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Implementation of Battery Aware System for Wireless Sensor Networks

Kartikeya Tripathi, Neha Sajwan, Aditya Gupta,Dipannita Mondal
Electronics & Telecommunication
Sinhgad Institute of Technology & Science
Pune, India

***Abstract*—In this paper a time division approach is applied to increase the battery life time of a wireless sensor network (wsn), in today's time we use wireless sensor networks which are not able to adapt to their battery life and increase their battery lifetime we use a system which adapts to the battery life and increases the lifetime of the system.**

Keywords:- Time division; wireless sensor network; battery life;

1. INTRODUCTION

An urgent need for energy management has emerged all over the world because ever growing consumption demands will eventually surpass the supply of critical resources. Energy management should be more effective and efficient in smart cities. In this study, we propose a method for the energy management with a battery system of a gas plant.

The emergence of Wireless Sensor Networks (WSNs) had been quite remarkable over the last decade due to the prospect of exciting and beneficial applications in countless civilian and military sector. The sensor nodes which were initially intended to monitor basic parameters such as temperature, pressure and humidity have evolved to be able to stream video and rich multimedia content. It is highly crucial for the WSN protocols to be energy aware given the limited battery capacities available in the sensor nodes. The batteries used in each of the nodes as an energy source for the purpose of sensing, data processing and communications cannot be recharged or replaced when the need arises. The challenge is therefore to identify methods which can be implemented at the higher layers that are able to manage the energy consumption of each node to maximize the network lifetime.

The objective of improving energy efficiency in Wireless Sensor Networks (WSNs) is a primary design requirement given the limited energy available in the battery powered sensor nodes. In this project, a battery aware protocol is proposed for the maximization of the network lifetime. The proposed protocol incorporates the state of the battery's remaining charge and health parameters in computing the charge utility metric at each step. The performance of the proposed protocol is assessed via analysis and simulations and the gains are quantified using common energy related metrics. The numerical results demonstrate that the proposed approach is able to effectively increase the network lifetime significantly when compared to other distributed flat and hierarchical based routing protocols.

In this project we use a potentiometer instead of a battery, potentiometer can be used to fluctuate the voltage levels in the system as the voltage levels decrease the system performance is changed accordingly. The battery aware system uses an integrated approach of the battery and the system.

The objective of improving energy efficiency in Wireless Sensor Networks (WSNs) is a primary design requirement given the limited energy available in the battery
powered sensor nodes. In this project, a battery aware protocol is proposed for the maximization of the network lifetime. The proposed protocol incorporates the state of the battery's remaining charge and health parameters in
computing the charge utility metric at each cluster formation round. The performance of the proposed protocol is assessed via analysis and simulations and the gains are quantified using common energy related metrics. The numerical results demonstrate that the proposed approach is able to effectively increase the network lifetime significantly when compared to other distributed flat and hierarchical based routing protocols. With the similar objective as that of the other works in the literature, in this paper we study the WSN network lifetime maximization problem. The definition used to signify network lifetime is the time when the first node runs out of energy While the energy related characteristics of WSNs have been traditionally modelled with the assumption that
batteries are ideal energy sources with linear capacity to discharge load relationship, the performance and behaviour of these networks with the consideration of realistic battery parameters remain unclear.

The potentiometer battery model adopted in this project has the advantage of providing quick results and is able to accurately gauge the impact of battery internal parameters on system performance, as compared to more complex electrochemical and stochastic battery models. With regards to this approach, a gas plant model with sensors such as gas sensor and temperature sensor are used. This gas plant model is integrated with the battery aware system. However, with the intent of minimizing additional losses attributed to the realistic battery behaviour, we take preventive measures while extending the network lifetime. Therefore, to maximize the network lifetime, we formulate the associated optimization problems with the objective of minimizing the overall charge expenditure rather than energy consumption. The main contributions of this paper are as follows: First, the low complexity battery model is adapted to the sensor node charge expenditure model. Secondly, the models are used to formulate a novel protocol that exploits the battery dynamics to achieve

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higher network lifetime as compared to the existing battery unaware protocols.

1. REQUEST AND RESPONSE PROTOCOL

Request and response is the basic protocol that systems use to communicate with each other, the first system sends a request and the designated system responds. After a connection is established the exchange of information takes place, the request and response protocol is used in technologies all around the globe weather you're browsing a web page or making a telephone call.

