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**RF ENERGY HARVESTING WITH DATA COLLECTION  
APPROACH INCORPORATING IN WSN**Mr. A. Srikrishnan<sup>1</sup>, Mr. R. Pandidurai<sup>2</sup>

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<sup>1</sup>srkrishnanmec@gmail.com, <sup>2</sup>ecepandidurai@gmail.com**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 (perpetually), 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 (RF) 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,

**I.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.

WSNs are composed of low-cost, low-power sensors, each of which is equipped with limited buffer/storage space for data. Also, the random walk-based data gathering is typically for delay insensitive applications in which the collected data is mainly

used for post-processing or other research studies later. It is thus more important to measure how much data can be collected before it is lost due to limited buffer space, when the sink periodically generates query packets or collector packets moving over the network in a random walk fashion to gather measured data or its aggregated/compressed version from sensor nodes.

## II. RELATED WORKS

*2.1 Wireless sensor network survey Computer Networks the International Journal of computer & telecommunications Networking.*

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. We classify the problems into three different categories: (1) internal platform and underlying operating system, (2) communication protocol stack, and (3) network services, provisioning, and deployment. We review the major development in these three categories and outline new challenges.

*2.2 On exploiting spatial and temporal correlation in wireless sensor networks Proceedings of Wiopt Modeling & Optimization in Mobile Ad Hoc & Wireless Networks.*

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. In this way, the proposed method achieves significant data reduction and in turn improves the energy conservation of data gathering.

*2.3. Studying the feasibility of energy harvesting in a mobile sensor network*

The feasibility of extending the lifetime of a wireless sensor network by exploiting mobility. In our system, a small percentage of network nodes are autonomously mobile, allowing them to move in search of energy, recharge, and deliver energy to immobile, energy-depleted nodes. We term this approach energy harvesting. We characterize the problem of uneven energy consumption, suggest energy harvesting as a possible solution, and provide a simple analytical framework to evaluate energy consumption and our scheme. Data from initial feasibility experiments using energy harvesting show promising results.

*2.4. Energy scavenging for mobile and wireless electronics*

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, 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.

## III. EXISTING SYSTEM

*3.1 Distributed Energy Harvesting Strategies.*

Nevertheless, renewable energy depends heavily on environmental conditions (e.g., harvested solar energy on a sunny day is much higher than it is on a cloudy or rainy day). The time-varying characteristics of renewable energy sources creates a shift in research focus from energy efficient to energy-neutral approaches, i.e. from optimizing energy consumption to adapting systems to deal with unstable energy sources while meeting application quality constraints.

Renewable energy sources such as solar energy show predictable patterns that are exploited in several coarse-grain (or slotbased) harvested energy prediction methodologies.

3.2 Energy Harvesting

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

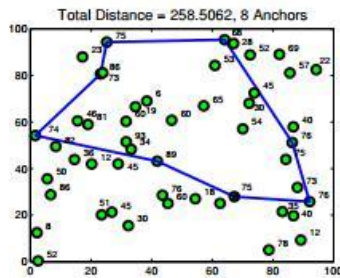


Fig.1. Anchor selections under different touring bound

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.

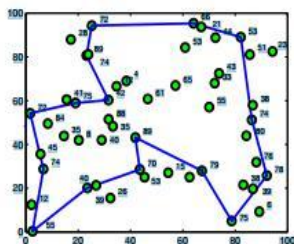


Fig.2. Evolution of anchor selections

planned to meet the delay requirement. In this paper, we consider deployment of sensors on a 2-dimensional sensing field, so more anchors would result longer tour length as well as the data collection delay.

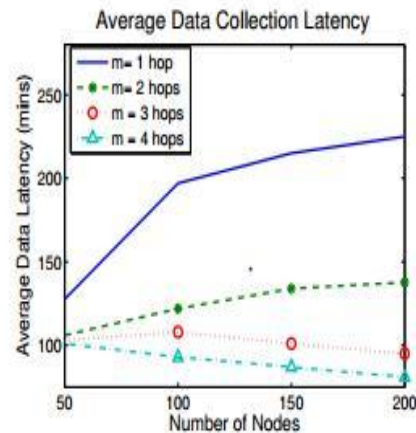


Fig.3 Data Collection Fairness

IV. PROPOSED SYSTEM

Wireless system is a way to transmit data to wide range of area with low cost but in wireless system some drawbacks are available in which energy or lifetime of sensors are important issue in wsn network

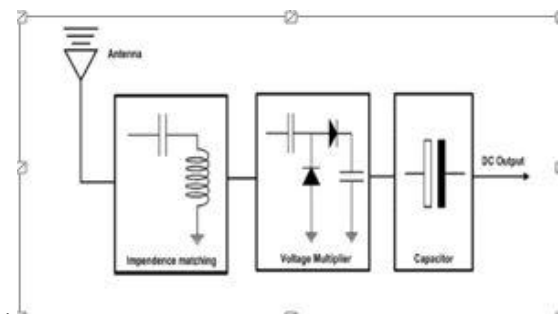


Figure 4 RF Charging circuit

The RF charging method and phototransistor or light sensor are used to charging the batteries at the Sensor. This method as increased the life time of the sensor.

