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A Maximum Sensing Range Bounded Energy Node Selection Approach to Optimise in WSN

A. P. Amit Mahal, Renu Goyat

***Abstract*— In wireless sensor networks, micro sensor nodes dispersed in real environmental field have constraint energy capacity, so energy-efficient mechanism for wireless communication on each sensor node is so crucial. Specially, the jobs sending and processing sensing data information from on sensor node to the others are more majority parts than merely sensing some events. Thus, energy-efficient routing protocol in wireless sensor networks is necessary for increasing the network lifetime and is also influenced by many challenging factors in terms of energy, processing, and storage capacities. In this paper, we designed and implemented a Reliable Energy Aware Routing(REAR) protocol for wireless sensor networks and evaluated the performance of REAR by comparing with existing routing protocols. REAR considers residual energy capacity of each sensor node in establishing routing paths and supports multi-path routing protocol for reliable data transmission. Furthermore, REAR allows each sensor node to confirm success of data transmission to other sensor nodes by supporting the DATA-ACK oriented packet transmission. Finally, the performance evaluation results show that REAR provides energy-efficiency and reliability related to wireless communication in wireless sensor networks.**

***Index Terms*— wireless sensor networks, routing protocol, energy-efficiency, reliability, multi-path.**

I. INTRODUCTION

Wireless networks have become increasingly popular in the computing and communication industries, since their emergence in the '70s. There are two variations of mobile wireless networks [3] - the first is known as infrastructure network, i.e., a network with fixed and wired gateways and the second is infrastructure-less mobile network, better known as an ad hoc network. Wireless networks are gaining popularity to its peak today, as the user wants wireless connectivity irrespective of their geographic position. Wireless Networks enable users to communicate and transfer data with each other without any wired medium between them. One of the reasons of the popularity of these networks is widely penetration of wireless devices. Wireless applications and devices mainly emphasize on Wireless Local Area Networks (WLANs). This has mainly two modes of operations, i.e. in the presence of Control Module(CM) also known as Base Stations and Ad-Hoc connectivity where there is no Control Module [2]. Ad-Hoc networks do not depend on fixed infrastructure in order to carry out their operations. The operation mode of such network is stand alone, or may be attached with one or multiple points to provide internet and connectivity to cellular networks. These networks exhibits the same conventional problems of wireless communications i.e. WSN width limitations, battery power, enhancement of transmission quality and coverage problems[5].

Network Design Challenges and Routing Issues

The design of routing protocols for WSNs is challenging because of several network constraints. WSNs suffer from the limitations of several network resources, for example, energy, WSNdwidth, central processing unit, and storage. The design challenges in sensor networks involve the following main aspects:

1. **Limited energy capacity:** Since sensor nodes are battery powered, they have limited energy capacity. Energy poses a big challenge for network designers in hostile environments, for example, a battlefield, where it is impossible to access the sensors and recharge their batteries[4]. Furthermore, when the energy of a sensor reaches a certain threshold, the sensor will become faulty and will not be able to function properly, which will have a major impact on the network performance. Thus, routing protocols designed for sensors should be as energy efficient as possible to extend their lifetime, and hence prolong the network lifetime while guaranteeing good performance overall.

2. **Sensor locations:** Another challenge that faces the design of routing protocols is to manage the locations of the sensors [6]. Most of the proposed protocols assume that the sensors either are equipped with global positioning system (GPS) receivers or use some localization technique to learn about their locations.

3. **Limited hardware resources:** In addition to limited energy capacity, sensor nodes have also limited processing and storage capacities, and thus can only perform limited computational functionalities. These hardware constraints present many challenges in software development and network protocol design for sensor networks, which must consider not only the energy constraint in sensor nodes, but also the processing and storage capacities of sensor nodes[6].

4. **Massive and random node deployment:** Sensor node deployment in WSNs is application dependent and can be either manual or random which finally affects the performance of the routing protocol[6]. In most applications, sensor nodes can be scattered randomly in an intended area or dropped massively over an inaccessible or hostile region. If the resultant

distribution of nodes is not uniform, optimal clustering becomes necessary to allow connectivity and enable energy efficient network operation.

