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Evolution of Efficient GOR for Multi-Constrained QOS Provisioning in WSNs

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Abstract:

Wireless Sensor Networks (WSNs) are a research topic of growing interest over the recent years due to its wide applications. A large number of applications including medical care, habitat monitoring, precision agriculture, military target tracking and surveillance, natural disaster relief, hazardous environment exploration and monitoring are all using this technology. Wireless Sensor Networks (WSNs) are critically resource-constrained by their limited power supply, memory, processing performance and communication bandwidth. Due to their limited power supply, energy consumption is a key issue in the design of protocols and algorithms for WSNs. Hence, most existing works (e.g., clustering, lifetime prolonging) in the WSN area are dealing with energy efficiency. In this paper, there are several mobile sensor nodes available with the limitation of mobility in the entire wireless sensor network.

This network monitors all the mobility nodes using the efficient QoS aware GOR protocol which helps to overcome the limitation of mobility. First we initialize the energy for the mobile sensor nodes. Based on that we can decide whether it is chargeable or non rechargeable in WSN using EQGOR protocol. This protocol is used for packet delivery based on the neighbor mobile nodes with certain limitations. At the same time all the mobile sensor nodes collect the neighbor mobile nodes details using Forward Candidate Algorithm, which is useful in calculating the connectivity of hop count and the packet size (for storage purpose) to forward to each and every mobile sensor nodes while moving from one location to another location. Suppose if any data is lost by the relay nodes then those node will choose another capable neighbor mobile node to perform the packet transfer of mobile nodes based on the multi objective evolutionary algorithm. This algorithm enables each mobile sensor node to choose the adjacent node for the next hop based on prioritization.

Here two kinds of priority exists, one is the higher priority for the highest size packet transmission and the other is the lowest priority for the lowest size packet transmission with timer setting. Hence using Quadratic Assignment technique with EQGOR protocol and the proposed algorithm we can detect data aggregation with limitation of mobile sensor nodes and also we can achieve the transfer of packet delivery more quickly than the available QoS algorithm.

Keywords:

Congestion, QoS Challenges, QoS issues, QoS mechanisms, Routing, Wireless Sensor Networks.

INTRODUCTION:

Wireless Sensor Networks (WSNs) have great potential for a wide variety of applications, such as remote environmental monitoring, target tracking and traffic control [1]. Inch scale and low-cost sensor devices can measure temperature, humidity, or find the location of objects. In recent years, research advancements have also made available inexpensive CMOS cameras and microphones that can capture multimedia content. The low cost of multimedia hardware has fostered the development of Wireless Multimedia Sensor Networks (WMSNs) [2].Consequently, the research interest in WSNs has shifted from measuring physical phenomena to enabling multimedia delivery such as video and audio streams over sensor networks.

A WMSN is a network of wireless interconnected smart devices that enables retrieving video and audio streams. The devices usually operate autonomously on limited no rechargeable battery power and are expected to last for several months or even years. Therefore, a major concern is to improve the energy efficiency of the network and maximize node lifetime.

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However, the unique characteristics of WMSNs pose significant challenges on the problem of energy efficiency. Most multimedia applications produce high volumes of data and require high transmission rates while sensor nodes are The work of D. Toumpakaris was supported by the European Union (European Social Fund - ESF) and Greek national funds through the Operational Program Education and Lifelong Learning of the National Strategic Reference Framework through the Research Funding Program Thales - Investing in knowledge society through the European Social Fund. battery-constrained devices.

Maximizing the lifetime of those networks is a critical issue. In parallel with the optimal energy management issue, there also exists the demanding requirement of adequate communication-wise operation and performance of the WMSNs. Most potential applications of WMSNs have predetermined levels of Quality of Service (QoS). QoS is the ability to deliver a guaranteed level of service to applications [3]. Existing work that exploits multipath routing to extend network lifetime suffers from increased delay. QoS routing is an important research issue in WMSNs.
This work considers a QoS and energy-aware routing protocol designed to extend network lifetime while guaranteeing delay QoS constraints. The impact of the selection of a proper forwarding candidate set in an Angle-based Dynamic Routing Scheme (ADRS) [4] is examined. Then, a scheme that properly selects the forwarding candidate set in order to optimize the lifetime under QoS constraints is introduced. The scheme is also compared with a simple routing scheme that follows the shortest-path approach.