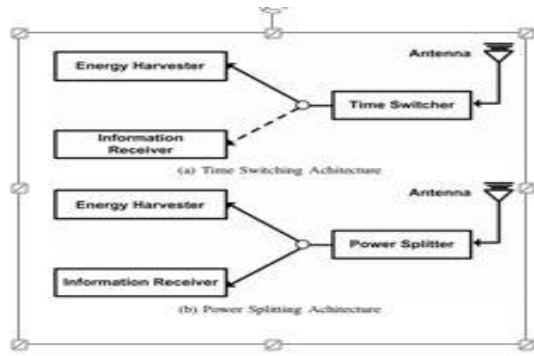


Figure 5 Charging model

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 1. 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.

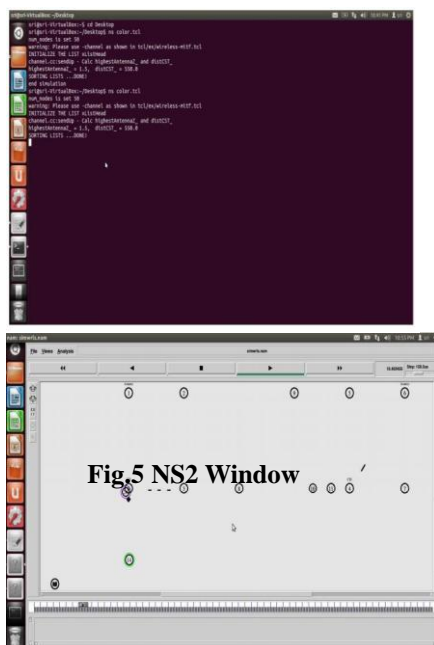


Fig.5 NS2 Window

Fig.6 Gathering Data from Nodes

V.CONCLUSIONS

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

VI. REFERENCES

[1].M. Rahimi, H. Shah, G. Sukhatme, J.Heideman and D. Estrin, “Studying the feasibility of energy harvesting in a mobile sensor network,” *IEEE International Conference on Robotics and Automation*, 2003.

[2] J. Paradiso, T. Starner, “Energy scavenging for mobile and wireless electronics”, *IEEE Journal of Pervasive Computing*, vol. 4, no. 1, pp. 18-27, 2005.

[3] X. Jiang, J. Polastre, and D. Culler, “Perpetual environmentally powered sensor networks,” *IEEE IPSN* Apr. 2005.

[4] V. Raghunathan, A. Kansal, J. Hsu, J.Friedman,andM.Srivastava,“Design considerations for solar energy harvesting wireless embedded systems,” *IEEE IPSN* Apr. 2005.

[5] C. Ma, Z. Zhang and Y. Yang, “Battery-aware scheduling in wireless mesh networks,” *Mobile Networks and Applications*, vol. 13, no. 1-2, pp. 228-241, 2008.

- [6] C. Ma and Y. Yang, "Battery-aware routing for streaming data transmissions in wireless sensor networks," *Mobile Networks and Applications*, vol. 11, no. 5, pp. 757-767, 2006.
- [7] A. Kansal, J. Hsu, M. Srivastava and V. Raqhunathan, "Harvesting aware power management for sensor networks," *43rd ACM/IEEE DAC*, 2006.
- [8] C. Ma and Y. Yang, "A battery-aware scheme for routing in wireless ad hoc networks," *IEEE Trans. TVT*, vol. 60, no. 8, pp. 3919-3932, 2011.48
- [9] C. Vigorito, D. Ganesan and A. Barto, "Adaptove control of duty cycling in energy-harvesting wireless sensor networks," *IEEE SECON*, 2007.
- [10] M. Gorlatova, A. Wallwater, G. Zussman, "Networking low-power energy harvesting devices: measurements and algorithms," *IEEE INFOCOM*, 2011.
- [11] R. Liu, P. Sinha and C. E. Koksal, "Joint energy management and resource allocation in rechargeable sensor networks," *IEEE INFOCOM*, 2010.
- [12] L. Lin, N. Shroff, R. Srikant, "Asymptotically optimal energy-aware routing for multihop wireless networks with renewable energy sources networking," *IEEE/ACM Trans. Networking*, vol. 15, no. 5, pp. 1021-1034, 2007.
- [13] R.C. Shah, J.M Rabaey, "Energy aware routing for low energy ad hoc sensor networks," *IEEE WCNC* 2002.
- [14] M. Ma and Y. Yang, "SenCar: An energy efficient data gathering mechanism for large scale multihop sensor networks," *IEEE Trans. TPDS*, vol.18, no.10, pp.1476-1488, 2007.
- [15] M. Ma, Y. Yang and M. Zhao, "Tour planning for mobile data gathering mechanisms in wireless sensor networks," *IEEE Trans. TVT*, vol. 62, no. 4, pp. 1472-1483, 2013.
- [16] M. Zhao and Y. Yang, "Optimization-based distributed algorithms for mobile data gathering in wireless sensor networks," *IEEE Trans. Computers*, vol. 11, no. 10, pp. 1464-1477, 2012.

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