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AN OPTIMIZATION FRAMEWORK FOR MOBILE DATA COLLECTION IN ENERGY HARVESTING WIRELESS SENSOR NETWORKS

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Abstract:

Renewable energy technology has become a promising solution to reduce energy concerns due to limited battery in wireless sensor networks. While this enables us to prolong the lifetime of a sensor network, unstable environment energy source bring challenge in the design of sustainable sensor networks. In existing some renewable energy source like solar panels are used in which the implementation of solar panels is quite difficult. So we propose an adaptive energy harvesting management framework, Ginibre Point Process modeling, which exploits an application's tolerance to quality degradation to adjust application quality based on energy harvesting conditions. And also charging the sensor node with the Radio Frequency signal that used for communication purpose in wireless sensor network. With additional we are implementing the data collection scheme based on the SenCar based Approach with moving Cluster Heads.

Keywords: Data Collection, Energy Harvesting, Radio Frequency, Renewable Energy, Sencar.

1. INTRODUCTION

Data gathering or harvesting is a generic research problem in wireless sensor networks (WSNs) how to collect observed (or measured) data or information from sensor nodes. For the data gathering process, a sink (or base station) periodically generates query packets or data packets to gather certain information of interest from sensor nodes or each sensor, instead, directly informs the sink node about its observed data or events. In addition, mobile sinks (agents), e.g., data mules, can move around the sensor field and collect information observed at each sensor node. A random walk has been widely used as a means of randomized routing or probabilistic packet forwarding in the data gathering process leads to the preferable properties such as simplicity of implementation, scalability, robustness to topology changes, and avoiding critical points of failure. The random walk has been also popularly used as a mobility pattern for physical mobile agents collecting information over sensor nodes. As to the random walk-based routing for data gathering, the existing research studies have mainly focused on the performance of the following metrics: delay – the time for a random walk (a data or query packet) to reach its destination. These metrics are suitable for one shot information delivery or search/query. In contrast, the problem of data gathering using the random-walk agents is the important perspective. Environmental energy harvesting has emerged as a promising technique to provide sustainable energy sources for battery-powered wireless sensor networks (WSNs), whose network longevity is constrained by battery capacity. Renewable energy sources such as solar, wind, thermal necessitates Cyber Physical Systems for achieving energy efficiency and cost effectiveness. For example, solar harvesting is proven to be useful to provide energy to sensors from a solar panel of relatively similar size of sensors. Thermoelectric conversion offers opportunities to harvest energy via heat transfer when the temperatures of objects or environments are different. When power from an ambient energy source (such as solar, wind or thermal, etc.) is brought into a WSN, it becomes rechargeable, and is possible to achieve infinite network lifetime by careful network planning and energy harvesting-aware designs.

2. RELATED WORK

A wireless sensor network(WSN) has important applications such as remote environmental monitoring and target tracking. This has been enabled by the availability, particularly in recent years, of sensors that are smaller, cheaper, and intelligent. These sensors are equipped with wireless interfaces with which they can communicate with one another to form a network. The design of a WSN depends significantly on the application, and it must consider factors such as the environment, the application's design objectives, cost, hardware, and system constraints. Following a top-down approach, we give an overview of several new applications and then review the literature on various aspects of WSNs.

Large scale dense Wireless Sensor Networks (WSNs) have been progressively employed for different classes of applications for the resolve of precise monitoring. As a result of high density of nodes, both spatially and temporally correlated information can be detected by several nodes. Hence, energy can be saved which is a major aspect of these networks. Moreover, by using these advantages of correlations, communication and data exchange can be reduced. In this paper, a novel algorithm that selects the data based on their contextual importance is proposed. The data, which are contextually important, are only transmitted to the upper layer and the remains are ignored.

Energy harvesting has grown from long-established concepts into devices for powering ubiquitously deployed sensor networks and mobile electronics. Systems can scavenge power from human activity or derive limited energy from ambient heat, light, radio, or vibrations. Ongoing power management developments enable battery-powered electronics to live longer. Such advances include dynamic optimization of voltage and clock rate, hybrid analog- digital designs, and clever wake-up procedures that keep the electronics mostly inactive. Exploiting renewable energy resources in the device's environment.

3. PROPOSED SYSTEM

We propose an energy harvesting management framework called SenCar for data collection applications in wireless sensor networks. To the best of our knowledge, this work is the first attempt to jointly use both application data quality (expressed as error margins) and harvesting ability to manage the energy budget of such systems. Our framework includes two stages: Sencar stage we employ a SenCar, called SenCar to collect data from designated sensors and balance energy consumptions in the network. To show spatial-temporal energy variations, we first conduct a case study in a solarpowered network and analyze possible impact on network performance; The Sencar stage exploits the slot based harvested energy prediction and the relation between energy cost and data accuracy to allocate energy budget for each time slot in a given harvesting period Data gathering or harvesting is a generic research problem in wireless sensor networks (WSNs) – how to collect observed (or measured) data or information from sensor nodes, and so has been actively studied in the literature. For the data gathering process, a sink (or base station) periodically generates query packets or collector packets to gather certain information of interest from sensor nodes or each sensor, instead, directly informs the sink node about its observed data or events. In addition, mobile sinks (agents), e.g., data mules, can move around the sensor field and collect information observed at each sensor node. Current technological advances have made sensible the deployment of inexpensive sensor nodes over a region of interest to collect sensor data, to process it and to route it to a sink node for aggregation that as an entire comprises wireless Sensor Network (WSN).

