to the desired location. However, the number of collectors can not be predefined, for the irregularity of the information generation rate as well as the cost of mobile collectors. A well-planned adaptive moving strategy (AMS) for a mobile sink in large-scale, hierarchical sensor networks was presented. The mobile sink traverses the entire network uploading the sensed data from cluster heads in time-driven scenarios. However, it just tries to minimize the whole tour length to save energy. An efficient hybrid method for message relaying and load balancing was proposed in low-mobility wireless sensor networks in [14]. The system uses either a single hop transmission to a nearby mobile sink or a multihop transmission to a far-away fixed node depending on the predicted sink mobility pattern. Recently, many research efforts have appeared in the literature to explore the mobility in wireless sensor networks for data collection, we only survey the most related ones here [12]. The mobility-assisted data collection was classified into three categories in [12]: with random

mobility, predictable mobility, and controlled mobility respectively. The mobile entities, referred to as Data Mobile Ubiquitous LAN Extensions (MULEs), lie in the middle tier on top of the stationary sensor nodes, move around in the network to collect data from sensor nodes, and ultimately upload the data to the sink. The term *Data MULEs* was widely used in the literature since then. In [10], the data collection process with predictable mobility was modelled as a queuing system, and the success of data collection was analyzed based on it. In [7], a mobile data observer, called SenCar, was used as a mobile base-station in the network. It also showed that the design of the travelling tour is critical for SenCar to accomplish data collection jobs successfully. Observing the importance of the travelling tour, a lot of efforts were put into its optimal design,[2].The tour selection problem can be modeled as a *Travelling Salesman Problem with Neighbourhoods* (TSPN), an NP-hard problem, if we do not consider the data rate constraints between the mobile element (ME) and sensor nodes, where all the *neighbourhoods* are possibly intersected communication disks. It has been proven that approximating Euclidean TSPN within a factor of (2") is also NP-hard [11].

III. CONCLUSION

Some distinct characteristics of WSNs such as large node density, unattended operation mode, high dynamicity and severe resource constraints pose a number of design challenges on sensor data-gathering schemes. Many research activities have been studied on the research issue. Since the fundamental task of WSN is to gather data efficiently with less resource consumption, to address the problem, there are two threads of research to improve the performance of data collecting: optimized data-gathering schemes and mobile collector assisted data-gathering in WSNs. Most data-gathering algorithms aim to prolong lifetime with some optimized schemes.

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