To Reduced the Energy Conception in Wireless Sensor Networks by Using Selective Message Forwarding Schemes

K. Venkata Ramana, M. Ravi Kishor

Abstract*: In a wireless sensor network where nodes have limited energy and forward messages of different priorities are frequent in the context of wireless sensor networks. So introduced several selective message forwarding policies to save energy and extend the lifetime of WSN. Forwarding schemes were designed for three different scenarios:1) when sensors maximize the importance of their own transmitted messages ; 2) when sensors maximize the importance of messages that have been successfully retransmitted by at least one of its neighbors; and 3) when sensors maximize the importance of the messages that successfully arrive to the sink . The three schemes have been compared under different criteria. From an overall network efficiency perspective, the first scheme performed worse that its counterparts, but it required less signaling overhead. More sophisticated schemes will achieve better importance performance, but will also require information from other sensors. It is a greater impact on the overall network performance.

***Index Terms*:- AODOV, Markov Decision, Bayesian Decision Modal, wireless sensor networks.**

I. INTRODUCTION

In Wireless Sensor Networks energy saving is a primary concern. This is because in many practical scenarios, sensor node batteries cannot be easily refilled and nodes have a finite (Energy) lifetime. Since every task carried out by WSN has an impact in terms of energy consumption, many solutions have been proposed in the literature to optimize energy management; see, e.g., [3], [4]. Energy savings can also be obtained by taking a higher level approach and considering the different nature of the information that nodes have to transmit. A first step to address such an optimum design is to properly quantify or estimate both costs and benefits. This is possible in practice because the energy consumed by every communication task (cost) is typically well-characterized and because applications where messages are scored according to an importance indicator (benefit) are frequent in WSN. The message importance can be, for instance, a priority value established by the routing protocol, or an information value specified by the application supported by the network. Once costs and benefits are properly quantified, energy can be saved by making intelligent importance-driven decisions about message transmission. The idea of selective communications, which is the basis of this paper, consists of discarding low importance messages in order to save energy that can be used to transmit more important messages in the future. In order to make a decision[1], sensors will take into account factors such as the energy consumed during the different node states, the available battery, the importance of the received message, the statistical distribution of such importance, or the behavior of their neighbors.

Revised Manuscript Received on 30 June 2012
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II. SENSOR MODEL

Sensor network as a collection of nodes of the analysis that follows, we consider a $N = \{n|n = 0, . . ., N - 1\}$. For the time being, we will focus on the behavior of each node, which receives a sequence of requests to transmit messages (no matter how the network topology is).The node dynamics will be characterized by two variables.

- ek : available energy at a given node at time k. It reflects the "internal state" of the node; and
- xk : importance of the message to be sent at time k. It reflects the "external input" to the node.

For mathematical reasons, we assume that if the node does not receive any request to transmit at time k, then xk = 0, while true messages will have xk > 0. At time k, the sensor node must make a decision, dk, about sending or not the current message, so that dk = 1 if the message is sent, and dk = 0 if the node decides to discard it. Nodes consume energy at each time slot, by an amount that depends on the message reception and the taken actions. In the literature, up to three different energy expenses are typically considered:

- EI : energy spent at a silent time, when there is no message reception, and the node may stay at "idle" mode;
- ER: energy spent when receiving a message; and
- ET : energy spent when transmitting a message.

When the sensor node is the source of the message, ER comprises the energy expense of the message generation process (possibly by a sensing device). When the sensor node acts as a forwarder, ER comprises the energy expense of receiving the message from other node. Thus, we assume that

ER is the same no matter if the node is the source of the message or it has been requested to forward a message from other node. Even though this assumption is not critical and could be bypassed by splitting ER between receiving and sensing costs, we adopt it for two reasons: (i) it leads to a simpler mathematical formulation and (ii) nodes are prevented from acting selfishly that if the energy cost of sensing were smaller than

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the cost of receiving [1], nodes would promote their own messages instead of forwarding others' messages.

III. Optimal Selective Transmission under Energy Constraints in Sensor Networks

An optimum selective transmission scheme for energy-limited sensor networks, where sensors send or forward messages of different importance (priority), is developed. Considering the energy costs, the available battery, the message importance [1] and their statistical distribution, sensors decide whether to transmit or discard a message so that the importance sum of the effectively transmitted messages is maximized. It turns out that the optimal decision is made comparing the message importance with a time-variant threshold. Moreover, the gain of the selective transmission scheme, compared to a nonselective one, critically depends on the energy expenses, among other factors. Albeit suboptimal, practical schemes that operate under less demanding conditions than those for the optimal one are developed. Effort is placed into three directions: 1) the analysis of the optimal transmission policy for several stationary importance distributions; 2) the design of a transmission policy with invariant threshold that entails asymptotic optimality; and 3) the design of an adaptive algorithm that estimates the importance distribution from the actual received (or sensed) messages.