5. **Network characteristics and unreliable environment:** A sensor network usually operates in a dynamic and unreliable environment. The topology of a network, which is defined by the sensors and the communication links between the sensors, changes frequently due to sensor addition, deletion, node failures, damages, or energy depletion. Also, the sensor nodes are linked by a wireless medium, which is noisy, error prone, and time varying. Therefore, routing paths should consider network topology dynamics due to limited energy and sensor mobility as well as increasing the size of the network to maintain specific application requirements in terms of coverage and connectivity [4].

6. **Data Aggregation:** Since sensor nodes may generate significant redundant data, similar packets from multiple nodes can be aggregated so that the number of transmissions is reduced. Data aggregation technique has been used to achieve energy efficiency and data transfer optimization in a number of routing protocols[6].

7. **Diverse sensing application requirements:** Sensor networks have a wide range of diverse applications. No network protocol can meet the requirements of all applications.
8. **Scalability:** Routing protocols should be able to scale with the network size. Also, sensors may not necessarily have the same capabilities in terms of energy, processing, sensing, and particularly communication. Hence, communication links between sensors may not be symmetric, that is, a pair of sensors may not be able to have communication in both directions. This should be taken care of in the routing protocols [6].

II. Constraints in WSNs

A sensor node has limited resources. Most important ones are:

- **WSNdwidth:** The WSNdwidth of wireless links among sensor nodes is very limited. This communication constraint increases packet losses, latency and introduces communication failures (Ganesan, Krishnamachari, Woo, Culler, Estrin & Wicker, 2003).
- **Processing:** Sensor nodes have limited computing power; hence data processing power of a sensor node is limited [7].
- **Storage:** Because of limited memory of a senor node, its storage capability is restricted.
- **Power:** Sensor nodes have limited power supply, a typical sensor node works one week under full-load and one year in the idle state (Yao and Gehrke, 2002).

In addition to the above resource constraints, WSNs pose many other challenges, one of which is large scale of network deployment. Heterogeneity of nodes is also an important issue for WSNs. Another challenge is network longevity and robustness. Furthermore, adaptation to environmental changes is also essential for WSNs (Yu, Niyogi, Mehrotra & Venkatasubramanian, 2003). One other important challenge is programming the WSNs.

III. LITERATURE SURVEY:-

J. Jobin (2005) has defined a effective data transmission scheme to handle communication in sensor network. Author defined a work to provide effective communication while analyzing the communication WSN width and the energy specification. **Atul Bari** has defend an effective route communication so that the network life will be improved. Author defined the communication network to handle three communication over the network. Author has defined the effective balanced data gathering to perform data transmission under range, connectivity, fault effectiveness and power aware communication. **Vinay Joseph (2009)** has defined an effective power effective scheduling and routing under multipath scheduling and energy effective routing. Author has defined multicast communication routing in sensor network. Author improved the broadcasting over the network with performance improvement.

Author has defined suboptimal algorithm under the performance study. **Zhe Zang (2011)** has defined effective route generation in sensor network. Author improved the routing under there liability and low cost communication in sensor network. Author defined hop effective communication so that the reliable communication will be drawn. Author improve the hop effective routing policy so that the effective route quality will be improved. Jinbao Li (2011) has defined channel specific multi parameter specific routing in sensor network. Author defined the power control effective routing under optimal route generation and to handle the opportunities to reduce the communication loss. Author defined the performance effective routing in sensor network.

IV. PROBLEM DEFINITION:-

Energy and efficiency are always the main concern in wireless Mobile network. A mobile network contains huge amount of data transmission over the network. Because of this, there are more chances of data loss over the network. Our work is defined in same area. We proposed an algorithm to get the efficiency as well as the reliability. In this work an efficient maximally covered mobile network algorithm is presented such that addresses the requirements of power efficient infrastructure issues for WSN [6]. In this work we have combined the Path Selection Routing along with the concept of Energy Preserving. The initial route will be identified by the Path Selection algorithm and in case of any broken link or energy hole in the path it will look for the Alternate path using Energy Preserving [7].