In the request and response protocol a requestor sends a message request to a recipient, the request is received and processed accordingly. The request and response protocol uses a two-way conversation method.

2. ADAPTIVE REQUEST AND RESPIONSE

In the adaptive request and response protocol we change the algorithm of how the request and response protocol on our wireless sensor network works.

As we reduce the voltage below a certain value the system goes in adaptive request and response mode. In the adaptive request and response mode the system receives less responses from the wireless sensor network than it usually does. Thus the life time of our system increases.

3 PROPOSED SYSTEM

We use two slaves and one master configuration; the slaves act as the model of a gas plant. In the normal mode the master requests slave to send data from the sensors that that is the temperature and gas level values in real time. As we reduce the voltage with the help of a potentiometer the system goes in adaptive mode. In the adaptive mode the request and response protocol is altered, now the master requests the slave for data but the response intervals from the slave have been increased thus the battery life will increase.

In the adaptive mode the request and response scan time increases so the response intervals from the slave to the master increases increasing the lifetime of a wireless sensor network thus, making it battery aware.

The gas plant comprises of gas sensor and temperature sensor which sends real time data to the master that is the computer. As the battery voltage goes down from 4V the system goes in adaptive power mode. Here we use two slaves to compare the power consumption side by side on the visual basic (master).

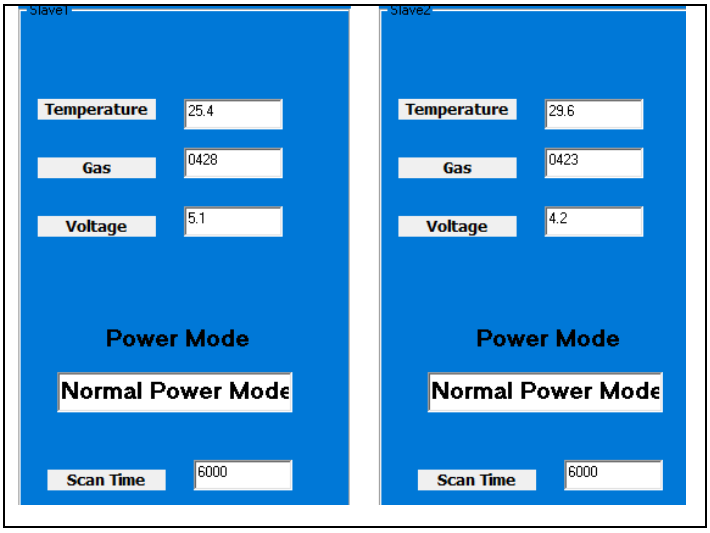

Figure No. 1 Slaves functioning in normal mode sensing real time data to master

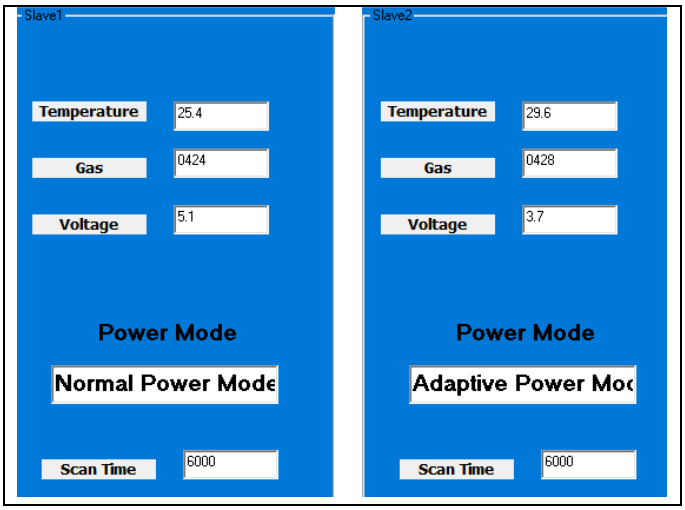

Figure No. 2 Adaptive power mode

4 CONCLUSION

The battery aware wireless sensor consumes less power when it working in the adaptive power mode thus, it increase the battery lifetime of a wireless sensor network.

It can be used in wireless sensor networks all around by altering the request and response protocol of a wireless sensor network.

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