A. An Energy-Efficient Cooperative MISO-Based Routing Protocol for Wireless Sensor Networks

Cooperative transmission technique is now widely considered as a promising approach to combat fading and achieve energy efficiency in wireless networks. In this paper we focus on the routing problem in energy-constrained wireless sensor networks (WSNs), of which a cooperative MISO-based routing strategy is adopted. We first analyze the physical layer energy consumption model of cooperative transmission in the scenarios of one hop and hop-to-hop for energy-efficient routing in order to prolong the network lifetime. Based on this analysis, we disclose how the energy-efficient network routing problem is tightly related to the inter-cluster MISO [3] node and hop-to-hop relay node selection. As we noticed, the problem of energy-efficient cooperative routing is NP-hard innately which is difficult to implement in a totally distributive approach. Due to this analysis, a feasible algorithm with minimum cost is thus proposed. In the simulation part, we prove that our protocol can prolong the network lifetime tremendously when choose appropriate transmission parameters. Moreover, as an example, we simulate a typical network scenario which indicates our protocol is more energy efficient when comparing with v MIMO scheme in our previous work.

B. A Cross-Layer Strategy for Energy-Efficient Reliable Delivery in Wireless Sensor Networks

We investigate the problem of the lifetime maximization in wireless sensor networks under the constraint of end-to-end transmission success probability, by adopting a cross-layer strategy that considers physical layer (i.e., power control), MAC layer (i.e., retransmission control) and network layer (i.e., routing protocol) jointly. We decouple the problem into separate sub-problems of each layer and propose the optimal algorithm as well as an alternative heuristic algorithm with lower complexity for each sub-problem. We demonstrate through computer simulations that a trade-off relation exists between the network lifetime maximization and the reliability constraint, and the strategy that is designed by combining the proposed algorithm at each layer can significantly increase the network lifetime. We also investigate the effect of the retransmission control on the energy efficiency for different energy consumption models. Simulation results reveal that multiple retransmissions with low power yield little gain when the link distance is short and the power conversion efficiency of the amplifier increases with the transmission power.

IV. MODULE DESCRIPTION

A. Creation Of wireless sensor network

Sensor networks are the key to gathering the information needed by smart environments, whether in buildings, utilities, industrial, home, shipboard, transportation systems automation, or elsewhere. The ideal wireless sensor is networked and saleable, consumes very little power, is smart and software programmable, capable of fast data acquisition, reliable and accurate over the long term, costs little to purchase and install, and requires no real maintenance [4]. 1) managing data collection from the sensors 2) performing power management functions 3) interfacing the sensor data to the physical radio layer 4) managing the radio network protocol.

B. Markov Decision Process

MDP (Markov Decision Process) [6] models is sequential decision in WSN has attracted recent attention. It has been used as a tool to find a trade-off between the energy savings [5] of data aggregation and the transmission delay; to balance the energy saving of low-power sensor states and the efficiency of the sensing, receiving and transmitting processes; or to optimize a reward function combining power consumption, throughput and delay. Content-driven: the importance is used to decide whether transmit or discard a message so that the accumulated importance of all transmitted messages is maximized.

C. AODV Protocol

Ad hoc On Demand Distance Vector (AODV) [2] is mainly used in vehicle path estimation. To find the shortest distance among the peer. Intended for use by mobile nodes in an ad hoc network. It offers quick adaptation to dynamic link conditions, low processing and memory overhead, low network utilization, and determines uncast routes to destinations within the ad hoc network. It uses destination sequence numbers to ensure loop freedom at all times (even in the face of anomalous delivery of routing control messages), avoiding problems (such as ``counting to infinity") associated with classical distance vector protocols.

D. Selective forwarding schemes

1)when sensors maximize the importance of their own transmitted messages; 2) when sensors maximize.

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-1 Issue-1, June 2012

the importance of messages that have been successfully retransmitted by at least one of its neighbors; and 3) when sensors maximize the importance of messages that successfully arrive to the sink[1]. All selective communication strategies outperform non-selective forwarding (NS). Despite the fact that the latter delivers more messages to the sink, the total importance sum is lower and so the network lifetime.

E. Energy aware system / Battery consumption

The sensor does not censor any message called Non-Selective sensor (NS) [7]. Energy consumption may depend on factors such as the amount of time spent in each state (which in fact is closely linked to messages of different lengths as a consequence (or not) of having different priorities) or the inter-sensor distances. To compute the forwarding threshold,[1][5] the average value of the energy costs is needed. To save memory resources, all estimates are based on a battery power as an virtual energy.