FLOW OF EXISTING WORK:-

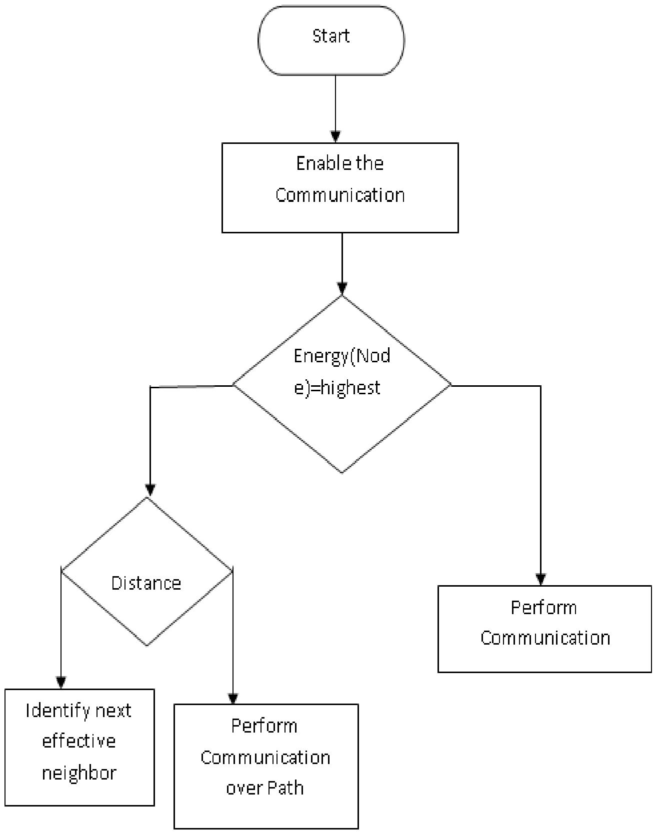

Figure 1: Existing Work Path Identification Approach[6]

As shown in figure 1, the existing path identification can be done by performing the distance and energy based analysis[9]. The energy is having the higher priority so that if next neighbor is energy effective, the communication will be performed over it. Otherwise, the communication will be performed under the distance and energy constraints [10].

V. RESEARCH METHODOLOGY:-

In Ad-hoc network distance is the major factor respective to which routing algorithms [7]. But In this presented work we have considered multiple parameters to identify the right communication path. The parameters included in this work are

(i) Distance
(ii) Energy
(iii) Maximum Coverage Range

Based on these all vectors the reliable and efficient communication path will be generated and that path will be taken as the main routing path on which the communication will be performed [11]. As the algorithm begin, the source and the destination nodes are specified explicitly between which the communication path will be generated. Now it will send the request to the source node and the wait is performed for the reply. As the reply is obtained it signify the right communication can be taken place. Now to perform the effective communication between the source and the destination the effective parameters are required to identify for each neighbor node of current node.

Now to perform the effective communication we need to find the next effective neighbor over which the communication will be performed. In this work, the parametric analysis is performed on each node to identify the best neighbor. The parameters considered here are the distance, energy, delay analysis on each node. In the simple form, a minimum distance neighbor is considered as the effective next node. But in this work, the maximum distance node within the coverage range with maximum energy is considered as next effective node. Set this node as the best neighbor and the communication will be performed over that node. The process is repeated till the destination node is not arrived.

VI. FUTURE WORK:-

In this, the complete work is performed under the energy constraint. It this work we have resolved the energy consumption problem in a sensor area network by considering the minimum hop path over the network. The improvement to the work can be done in different direction [13].

- In this work, the type of data communicating over the network is not considered but in future type of data can also considered.
- In this work, the nodes are defined as normal sensor nodes. But in future, smart sensors can also be used.

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