International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 04 | Apr-2016 www.irjet.net p-ISSN: 2395-0072

Wireless Charging And Data Collection In Sensor Network

Diksha Dhendwal[1], Mayur Yadav[2], Prof. Chate Parinita J.[3]

[123]*Computer Department, BVCOEL Pune, India*

Abstract- *In the wireless charging and data collection in sensor network, a new technology can be used, that is wireless energy transfer (WET), it is used to charge the batteries of sensor nodes without wires, WET thus requires a charging station to be brought within the proper range of sensor nodes so that the good energy transfer efficiency can be achieved. In short it has been well recognized that data collection with a mobile base station is fixed. Through wireless charging vehicle, we are going to co-locate a wireless charger and mobile base station. The WCV travels along the pre-planned path inside the sensor network, so that the energy consumption will be minimized .so that the each sensor node is charged in time and it will never run out of energy and all the data that is collected from sensor node will relay on mobile base station. In this we are going to explore the challenging problem of using single mobile platform (i.e. WCV)to carry both wireless charge for WET and base station for data collection in a sensor network.*

Key word: Wireless sensor network, Wireless energy transfer, Mobile base station, Optimization.

1 .INTRODUCTION

The wireless energy transfer (WET) based on magnetic resonant coupling was known to be a promising technology to fundamentally address energy and lifetime problems in a wireless sensor network (WSN). As we know that nowadays, magnetic resonant coupling is based on wireless energy transfer and is a widely used technology for charging the sensor nodes in a wireless sensor network. WET does require the charging station to be brought to within fair range of a sensor node so that good energy transfer efficiency can be achieved. We use the mobile vehicle platform that is used to carry wireless charging station as a *wireless charging vehicle* (WCV). The wireless charging technology was limited to charge one node at a time and is not scalable as the number of nodes increases. After that the problem has been identified and then developed an improved technology that allows energy to be transferred to multiple receiving nodes simultaneously. A single mobile platform has been employed over the mobile platform i.e. wireless charging vehicles for both WET and data collection in a WSN. It is necessary that data collected from all sensor nodes is relayed on the same path (via multi-hop) to the mobile base station on WCV in real time. Our main objective of our problem is to minimize energy consumption of the entire system. By putting both WET and data collection on the same mobile platform is an interesting and challenging problem. The problem involves several sub problems, each of which is challenging on its own. First, the WCV's movement behavior needs to be optimized, because traveling path is given, where the WCV should make stops along this path and how long it should stay at each stop for charging. Second, the flow routing among sensor nodes need to be optimized, which depends on the location of WCV and time. Finally, the WET efficiencies depend on the stopping locations and their distances to neighboring sensor nodes.

2. RELATED WORK

The wireless energy transfer technologies can be classified into three categories:

2.1 Inductive coupling:

Inductive coupling can be worked with primary coil at a source generate a various magnetic field that impel a voltage across the terminals of a secondary coil at the receiver. Even this wireless energy transfer technology has revealed a number of applications in portable electronic devices (e.g., RFID tags, medical implants), it is not appropriate for charging a wireless sensor node.

2.2 Electro- magnetic radiation:

EM radiation transfers power via a far-field electromagnetic field over a specified radio frequency (RF) band. In this frequency band, an RF transmitter emits radio waves, which are received by an RF receiver. In this way, radio power can be harvested by the RF receiver. This technology has been applied to prolong lifetime of a WSN. However, there are a number of issues associated with this technology, such as extremely low energy transfer efficiency, requiring complicated tracking mechanisms if relatively the gets positions change, being sensitive to obstruction between the energy source and the receiver.

2.3. Magnetic resonant coupling:

The third and widely used category of wireless energy transfer technology is magnetic resonant coupling .It works

well by accomplishing magnetic resonant coils operating at the same resonant frequency (for e.g., 6.5 MHz). Magnetic resonant coupling has the merits of offering much higher energy transfer efficiency when compared to electromagnetic radiation. Also it works well even under omni direction, not requiring Line of Sight, and being insensitive to the neighboring environment.

2.4. Mobile base station:

The benefits of using the mobile base station in wireless sensor network is that the data is well recognized and data is collected and managed properly. Due to the complexity associated with a mobile base station, efforts has been taken such as simplified the problem by limiting the locations of the base station to a finite set of points and assuming negligible traveling time between points, or developed heuristic solutions.

3. AN EXAMPLE OF WSN WITH MOBILE WCV

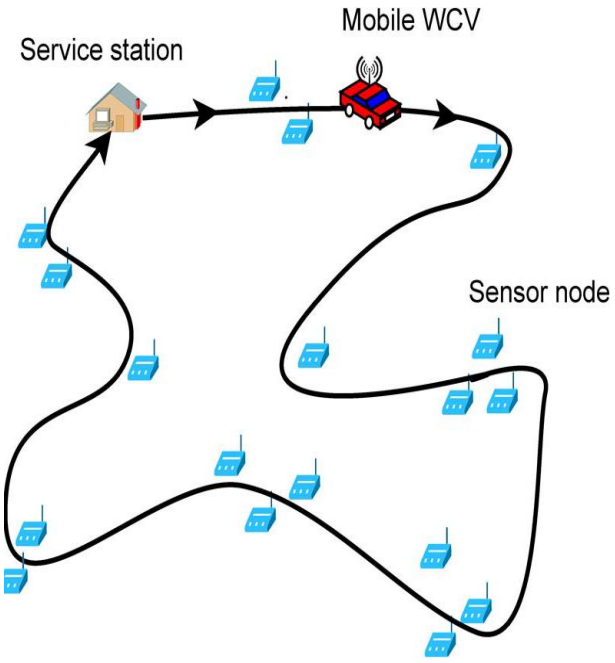

Fig. [1] WSN with mobile WCV

A WCV is employed to travel inside the network and charge the sensor nodes' batteries. This WCV starts from its home service station, travels along a pre-planned path in the area and returns to the service station at the end of its trip. While on its path, the WCV makes a number of stops and charges sensor nodes near the WCV has sufficient amount of energy to support its travel, data collection, and energy transfer to sensor nodes before it returns to the service station.

