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WINGS TO YOUR THOUGHTS.....

Enhanced Data Aggregation in WSN

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***Abstract**: Sensors are very important for today life to monitor environment where human can't reach. These networks are used in many real world applications such as traffic control, environmental monitoring and trajectory monitoring. It is more challenging task 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 destination for further decision making process. In a wireless sensor network, where sensors are geographically distant from each other, it may not be practical to require sensors to directly coordinate with each other to form a communication network due to the energy restriction.*

***Keywords:** Wireless Sensor Networks, TSPN, Data Mining, Data Aggregation and Classification.*

1. INTRODUCTION

We have witnessed the emergence of wireless sensor networks (WSNs) as a new information-gathering paradigm, in which a large number of sensors spread over a field and extract data of interests by reading real-world phenomena from the physical environment.[1] Nowadays sensors are very essential for today life to monitor environment where human cannot get involved very often.[2] A sensor network basically consist of a large number of sensor nodes. These sensor nodes are deployed either inside the phenomenon or very close to it. The sensor nodes position need not be pre-determined. This allows randomly deployment in inaccessible terrains or disaster relief operations. This also means that sensor network protocols and algorithms must possess self organizing capabilities. Another unique feature is the cooperative effort of sensor nodes. These sensor nodes use their processing abilities to locally carry out simple computations and transmit only the required and partially processed data. The sensor network collects the massive amount of data. To manage these data the appropriate data analysis is required. Therefore the two disciple sensor network and data mining can be combined. Knowledge from sensor data (Sensor-KDD) is important due to many application of crucial important to our society and large scale sensor system need to process heterogeneous and multisource of information from diverse type of instruments. The raw data of sensor need to be efficiently manage and transform to usable information through data fusion, which in turn must be induced tactical decision or strategic policy.

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 destination for further decision making process. Sensor data in the form of cluster act as a nucleus job of data mining. A clustering in wireless sensor network involves selecting cluster heads and assigning cluster members (sensors) to it for efficient data relay. In data mining grouping a similar data is known as clustering which is a preparatory step for future data analysis.

IN wireless sensor network, where sensors are geographically distant from each other, it may not be practical to require sensors to directly coordinate with each other to form a communication network due to the energy restriction. One possible solution is to employ a mobile robot, which can travel to all sensors, to download the data and finally return to its base station (starting position). In order to communicate with each sensor, the robot must present physically within its effective range, which is specified by a disk. Sensor nodes can be classified into static sensor nodes and mobile sensor nodes. Currently, a wireless sensor network has focused on fixed sensor networks, in which the nodes are static. These Static sensor nodes cannot change position by themselves, after they have been

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placed in the sensing area. On the other hand, mobile sensor nodes can change position autonomously that depending on their mission requirements. They are able to dynamically adjust network topology and promote the performance of sensor networks.

Wireless Sensor Networks (WSN) are used in many real world applications like environmental and trajectory monitoring, traffic control. It is also used in several real life applications, especially in physical phenomena such as climate, Building structure and response to earthquakes.[2]

1.1 Challenges of Data Mining

Challenges in science and engineering, from the data mining perspective will focus on the following issues: (1) information network analysis, (2) discovery and usage of patterns and knowledge, (3) mining of stream, (4) Data mining of moving object , RFID , and data from sensor networks, (5) spatial, temporal and multimedia data mining, (6) text, Web, and other unstructured data mining, (7) cube-oriented multi-dimensional online analytical mining, (8) visual data mining, and (9) data mining by integration of sophisticated scientific and engineering domain knowledge.[3]

1.2 Anomalies of Wireless Sensor Network (WSN)

- WSN face rigorous resource constraints in communication bandwidth, power supply, and storage and processor capacity.
- Wireless sensors networks are typically highly limited in terms of sensing, computation, communication, battery life, and the actions they can perform.
- Higher-capability mobile robots may be dispatched to gather more accurate temperature or humidity readings.
- Mostly wireless sensor networks consist of a large number of static, low-power, short-lived and unreliable sensors.

1.3 Algorithm for Routing

This robot routing problem can be regarded as special cases of the Travelling Salesman Problem with Neighborhoods (TSPN) where the neighbor- hoods are disjoint disks (the starting position is represented by a disk with zero diameter). In this algorithm, a salesman needs to deliver products to a group of clients who are living in different places. Instead of waiting for the salesman, each client wants to meet the salesman within a certain region near his/her house. The objective of optimization is to find the shortest trip, along which the salesman can meet all the clients and come back to the starting position. So, we can easily say that TSPN is a generalization of travelling salesman problem.