V. PERFORMANCE IN GRAPH

Performance is assessed in terms of the importance sum of all messages received by the sink, the mean value of the received importance, the number of receptions at the sink, and the number of generated messages. This can be shown in fig1.

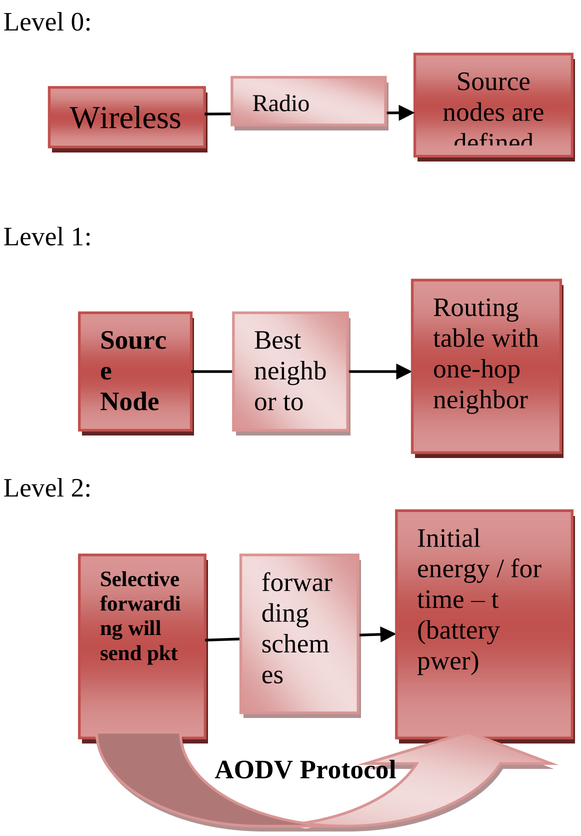

Fig 1: data flow diagram all messages received by the sink

VI. SIMULATION ENVIRONMENT

It is assumed that 24 sensor nodes move over a square area of 300 × 1500*m*2. Each simulation has been run for 900 seconds of simulation time. The propagation channel of *two-ray ground reflection model* is assumed with a data rate of 2 Mbps.

VII. SIMULATION RESULTS

In this section, we show and analyze the simulation results of Packet delivery Selective Forwarding Policies, Packet Distribution (enrgy-joule), Delay comparison, Packet transmission and Performance analysis of our system.

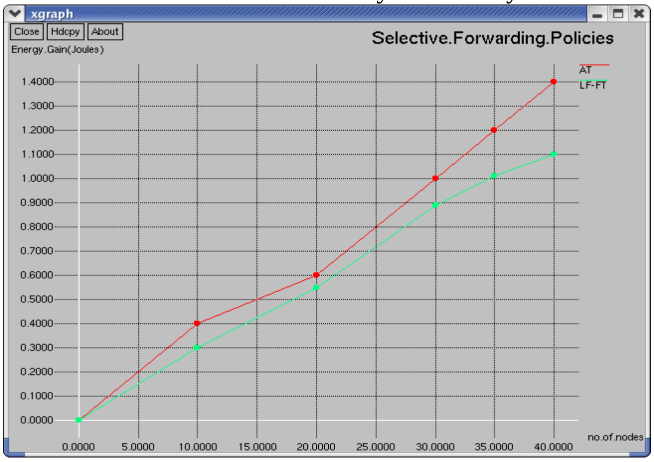

Fig 2: It is shows given selective Forwarding Policies AT and LF-FT

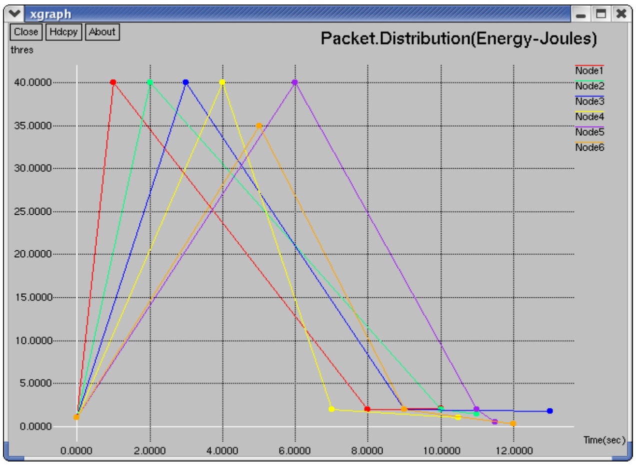

Fig 3: In these graph is showing Packet Distributions (energy-joules) six nodes different distributions shows packet delivery