4. METHODOLOGY

Different from traditional energy harvesting in sensor networks the harvested energy is dynamic in both the spatial and temporal dimensions, the mobility-assisted energy replenishment provides a stable and reliable energy supply for sensor nodes and thus enables truly sustainable operations of sensor networks. Due to the limited mobility of the charger, the scheduling of charging tasks for sensor nodes in the network plays a critical role in achieving a high charging efficiency. The Travelling Salesman Problem (TSP)-based charging protocols are a family of classic solutions to the mobile charging problem with which in general, the mobile charger periodically carries out the charging process following a pre-optimized tour. To improve the system performance, Adaptive Decision System (ADS) assisted Non-Linear Optimization is to be analyzed. It gives high performance related to Wireless Charging Vehicle's (WMCV) vacation time and low computational complexity [3].

5. DATA COLLECTION IN SENSOR NETWORK

Wireless Sensor Networks are used in a large variety of applications including military applications, environmental applications, health-care applications, home applications and other commercial applications. WSNs contain a large number of sensor nodes; those are tiny or small devices that work using a battery. These devices perform three functions: sampling a physical quantity from the surrounding environment, processing and storing the acquired data and transferring them through wireless communications where there is a data collection point called as sink node or base station. The life time of the network can be increase by using mobility into the Wireless Sensor Network (WSN).

6. COMPONENTS OF WIRELESS SENSOR NETWORKS

Nodes –In this they the sense data, and they also forward and relay the messages to other nodes in the network.

Sinks – Sink is the destinations of information. They can collect data either directly or indirectly using intermediate nodes. Sinks can use data coming from sensors or make them available on the Internet to interested users.

Mobile Data Collectors – They are neither the sources nor the destinations, they merely act as intermediate nodes to collect data. A network is said to be mobile whenever at least node or sink is mobile.

7. OVERVIEW OF DATA COLLECTION

There are different terminologies which are used they are:

Contact – Mobile Element is in contact with a sensor when they can reach out to each other through wireless communications. In general, a contact happens between when two or more nodes are in their mutual communication range.

Contact Time – The amount of time the nodes are in contact is called as contact time.

Contact Area – The contact area of a node is defined as the region where that node can possibly be in contact with other nodes.

Discovery – Since nodes cannot communicate unless they are in contact, discovery is the process which allows a node to identify a contact, i.e. a Mobile Element in its communication range.

Data Transfer –Data transfer is nothing but the message exchange between the nodes which are in contact. The data transfer covers only single-hop transmissions, which may involve several nodes, where at least one is mobile.

8. FUTURE WORK

In future we will make use of high level of performance by reducing the traveling time of wireless mobile charging vehicle (WMCV), and also the charging time of sensor nodes and will be provided with more efficient routing path. We will exploit the redundancy of the sensor network. It will also employ more efficient technique for fault tolerance. It will maximize the life time of sensor node in the network. It will also provide more secure way for the data transmission in the sensor network.

9. CONCLUSION

We are exploring or generating the interesting and challenging problem of using a single mobile platform (i.e. WCV) to carry both wireless charger for WET and base station for data collection in a sensor network. We have exploited an efficient and robust approach for charging the batteries of sensor nodes wirelessly in a WSN. The goal was to minimize energy consumption of the entire system under the constraints that none of the sensor nodes runs out of energy. All data collected by the sensor nodes are relayed to the base station in real time. The wireless technology provides a wide range of benefits, including better portability, lower cost.

10. ACKNOWLEDGEMENT

With the immense pleasure I am presenting paper on "WIRELESS CHARGING AND DATA COLLECTION IN SENSOR NETWORK", which a part of our curriculum activity. It gives me privilege to complete this paper work under the valuable guidance of our professors.

11. REFERENCES

[1] S. Basagni, A. Carosi, E. Melachrinoudis, C. Petrioli, and Z. M. Wang,"A new MILP formulation and distributed protocols for wireless sensor networks lifetime maximization," in *Proc. IEEE ICC*, Istanbul, Turkey,Jun. 2006, pp. 3517–3524.

[2] J. Chang and L. Tassiulas, "Maximum lifetime routing in wireless sensor networks," *IEEE/ACM Trans. Netw.*, vol. 12, no. 4, pp. 609–619, Aug. 2004.

[3] D. Linden and T. B. Reddy, Eds., *Handbook of Batteries*, 3rd ed. New York, NY, USA: McGraw-Hill, 2002, ch. 1.

[4] B. Tong, Z. Li, G. Wang, and W. Zhang, "How wireless power charging technology affects sensor network deployment and routing," in *Proc. IEEE ICDCS*, Genoa, Italy, Jun. 2010, pp. 438–447.

[5]R. C. Shah, S. Roy, S. Jain, and W. Brunette, "Data MULEs: Modeling a three-tier architecture for sparse sensor networks," in *Proc. 1st IEEE Int. Workshop SNPA*, Anchorage, AK, USA, May 2003, pp. 30–41.

[6]Y. Shi and Y. T. Hou, "Some fundamental results on base station movement problem for wireless sensor networks," *IEEE/ACM Trans. Netw.*, vol. 20, no. 4, pp. 1054–1067, Aug. 2012.