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A WIRELESS SENSOR NETWORK BASED BORDER MONITORING SYSTEM USING CLUSTERS

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Abstract - *The military services and applications comprise large acres of areas. It encompasses arms, ammunition weapons, tools and confidential data. Wireless Sensor Network (WSN) is one of the upcoming technologies in the field of wireless communication in which is used for intruder alert system for enhance the security level LDG algorithm is implemented enhance the energy consumption of system. The nodes are randomly deployed in the sensor field for such applications because of which the density of nodes in some part of the area to be monitored will be more and other areas might be very less. In this paper, we identify an appropriate metric to measure the quality of WSN border crossing detection. Furthermore, we propose a method to calculate the required number of sensor nodes to deploy in order to achieve a specified level of coverage according to the chosen metric in a given belt region, while maintaining radio connectivity within the network.*

Key Words: *WSN Routing protocols, media access control, border security & surveillance, network coverage and cluster heads.*

1. INTRODUCTION

Wireless sensor networks (WSN), composed of numerous sensor nodes with small, low-power, inexpensive radios, have attracted a large amount of research that has led to interesting and innovative applications. Using a state based convergence mechanism, the current state-of-the-art cut detection algorithm, Distributed Source Separation Detection (DSSD), reliably detects arbitrarily-shaped cuts and allows individual nodes to perform cut detection autonomously. However, the algorithm suffers from a number of problems. First, DSSD fails to address security, a critical component of sensor deployments in unattended environments. Second, the algorithm requires a lengthy, iterative convergence process. Finally, all nodes participate in the frequent broadcasts required to achieve convergence. We propose an improved cut detection algorithm called robust cluster-based cut detection. This algorithm divides the network into a set of location-based clusters. Cluster leaders form a virtual grid network and the cut detection algorithm runs on this high-level network. As the algorithm executes, leaders converge to some state. A leader finding inconsistency in its expected state informs its neighbors and the sink that a cut has happened.

1.1 Introduction to WSN

Wireless Sensor Networks consists of a large number of low cost, low-power, low maintenance sensor nodes. Sensor nodes usually consist of sensing, communicating, computing, storing and power components. Sensor nodes are often randomly deployed in huge numbers over a large area to monitor physical conditions like temperature, humidity, intensity, vibration, pressure, motion, pollutants etc. Wireless sensor nodes are equipped with sensing unit, a processing unit, communication unit and power unit. Each and every node is capable to perform data gathering, sensing, processing and communicating with other nodes. The sensing unit senses the environment, the processing unit computes the confined permutations of the sensed data, and the communication unit performs exchange of processed information among neighboring sensor nodes.

The basic building block of a sensor node is shown

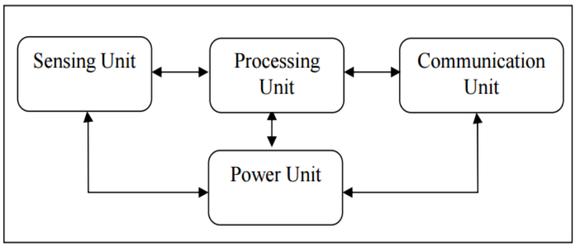

Figure 1.1.1: Basic Building Blocks of sensor nodes

The sensing unit of sensor nodes integrates different types of sensors like thermal sensors, magnetic sensors, vibration sensors, chemical sensors, bio sensors, and light sensors.

1.2 Functionality of sensor nodes

The major characteristics of the sensor node used to evaluate the performance of WSN

1. Fault tolerance

Each node in the network is prone to unanticipated failure. Fault tolerance is the capability to maintain sensor network functionalities without any break due to sensor node failures.

2. Mobility of nodes

In order to increase the communication efficiency, the nodes can move anywhere within the sensor field based on the type of applications.

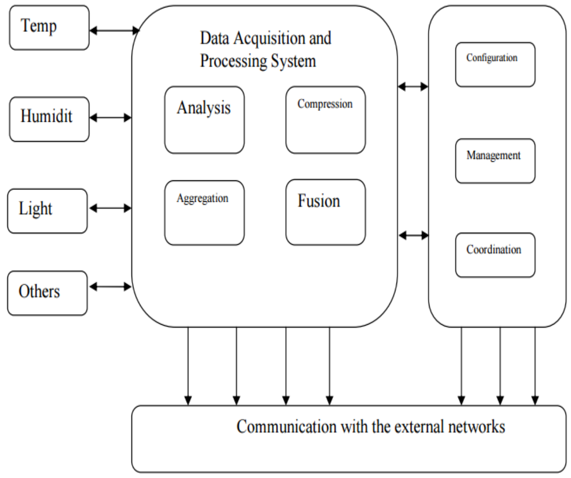

Figure 1.2.1: functionality of sensor node

3. Dynamic network topology

Connection between sensor nodes follows some standard topology. The WSN should have the capability to work in the dynamic topology.