This work addresses two important issues of multi-constrained QoS routing in WMSNs:

1) How important is the forwarding candidate set selection on the network lifetime and what is the optimal candidate set?

2) Under certain QoS constraints and node transmission range, can a proper packet transmission mechanism extend the network lifetime?

The major contributions of this work are listed below:

• We provide an analytical evaluation of the impact of the selection of the forwarding candidate set on the network lifetime. Especially, we explore the effect that the choice of the forwarding area has on the network lifetime.

• We propose to use the ADRS in order to improve the network lifetime, network reliability and packet latency.

• Through comprehensive performance evaluation, we demonstrate the efficiency of the proposed scheme and we compare it with other approaches.

ISSUES IN WIRELESS SENSOR NETWORKS:

The major issues that affect the design and performance of a Wireless Sensor Network are

Localization:

Sensor localization is a fundamental and crucial issue for network management and operation. In many of the real world applications, the sensors are deployed without knowing their positions in advance and also there is no supporting infrastructure available to locate and manage them once they are deployed.

Calibration:

Calibration is the process of adjusting the raw sensor readings obtained from the sensors into corrected values by comparing it with some standard values.

Quality of Service:

Quality of service is the level of service provided by the sensor networks to its users. Quality of Service (QoS) for sensor network is the optimum number of sensors sending information towards information collecting sinks. Data aggregation: During data gathering the sensor nodes periodically, sense the data from the surrounding environment, process it and transmit it to the base station .

Synchronization:

Clock synchronization is an important service in sensor networks. Time Synchronization in a sensor network aims to provide a common timescale for local clocks of nodes in the network. A global clock in a sensor system will help process and estimate the data correctly and predict future system behavior.

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QOS REQUIREMENTS IN WSNS:

The QoS protocols have to address various requirements like timeliness, reliability, energy consumption, bandwidth, delay, throughput, latency etc.

Reliability:

The transmission reliability is an important index of QoS, calculated to measure the probability of transmission failures and can be expressed in terms of data.

Energy Consumption:

It is a measure of the energy required for data transmission, from any sensor node to the sink on a single path. Bandwidth: It is a measure of information carrying capacity of a network.

Delay Metric:

Delay is a measure of time elapsed from the departure of a data packet from the source node to the destination node.

Throughput :

It is defined as the time average of the number of bits that can be transmitted by each node to its destination.

Timeliness :

Timeliness refers to the occurrence of events at suitable instants of time. It evaluates the punctuality of the event.

LITERATURE SURVEY:

In recent years, there has been a growing interest in Wireless Sensor Networks (WSN).Recent advancements in the field of sensing, computing and communications have attracted researchers towards the field of WSNs. An overview of the basics of Wireless Sensor Networks, issues, challenges are discussed in [1-2]. Xiaoxia Huang et al., [3] utilize multiple paths between the source and sink pairs for QoS provisioning and have proposed a probabilistic model of link state for Wireless Sensor Networks. Based on this model, an approximation of local multipath routing algorithm is explored to provide QoS under multiple constraints, such as delay and reliability.

Jianwei et al., [4] have presented R3E, which can augment most existing reactive routing protocols in WSNs to provide reliable and energy-efficient packet delivery against the unreliable wireless links. It can effectively improve robustness, end-to-end energy efficiency and latency. Cheng et al., [5] have exploited the Geographic Opportunistic Routing (GOR) for multi constrained QoS provisioning in WSNs, which is more suitable than the multipath routing approach.

