Optimizing Data Collection in Rechargeable Sensor Networks by Dynamic Sensing and Routing

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ABSTRACT

Data Sensing and Data Transmission in the sensors remains active during the whole process by dynamically adjusting its sensing rate and transmission based on the available energy. In existing system to improve the energy efficiency for transmitting data, most of the existing optimal data sensing and routing strategies attempt to find the minimum energy path between a source and a sink to achieve optimal energy consumption. In this paper, we propose a Balanced Energy Allocation Scheme (BEAS) for managing the energy use so that all sensors can effectively utilize the harvested energy and Distributed Sensing Rate and Routing Control (DSR2C) algorithm for choosing. The best energy path to transmit the data without energy loss. In these algorithms, we introduce that the sensor dynamically adjusts its Sensing rate depending upon the energy. In this process effectively transfer the value data to the sink. Data transmit first data sensing level based depends upon energy level will low and it depends the works coverage will be reconstructed then will be transmit data. One method will be send the data based on neighbor communications and another method to transmit the data depends on the convergence rate in a large-scale sensor network it mean large distance to send the message.

KEY WORDS: EEN, BEAS, DSR2C, Sink.

1. INTRODUCTION

DATA gathering optimization was previously have addressed in battery powered WSNs (Hua, 2008). A popular approach is to be jointly optimize data sensing and data transmission globally by using cross-layer optimization. As the energy budget of each sensor is given initially, problem can be formulated as a deterministic optimization problem. However, energy arrival a teach sensor intrinsically stochastic in RSN. To optimize data gathering, sensors have to dynamically determine their sensing and transmission strategies in order to fully utilize the harvested energy according to the instant profile of energy arrival. These unique features make data gathering in RSNs a radically new and challenging problem, which is far from data gathering in battery-powered WSNs. In this paper, we seek to optimize data gathering in RSNs by jointly considering data sensing and data transmission. Existing works either assumed a static network topology or considered data sensing and data transmission independently. For example, Liu et al. proposed a distributed algorithm to jointly compute a routing structure and a high lexicographic rate assignment, provided that the available logical links are predetermined. According to the amount of available energy, each sensor can adaptively adjust it's transmit energy consumption within a certain range during network operation to improve the efficiency of data gathering by selecting optimal sensing rate and routing. The dynamic feature of network topology should be taken into account to improve the efficiency of data gathering. In addition, since sensors should communicate with each other to compute the optimal data sensing and data transmission upon different energy allocation, 1 changing the energy allocation frequently may bring extra energy cost for communication and computation. Thus, the extra energy cost, as well as the computational complexity, should be taken into consideration. The objective of this paper is to design an algorithm for data gathering optimization via dynamic sensing and routing (DoSR) that can maximize data gathering (in the form of utility) by jointly optimizing energy allocation, data sensing and data transmission for each sensor while taking the dynamic Data gathering optimization was previously addressed in battery-powered WSNs (Hua, 2008). A popular approach is to jointly optimize data sensing and data transmission globally Routing Control (DSR2C) algorithm for choosing. The best energy path to transmit the data without energy loss. In these algorithms, we introduce that the sensor dynamically adjusts its Sensing rate depending upon the energy. In this process effectively transfer the value data to the sink. Data transmit by using cross-layer optimization. As the energy budget of each sensor is given initially, the problem can be formulated as a deterministic optimization problem. However, energy arrival a teach sensor is intrinsically stochastic in RSNs. To optimize data gathering, sensors have to dynamically determine their sensing and transmission strategies in order to fully utilize the harvested energy according to the instant profile of energy arrival. These unique features make data gathering in RSNs a radically new and challenging problem, which is far from data gathering in battery-powered WSNs. Existing works either assumed a static network topology or considered data sensing and data transmission independently. For example, Liu et al. proposed a distributed algorithm to jointly compute a routing structure and a high lexicographic rate assignment, provided that the available logical links are predetermined. In practice, according to the amount of available energy, each sensor can adaptively adjust it's transmit energy consumption within a certain range during network operation to improve the efficiency of data gathering by selecting optimal sensing rate and routing. Therefore, the dynamic feature of network topology should be taken into account to improve the efficiency of data gathering. In addition, since sensors should communicate with each other to compute the optimal data sensing and data transmission upon different energy allocation, changing the energy allocation frequently may bring extra energy cost for communication and computation. Thus, the extra energy cost, as well as the computational complexity, should be taken into consideration. The objective of this paper is to design an algorithm for data gathering optimization via dynamic sensing and routing (DoSR) that can maximize data gathering (in the form of utility) by jointly optimizing energy allocation, data sensing and data transmission for each sensor while taking the dynamic..

2. MATERIALS AND METHODS

Network Formation: Each sensor will be sensing the temperature and humidity and consumes energy continuously for every 10 seconds. Each sensor's energy will be distributed between Sensing Rate and Transmission based on the algorithm. Using multicast socket, all sensors are used to detect the neighbor sensors. Once after finding neighbor sensors a queue is maintained for each neighboring sensor called as real queue. Once the sensor sends the data to the sink, energy will be reduced and it dynamically adjusts its sensing rate.

Distance based Route Finding: In this distance based route finding process, every sensor has a distance and a coverage area. Using multicast socket, all sensors are used to detect the neighbor sensors. Once after finding neighbor sensors a queue is maintained for each neighboring sensor to the Sink called as available path. A sensor can have any number of available paths. That can be used to make a route.

Energy based Route Finding: In this energy based route finding process, every sensor has an individual energy level. The energy level will differ from one sensor to another sensor. The highest energy level sensor is chosen as data forwarder. The higher energy sensors are forming the route for source to sink. In the data transmission process sensors energy can be reduced depends upon the data length. Energy level will be reduced automatically recharge from solar cell for each sensor.