4. Communication failures

If any node in the WSN fails to exchange data with other nodes, it should be informed without delay to the base station or gateway node.

5. Heterogeneity of nodes

The sensor nodes deployed in the WSN may be of various types and need to work in a cooperative fashion.

6. Scalability

The number of sensor nodes in a sensor network can be in the order of hundreds or even thousands. Hence, WSN designed for sensor networks is supposed to be highly scalable.

7. Independency

The WSN should have the capability to work without any central control point.

8. Programmability

The option for reprogramming or reconfiguring should be available for the WSN to become adaptive for any dynamic changes in the network.

9. Utilization of sensors

The sensors should be utilized in a way that produces the maximum performance with less energy.

10. Impracticality of public key cryptosystems

The limited computation and power resources of sensor nodes often make it undesirable to use public key algorithms.

2. PROPOSED METHOD

2.1 LINK SELECTION IN LDG ALGORITHM

Link Selection in LDG Algorithm is implemented here. The proposed power control technique can also be used by MAC protocols to improve the probability of successful data transmissions. Many country research groups have proposed using WSNs for border monitoring. Although there are many interesting research problems in sensor networks, computer scientists must work closely with security personal to create a system that produces useful data. In this section, we examine the need for sensor networks and the requirements that sensor networks must meet to collect useful data for defence purpose. For any country to maintain peaceful relations with its neighbors there is a need to establish a fire free zone in the borders, here the wireless sensor network system is at use. Solder presence in the borders may lead to taunting among them and lead to unexpected conflicts and ultimately results in a war. Wireless networking systems are required in less population density areas where there is chance for illegal human operations, where as it is not necessary in places which has high density of population and security. Another difficulty present in highly populated area is that the sensors will detect the disturbances caused by people living in that area. The impact of sensor networks for habitat and environmental monitoring will be measured by their ability to enable new applications and produce new, otherwise unattainable, results. In addition, border places often serve as refuges for people who leave their home land in the pursuit of money and good life style. Sensor networks have a significant advantage over traditional methods of monitoring. Finally, sensor network deployment is a comparatively more economical method for conducting long term studies than traditional methods. Presently, a large number of solders are required to monitor the border but implementing of sensor network will reduce the numbers to minimum.

2.2 Border Requirements

[1] Access of Internet

The sensor network at borders should be accessible through internet. An important purpose of border monitoring applications is the ability to support remote communication with main networks.

[2] Network hierarchy

The field station at border needs enough requirements to support database systems and Internet connectivity. However, the borders of political interest are located up to several kilometers away. In the second phase the multiple patches are deployed at areas of interest to provide connectivity to main network. Four or more patches of 150 static (not mobile) nodes are sufficient to start.

[3] Durability of sensor network

Non rechargeable sources of power sources that run for 10-11 months used in sensor networks gained significant audience. Although ecological studies at borders span multiple field seasons, individual field seasons typically vary from 9 to 12 months.

[4] Grid Operation

Energy supply is bounded to each and every level of network. Disconnection may occur when we try to use non conventional energy sources like solar power and wind energy. Our country border has sufficient solar power to run many elements of the application 24x7 with low probabilities of service interruptions due to power loss.

[5] Managing the device from a distance

There is the necessity to monitor and manage the network wirelessly from a large distance since no military presence is required in borders. Except for installation and maintenance purpose in some extraordinary exceptional conditions there should be no presence of military people in the borders.

[6] Hidden operation

The circuits and equipment that is used in border monitoring must be hidden. It should not be identified by the neighboring countries as it may lead to personal indifferences between the two countries. Removing human presence from the border areas present gives us tension free conditions between the nations and lead to economic and political ties.

[7] Behavior of the system

For the functioning of our border monitoring system our sensor network must exhibit stable, predictable, and repeatable behavior. It is difficult to maintain and debug an unpredictable system. Predictability is important to induce confidence in the military that they can depend on these alternatives for protecting the country in borders.

[8] Interactions with main network

As the connections are made using the internet, in cases of maintenance and testing it is the local network that we use. We can use personal digital assistants to serve us in this aspect. It can be used to question, alter parameters of operation.

[9] Recording of data

It is very important to store the readings from a sensor for using in analysis. The data is retrieved from sensor and then sent for error correction. This processed data is stored in data bases. These data bases are highly secured and are open for top army personal. Since we can't expect the inflow of human traffic and the moment of the enemy near the border. Time to time update of new data is important in this operation.

The main contribution of this paper is to outline techniques from the literature to calculate node density and determine the number as well as the location of monitoring towers. However, the cost of such a system is extremely high and its multi-phase sensing could introduce significant reporting delays. The collaboration between sensors in different layers requires complex coordination techniques. Furthermore, the integration of the multimodal data is not a trivial task.