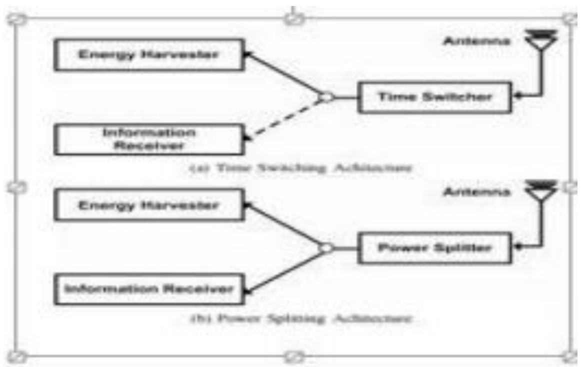

Fig.1.Model System

In Wireless Sensor Networks (WSN), the key challenge is to prolong the network life time by reducing the energy consumption among sensor nodes and reduce energy dissipation in network operation, improve network load and stability. In fact, WSN's have numerous applications in weather monitoring, disaster management, inventory tracking, smart spaces, habitat monitoring, target tracking, surveillance and many more. In a multi-hop Wireless Sensor Network (WSN) with continuous traffic, each sensor node acts as a data originator that introduces a data packet into the network at regular intervals, to send its data to the sink node. At the same time, each node also acts as a router to forward others data packets to the sink node via minimum-hop paths.

4. ANALYSIS

The compressive data collection method are used to collect the data from the sensor the data from each sensor are collected and then data can be compressed and store in the cluster heads the cluster head consists of buffer it is used to store the data from the sensor. Once the buffer is full the data collector nodes are used. It collects data from the cluster head and given to the base station. While the transmission of data from one node to another node RF signal are used by using RF signal the both the data collection and charging of sensors are done. The data from the node are collected with two methods. Time varying method and power splitting method . The time varying method is allocate time session for data collection and charging but power splitting method the data collection and charging are done simultaneously. We propose an energy harvesting management framework called SenCar for data collection applications in wireless sensor networks. To the best of our knowledge, this work is the first attempt to jointly use both application data quality (expressed as error margins) and harvesting ability to manage the energy budget of such systems. Our framework includes two stages: Sencar stage we employ a SenCar, called SenCar to collect data from designated sensors and balance energy consumptions in the network. To show spatial-temporal energy variations, we first conduct a case study in a solarpowered network and analyze possible impact on network performance; The Sencar stage exploits the slot based harvested energy prediction and the relation between energy cost and data accuracy to allocate energy budget for each time slot in a given harvesting period. Energy harvesting has grown from long-established concepts into devices for powering ubiquitously deployed sensor networks and mobile electronics. Systems can scavenge power from human activity or derive limited energy from ambient heat, light, radio, or vibrations. Ongoing power management developments enable battery-powered electronics to live longer. Such advances include dynamic optimization of voltage and clock rate, hybrid analog- digital designs, and clever wake-up procedures that keep the electronics mostly inactive.

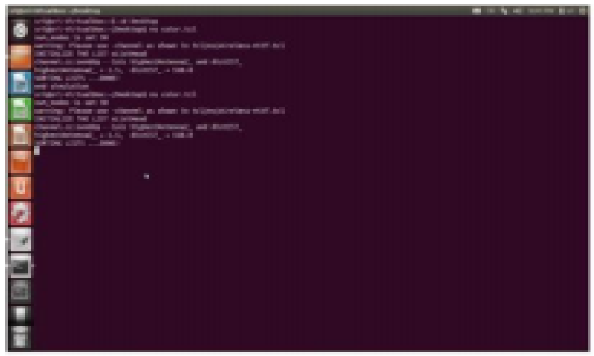

Fig.2.Analysis

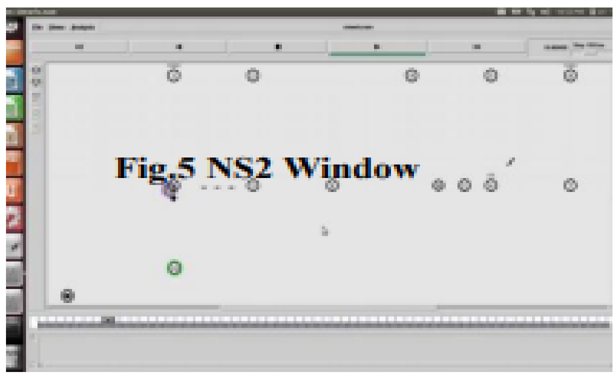

Fig.3.Output

Exploiting renewable energy resources in the device's environment, however, offers a power source limited by the device's physical survival rather than an adjunct energy store. Energy harvesting's true legacy dates to the water wheel and windmill, and credible approaches that scavenge energy from waste heat or vibration have been around for many decades. Nonetheless, the field has encountered renewed interest as low-power electronics, wireless standards, and miniaturization conspire to populate the world with sensor networks and mobile devices. This article presents a whirlwind survey through energy harvesting, spanning historic and current developments.

CONCLUSION

The simulated framework to evaluate the network loss probability as a performance metric for different distributed Energy Harvesting strategies of SenCars moving over a graph (or network) for data harvesting in WSNs. Under this framework, we were able to find the Energy Harvesting strategy for the SenCars under mild conditions so as to minimize the network loss probability. Our Energy Harvesting strategy can be made distributed using only local information via the Metropolis-Hastings algorithm. We have demonstrated through extensive numerical simulations that our Energy Harvesting strategy. Remarkably outperforms the Distributed Energy Harvesting strategy under various settings of network topology, buffer size, and the number of SenCars, as well as heterogeneous and spatially-correlated data arrival patterns. We expect that our reasoning behind the Energy Harvesting strategy can be applicable for the design of Distributed energy based applications sample topologies of each sensor node. The RF charging schemes have been referred in future the photo transistor panels are deployed for energy harvesting.

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