Further, an Efficient QoS-aware GOR (EQGOR) algorithm is proposed for QoS provisioning in WSNs. EQGOR achieves a good balance between these multiple objectives and has very low time complexity. In order to maintain better QoS under failure conditions, identifying and rectifying such faults are essential.

Ravindra et al., [6] have proposed a method in which faulty sensor node is detected by measuring the round trip delay (RTD) time of discrete round trip paths and comparing them with threshold value. Yuli et al., [7] have proposed partial quality-of-service (QoS)-oriented relay selection scheme with a decode-and-forward (DF) relaying protocol, to reduce the feedback amount required for relay selection. The activated relay is the one with the maximum Signal-to-Noise power Ratio (SNR) in the second hop among those whose packet loss rates (PLRs) in the first hop achieve a predetermined QoS level.

Samina et al., [8] have developed a crosslayer techniques suitable for Wireless Sensor Networks (WSNs) that are capable of multichannel access. More specifically, energy and cross-layer aware routing schemes are proposed for multichannel access WSNs that account for radio, MAC contention and network constraints. Yunbo et al., [9] have developed a comprehensive cross-layer analysis framework, which employs a stochastic queueing model in realistic channel environments.

This framework is generic and can be parameterized for a wide variety of MAC protocols and routing protocols which effects various network parameters like endtoend delay. The developed framework can be used.Feng et al., [18] discusses the requirements, critical challenges and open research issues related to QoS management in WSNs. Sankarasubramaniam et al., [24] proposes a new reliable transport scheme Event to Sink Reliable Transport (ESRT) for WSNs.

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ESRT is a novel transport solution developed to achieve reliable event detection in WSN with minimum energy expenditure and their solution is based on a non-end-to-end concept. The solution includes a congestion control component that serves the dual purpose of achieving reliability, conserving energy and reliability of event detection that is controlled by the sink which has more power than sensors.Javad et al., [20] discuss the Quality of Service (QoS) requirements in WSNs and present a survey of some of the QoS multi-parameters metrics in WSNs.

Also, it gives the performance of 802.15.4, LEACH and CBRP protocol considering parameters. Hamid et al., [21] presents Effective Life time-Aware Routing in Wireless Sensor Networks. This method determines the network resource specifications such as the number of available nodes and their sensing spatial coverage. The sensing problem is addressed and analyzed for various layers of the network. By using the solutions of various linear programming equations, normalized network lifetime can be calculated for various network environments. Leandro et al., [22] proposes Data Routing for In Networking Aggregation (DRINA): A Lightweight and Reliable Routing Approach for In-Network Aggregation in Wireless Sensor Networks which reduces the energy consumption of various high density nodes. Data fusion and data aggregation methods can remove the redundancy in the data and can reduce the energy consumption and cost. Hence, reduced number of messages are used for setting up a routing tree, maximized number of overlapping routes, high aggregation rate, reliable data aggregation and transmission. The algorithm includes the Information Fusion-based Role Assignment (InFRA) and Shortest Path Tree (SPT) algorithms. These algorithms provide good performance in aggregation of data.

EXISTING SYSTEM:

Several existing works, MMSPEED, MCMP, EQSR, ECM, and DARA propose to utilize multiple pathsbetween the source and sink for multi-constrained QoS provisioning in WSNs. Data transmission along multiple paths can achieve certain desired reliability, and the delay QoS requirement is met as long as any one packet copy arrives at the destination before the deadline. Compared with the single path routing with retransmission to guarantee delivery reliability, the multipath approach may probably provide shorter end-to-end delay by removing the retransmissions.

However, it has following two major disadvantages: Sending a packet over multiple paths inevitably induces significant energy cost, which is one of the primary design concerns in WSNs; Exploiting multiple paths also introduces more channel contentions and interference which may increase the delivery delay as well as cause transmission failures.