Data Transfer: The transmission route depends on energy of each node. All the sensors are dedicated to send the sensed information to the Sink continuously. The sensor which sensed the data chooses one of the neighbors in the range which has maximum energy and sends the information to that node. That sensor which got the information follows the same procedure to send to the next node in the neighbors. This way the information from each sensor reaches the sink. This method will save the energy of each sensor by dynamically choosing the path based on the energy.

Design and Implementation Constraints:

Constraints in Analysis:

- Constraints as Informal Text
- Constraints as Operational Restrictions
- Constraints Integrated in Existing Model Concepts
- Constraints as a Separate Concept
- Constraints Implied by the Model Structure

Constraints in Design:

- Determination of the Involved Classes
- Determination of the Involved Objects
- Determination of the Involved Actions
- Determination of the Require Clauses
- Global actions and Constraint Realization

Constraints in Implementation: A hierarchical structuring of relations may result in more classes and a more complicated structure to implement. Therefore it is advisable to transform the hierarchical relation structure to a simpler structure such as a classical flat one. It is rather straightforward to transform the developed hierarchical model into a bipartite, flat model, consisting of classes on the one hand and flat relations on the other. Flat relations are preferred at the design level for reasons of simplicity and implementation ease. There is no identity or functionality associated with a flat relation. A flat relation corresponds with the relation concept of entity-relationship modeling and many object oriented methods.

System Features: In this paper, we propose a Balanced Energy Allocation Scheme (BEAS) for managing the energy use so that all sensors can effectively utilize the harvested energy and Distributed Sensing Rate and Routing Control (DSR2C) algorithm for choosing the best energy path to transmit the data without much energy loss. In these algorithms we introduce that the sensor dynamically adjust its sensing rate depending upon the energy. Each sensor consists of a solar cell or device, a rechargeable battery and a wireless module. We introduce the forwarder list based on the distance to energy efficient sensor (EEN) and residual energy of each sensor. Here we sends the data to sink using one dimensional network, so it cannot divert to other sensors, it will go straightly to sink. Another process of rout finding is depends on its coverage. In this process effectively transfer the value data to the sink. Data transmit first data sensing level based depends upon energy level will low and it depends the works coverage will be reconstruct then will be transmit data. One method will be send the data based on neighbor communications and another method to transmit the data depends on the convergence rate in a large scale sensor network it mean large distance to send the message

External Interface Requirements

User Interfaces:

- All the contents in the project are implemented using Graphical User Interface (GUI) in Java through JavaFX concepts.
- Every conceptual part of the projects is reflected using the JavaFX.
- System gets the input and delivers through the GUI based.

Hardware Interfaces: Ethernet on the AS/400 supports TCP/IP, Advanced Peer-to-Peer Networking (APPN) and advanced program-to-program communications (APPC).

ISDN: You can connect your AS/400 to an Integrated Services Digital Network (ISDN) for faster, more accurate data transmission. An ISDN is a public or private digital communications network that can support data, fax, image, and other services over the same physical interface. Also, you can use other protocols on ISDN, such as IDLC and X.25.

Software Interfaces: This software is interacted with the TCP/IP protocol, Socket and listening on unused ports. Server Socket and listening on unused ports and JDK 1.6

Communications Interfaces:

- TCP/IP protocol.
- LAN settings

Other Nonfunctional Requirements:

Performance Requirements: The performance of the wireless sensor network, to execute this project on LAN or wifi communication channel. So we need to one or more than machine to execute the demo. Machine needs the enough hard disk space to install the software and run our project.

Safety Requirements:

- The software may be safety-critical. If so, there are issues associated with its integrity level
- The software may not be safety-critical although it forms part of a safety-critical system. For example, software may simply log transactions.
- If a system must be of a high integrity level and if the software is shown to be of that integrity level, then the hardware must be at least of the same integrity level.
- There is little point in producing 'perfect' code in some language if hardware and system software (in widest sense) are not reliable.
- If a computer system is to run software of a high integrity level then that system should not at the same time accommodate software of a lower integrity level.
- Systems with different requirements for safety levels must be separated.
- Otherwise, the highest level of integrity required must be applied to all systems in the same environment.

3. RESULTS

In this section, we report the results concerning the implementation of:

Simulation Setting: Simulation setting defines about the network topology.In this the, node is connected to certain neighboring nodes, the distance is calculated according to the sensor. Each sensor as a certain Radiation. The sensor senses the distance between the neighboring nodes and respective transmission rate each transmission has a mathematical formulation according to this the transmission of the data will take place in the distance nodes.it simulates the network setting and occupies the data in certain space and evaluate it.

Performance Evaluation of BEAS: In this the BEAS allocated the energy to certain slots the energy space is allocated to preserve the data collected in day light.in this the sensors is used to collect the data and evaluate it solar energy also plays a role in this and also the quick fix to allocate the data and represent the day transmission rate take place according to the solar radiation and the means of perspective energy

4. DISCUSSION AND CONCLUSION

Thus we design two algorithm BEAS and DSR2C for effectively utilizing the available energy and choose the path to sink that best suits to save the energy. By using Rechargeable battery the algorithm use will be distributed the energy to all the nodes equally and can get the energy to sense and transmit the data. To sense the data rates and flow rates using decomposition while taking the dynamic of network topology. In future enhancement we are going to increase the storage of energy from natural source and the data will not be lost while transmitting to neighbor nodes one another until reaches sink. It depends upon energy to use manage it distribute the data, energy consumption and maximize network lifetime in one dimensional network. The nodes get efficient energy and the energy is saved and used efficiently while transmitting the data from one node to another and then to the sink.

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