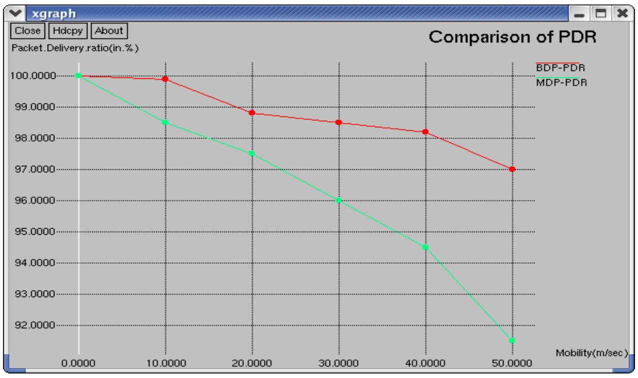

Fig 4: Comparison of PDR to compurgation MDP and BDP. In these ratio shows BDP is good mobility

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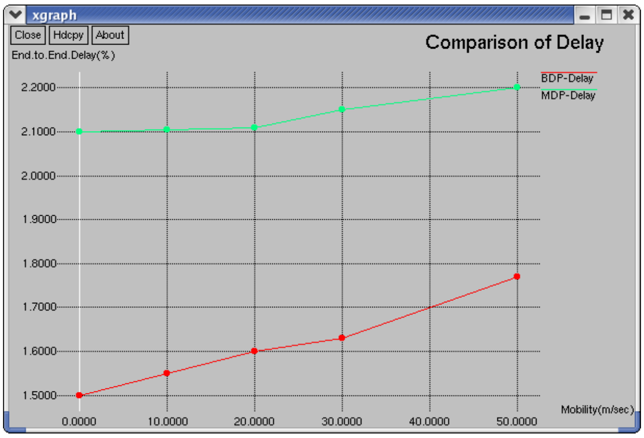

Fig 5: Shows the Delay comparison, in our case considered the three Delays like BDP, MDP and POISSION. This Mobility (m/sec) calculates by the number of packets transmission (throughput) per second. While in BDP is very high when compared to other types and the MDP is very low compared other Mobility. So the best type of traffic is BDP for our consideration.

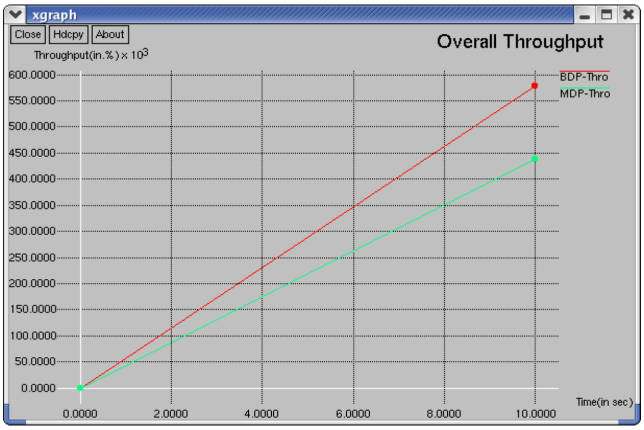

Fig 6: It is shows Overall Throughput taken BDP and MDP in our case considered the three Delays like BDP, MDP and POISSION. This Mobility (m/sec) calculates by the number of packets transmission (throughput) per second. While in BDP is very high when compared to other types and the MDP is very low compared other Mobility. So the best type of traffic is BDP for our consideration Packet Delivery Ratio showing in comparison of PDR to compurgation MDP and BDP. In these ratio shows BDP is good mobility, so overall BDP is better for fermented compare MDP

VIII. CONCLUSION

In this paper graded with an importance value and which could be especially discarded, were transmitted by sensor nodes according to a forwarding policy, which considered consumption patterns, available energy resources in nodes, the importance of the current message and the statistical description of such importance. Forwarding schemes were designed for three different scenarios:

1) When sensors maximize the importance of their own transmitted messages ; 2) when sensors maximize the importance of messages that have been successfully retransmitted by at least one of its neighbors ; and 3) when sensors maximize the importance of the messages that successfully arrive to the sink . The three schemes have been compared under different criteria. From an overall network efficiency perspective, the first scheme performed worse that its counterparts, but it required less signaling overhead. On the contrary, the last scheme was the best in terms of network performance, but it required the implementation of feedback messages from the sink to the nodes of the WSN. Numerical results showed that for the tested cases the differences among the three schemes were small -with schemes two and three performing evenly.

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