PROPOSED SYSTEM:

In this project our major contributions are listed as follows: We argue that multipath routing approach may not be suitable to guarantee both reliability and delay QoS constraints in WSNs. Correspondingly, we propose to exploit the opportunistic routing approach for multi-constrained QoS provisioning in WSNs. We find that existing GOR protocol cannot be directly applied for QoS provisioning in WSNs. Therefore, we investigate the problem of efficient GOR for multi-constrained QoS provisioning (EGQP) in WSNs, which is formulated as a multi-objective multi-constraint optimization problem.

We provide insight into the properties of multiple routing metrics in GOR. Based on the theoretical analysis and observations, we propose an Efficient QoS-aware GOR (EQGOR) algorithm for QoS provisioning in WSNs. Through comprehensive performance comparisons, we demonstrate the low time complexity and effectiveness of EQGOR for multi-constrained QoS provisioning in WSNs.

MODULES:

In this section, the proposed system consists of four modules: Geographic opportunistic routing, data transmission, sleep and awake method and performance analysis

A.Geographic opportunistic routing:

Geographic routing is a routing principle that relies on geographic position information. It is mainly used to identify the location of sink node and send message to the geographic location of destination instead of using the network address.

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Based on the idea, the source node finds its neighbor node location and maintain the table.

i.Candidate selection: The Candidate selection and prioritization algorithm in EQGOR for QoS provisioning in WSNs. When node is sending a data packet to the sink node, it selects and prioritizes forwarding candidates based on the EQGOR scheme. The minimum and maximum number of candidates to be prioritized. EQGOR will only prioritize the first k available next-hop nodes.

ii.Path determination: After selecting the candidates the path has to be determined. Data packets are forwarded to the destination through this established route.

B.Data Conveying :Data conveying is the physical transfer of data (A digital bit stream) over a point-to-point or point-to multipoint channel. Data has to be conveyed on the route which is selected by the EQGOR protocol scheme .

C.Sleep and Awake Method :Source, Destination and intermediates are only in awake mode. Other nodes are go to a sleep mode.

D.Performance Analysis: Finally, Performance has to be analyzed between GPSR, EQGOR and IEQGOR protocols. The analyzed result is shown with the help of graph. IEQGOR significantly improves the energy consumption, latency and transmission cost for the QoS provisioning in WSNs. IEQGOR shows obvious advantage over EQGOR.

EXPERIMENT RESULTS

Server (Sender 1):

The above screen shows the design for server (sender 1) page where he first enter the ip address of client (destination) and upload the file and transfer it .

File Split :

The above screen shows the design for file split form where two different file from two different servers (senders) are split in to packets successfully.

Routing Form:

The above screen shows the design for routing form where the file1 and file2 are route from source (server sender 1,server sender2) to destination (client candidate) successfully.

Client (candidate):

The above screen is the client form is showing where client successfully received the file.

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Service Time Form:

The above screen shows the design for service time form where it shows how much time taken transfer the packet at each node also it shows average delay time for each file.

CONCLUSION:

Development of effective optimization algorithms is the key to improve the utilization of the limited resources of WSN s (energy, bandwidth, computational power). Using Quadratic Assignment technique with EQGOR protocol and the proposed algorithm we can avoid the time delay and we can increase the throughput of each mobile sensor node with mobility. Simulation results shows that EQGOR protocol achieves better energy efficiency than Geographic routing and blind opportunistic protocols in all the cases while maintaining very good routing performance. Further work to improve the algorithm includes the addition of routing network with clustering formation of multiple destination nodes. Any IDS entering into the WSN or if already available mobile sensor misbehaves in the system then those nodes can be easily detected through the enhanced protocol with gateway of clustering network. So we can quickly detect IDS of the nodes and improve as well as save the battery power, energy consumption, throughput ,end to end delay, network lifetime and also limitation of mobile sensor nodes is removed successfully. And in this paper, we have made an effort to put these works into perspective and to present a holistic view of the field. There is significant amount of scope for future work in these areas.

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