2.3 LDG protocol

BSNs use a cost metric to choose the 'best' MT and the 'best' parent to reach that MT. The potential parent, distance to reach it and the quality of the link connecting the two nodes. The link quality approximations depend on the Channel State Information (CSI). The algorithm for the parent selection considers the full path to the MT to ensure that the algorithm we propose flat, modular system architecture to offer timely, mission-centric event detection. The proposed architecture is open to any hardware platform and does not assume any sensing modality. Flat systems comprise a set of Basic Sensor Nodes (BSN), which collaborate to detect and report events. Conventional border surveillance systems rely on of fixed checkpoints, Monitoring Towers (MT), mobile vehicles, and border guards. Border guards could be equipped with man pack antennas. The proposed network architecture builds on top of the existing border surveillance infrastructure. BSNs are deployed in unattended ground to provide higher granularity for monitoring. Surveillance towers, which may be stationary or mobile, e.g., armored vehicle dispatched to incident, collect and route data to the wired network. Surveillance towers can host powerful and reliable multimedia sensors, i.e., radars and cameras. Information from BSNs and the multimedia sensors can be fused at the MT to reduce the false alarm rate. After the MT confirms an intrusion reported by a BSN(s), they report the intrusion location to the remote control and command centre. Due to coverage considerations and to reduce the miss rate, the number of deployed BSN(s) is expected to be very large.

2.4 Result of implementation

Packet delivery ratio (PDR)

PDR is expressed as the ratio between the number of packets successfully delivered to a destination and the number of packets sent by source node.

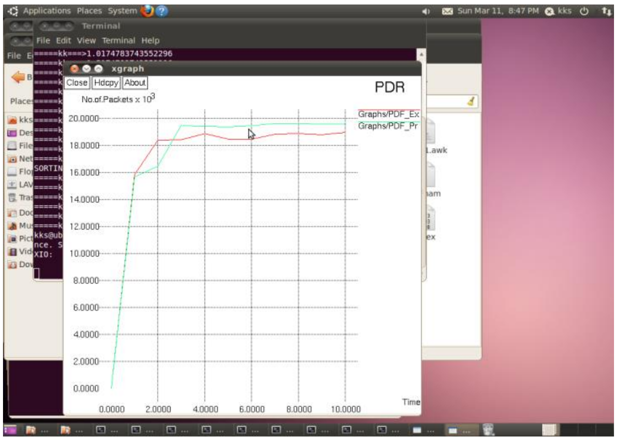

Figure2.4.1: packet delivery ratio

Energy consumption (EC)

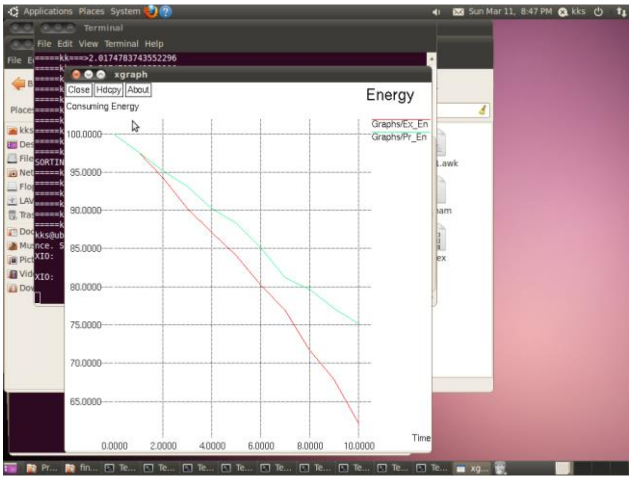

Figure 2.4.2: energy consumption

The EC measures the amount of power consumed at each BSN during the network operation. In NS-2, the calculation of energy expenditure at each node takes into account the power consumed for packet transmission and reception, the one consumed during the time where the radio is in sleep mode, and the energy consumed by the environment sensing operations (sensor boards).

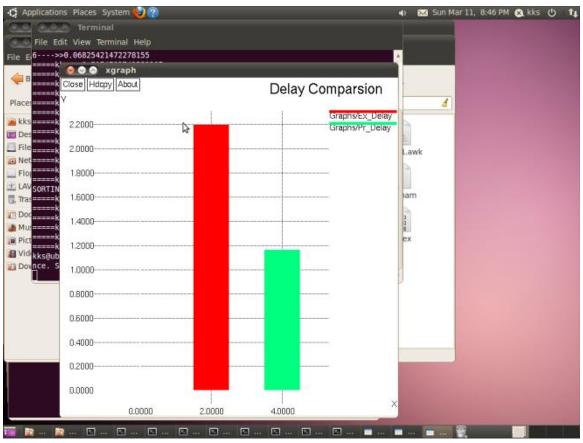

Figure 2.4.3: delay comparison

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