2. LITERATURE REVIEW

In [1], Miao Zhao, Member and Yuanyuan Yang, in Feb 2012 proposed that recent study reveals that great benefit can be achieved for data gathering in wireless sensor networks by employing mobile collectors that gather data via short-range communications. To do maximum energy saving at sensor node, a mobile collector should traverse the transmission range of each sensor in the field such that each data packet can be directly transmitted to the mobile collector without any relay. However, this approach may lead to increase data gathering latency due to the low moving velocity of the mobile collector. Fortunately, it is observed that gathering data latency can be effectively shortened by performing proper local aggregation via multihop transmissions and then uploading the aggregated data to the mobile collector.
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 and trajectory monitoring, traffic control. It is more challenging task 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 target for further decision making process. Sensor data in the form of cluster act as a nucleus job of data mining. A clustering in wireless sensor network involves selecting cluster heads and assigning cluster members (sensors) to it for efficient data relay. The constraints in power supply, limited communication, bandwidth, storage resources are the major challenges in WSN facing today.
In [3], Laxmi Choudhary, in Feb 2012 proposed that the fast development of computer and information technology in the last many years, an enormous amount of data in science and engineering has been and will continuously be generated in massive scale. It is either being stored in gigantic storage devices or flowing into and out of the system in the form of data streams. In this paper, we discuss the research challenges in science and engineering discipline, from the data mining perspective with focus on the following issues: (1)information network analysis, (2) discovery, usage of patterns and knowledge, (3)

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mining of stream, (4) mining of moving object , RFID , and data from sensor networks, (5) spatial, temporal and multimedia data mining, (6) text, Web, and other unstructured data mining, (7) cube-oriented multidimensional online analytical mining, (8) visual data mining, and (9) data mining by integration of sophisticated scientific and engineering domain knowledge.

In [4], Khushboo Sharma, Manisha Rajpoot, Lokesh Kumar Sharma, in 2011, proposed that advances in wireless technologies have led to the development of sensor nodes that are capable of sensing, processing, and transmitting. They collect large amounts of sensor data in a highly decentralized manner. Classification is an important task in data mining. In this paper a Nearest N0eighbour Classification technique is used to classify the Wireless Sensor Network data. Our experimental investigation yields a significant output in terms of the correctly classified success rate being 92.3%.

In [5], 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. This algorithm permits the improvement of data collecting performance by the base station by identifying locations of partitioned/islanded WSNs and navigating a mobile robot to the desired location. To identify the locations of partitioned WSNs, two control approaches, the first one is a global and second one is local-based approach, are proposed. Accordingly, the navigation strategy of the robot can be scheduled based on time and location using three scheduling strategies- (1) time based (2) location based (3) dynamic moving based. Using these three strategies, the mobile robot can collect the sensed data from the partitioned/islanded WSNs.

In [6], JANG-PING SHEU, KUN-YING HSIEH AND PO-WEN CHENG, in 2008 proposed that most wireless sensor networks consist of a large number of static, low-power, and unreliable sensors. In this paper, the author considered sensor networks consisting of both static and mobile nodes. Integration of both types of devices enables new applications, like nodes replacement, partition recovery, autonomous deployment and redeployment. We designed a mobile robot and implemented an application of nodes replacement to demonstrate its use, through our nodes replacement algorithm.

In this algorithm, the mobile robots can navigate towards low-energy sensor nodes and replace them automatically, with new sensor nodes, having no information of location. The navigation algorithm is based on the concept of received signal strength between the mobile robot and the communicating node. The output confirms that the mobile robots successfully achieved their assigned tasks.

In [7], Bo Yuan, Maria Orlowska and Shazia Sadiq, in Sep 2007, proposed that given a set of sparsely distributed sensors in the Euclidean plane, in which 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. This problem can be regarded as a special case of the Travelling Salesman Problem with Neighbor- hoods (TSPN), which is known to be NP-hard. In this paper, we present a novel TSPN algorithm for this class of TSPN, which can yield significantly improved results compared to the latest approximation algorithm.

3. CONCLUSIONS AND FUTURE WORK

Sensor nodes are capable of sensing and transmitting. They collect huge amount of data in a highly decentralized manner. Aggregation and classification is an important task in data mining. Nearest Neighbor Classification technique is used to classify network data. A data collecting algorithm using a mobile robot can be scheduled based on time and location. The mobile robot can collect and sense data from sensor nodes. It is shown that the mobile robot successfully achieved their assigned task.

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