Applications of Geometric Algorithms to Reduce Interference in Wireless Mesh Network

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ABSTRACT

In wireless mesh networks such as WLAN (IEEE 802.11s) or WMAN (IEEE 802.11), each node should help to relay packets of neighboring nodes toward gateway using multi-hop routing mechanisms. Wireless mesh networks usually intensively deploy mesh nodes to deal with the problem of dead spot communication. However, the higher density of nodes deployed, the higher radio interference occurred. This causes significant degradation of system performance. In this paper, we first convert network problems into geometry problems in graph theory, and then solve the interference problem by geometric algorithms. We first define line intersection in a graph to reflect radio interference problem in a wireless mesh network. We then use plan sweep algorithm to find intersection lines, if any; employ Voronoi diagram algorithm to delimit the regions among nodes; use Delaunay Triangulation algorithm to reconstruct the graph in order to minimize the interference among nodes. Finally, we use standard deviation to prune off those longer links (higher interference links) to have a further enhancement. The proposed hybrid solution is proved to be able to significantly reduce interference in a wireless mesh network in $O(n \log n)$ time complexity.

KEYWORDS

Wireless Mesh Network, Interference Reduction, Voronoi Diagram, Delaunay Triangulation Algorithm

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Survey and Taxonomy of Unicast Routing Protocols for Mobile Ad Hoc Networks

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ABSTRACT

The purpose of this paper is to survey the unicast routing protocols for mobile ad hoc networks (MANETs) and study their primary route selection principle. In this context, we did an exhaustive survey of unicast MANET routing protocols proposed in the literature. Qualitatively, based on their primary route selection principle, we show that all these protocols could be placed under one of two broad route selection categories: routing based on minimum-weight path and routing based on stability. In addition to the primary route selection principle, we also identify the underlying routing metric and the routing philosophy (proactive, reactive, flat, hierarchical, location-awareness, power-sensitiveness and multipath capability) adopted by the different routing protocols. We believe the survey can be a great source of information for researchers in ad hoc networks.

KEYWORDS

Routing Protocols, Survey, Mobile Ad hoc Networks, Unicast, Stability, Minimum-Weight Path

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A COMPARISON OF LINK LAYER ATTACKS ON WIRELESS SENSOR NETWORKS

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ABSTRACT

Wireless sensor networks (WSNs) have many potential applications [1, 5] and unique challenges. They usually consist of hundreds or thousands small sensor nodes such as MICA2, which operate autonomously; conditions such as cost, invisible deployment and many application domains, lead to small size and limited resources sensors [2]. WSNs are susceptible to many types of link layer attacks [1] and most of traditional networks security techniques are unusable on WSNs [2]; due to wireless and shared nature of communication channel, untrusted transmissions, deployment in open environments, unattended nature and limited resources [1]. So, security is a vital requirement for these networks; but we have to design a proper security mechanism that attends to WSN's constraints and requirements. In this paper, we focus on security of WSNs, divide it (the WSNs security) into four categories and will consider them, include: an overview of WSNs, security in WSNs, the threat model on WSNs, a wide variety of WSNs' link layer attacks and a comparison of them. This work enables us to identify the purpose and capabilities of the attackers; also, the goal and effects of the link layer attacks on WSNs are introduced. Also, this paper discusses known approaches of security detection and defensive mechanisms against the link layer attacks; this would enable it security managers to manage the link layer attacks of WSNs more effectively.

KEYWORDS

Wireless Sensor Network (WSN), Security, Link Layer, Attacks, Detection, Defensive Mechanism

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AN EFFICIENT METHOD BASED ON GENETIC ALGORITHMS TO SOLVE SENSOR NETWORK OPTIMIZATION PROBLEM

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ABSTRACT

Minimization of the number of cluster heads in a wireless sensor network is a very important problem to reduce channel contention and to improve the efficiency of the algorithm when executed at the level of cluster-heads. In this paper, we propose an efficient method based on genetic algorithms (GAs) to solve a sensor network optimization problem. Long communication distances between sensors and a sink in a sensor network can greatly drain the energy of sensors and reduce the lifetime of a network. By clustering a sensor network into a number of independent clusters using a GA, we can greatly minimize the total communication distance, thus prolonging the network lifetime. Simulation results show that our algorithm can quickly find a good solution.

KEYWORDS

Wireless Sensor Networks, Longevity of Network, Communication Distance, Clustering, Genetic Algorithm

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**Case Study On Social Engineering Techniques for Persuasion**

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**ABSTRACT**

There are plenty of security software in market; each claiming the best, still we daily face problem of viruses and other malicious activities. If we know the basic working principal of such malware then we can very easily prevent most of them even without security software. Hackers and crackers are experts in psychology to manipulate people into giving them access or the information necessary to get access. This paper discusses the inner working of such attacks. Case study of Spyware is provided. In this case study, we got 100% success using social engineering techniques for deception on Linux operating system, which is considered as the most secure operating system. Few basic principal of defend, for the individual as well as for the organization, are discussed here, which will prevent most of such attack if followed.

**KEYWORDS**

Spyware, Malware, Social Engineering, Psychology.

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Citation count 20

Constructing Minimum Connected Dominating Set: Algorithmic approach

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Abstract

Connected Dominating Set is popularly used for constructing virtual backbones for broadcasting operation in WSNs. UD Graph is the most suitable model for a wireless sensor network. In this paper we provide an algorithm to find MCDS in UD Graph. It is based on the computation of convex hulls of sensor nodes or vertices. Constructing a virtual backbone in WSNs is an important issue because it reduces unnecessary message transmission or flooding in the network. It helps in reducing interference and energy consumption because a limited number of sensors are engaged in message transmission and thus it helps in improving the Quality of Service (QoS) in the network.

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Classification and Evaluation of Mobility Metrics for Mobility Model Movement Patterns in Mobile

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ABSTRACT

A mobile ad hoc network is collection of self configuring and adaption of wireless link between communicating devices (mobile devices) to form an arbitrary topology and multihop wireless connectivity without the use of existing infrastructure. It requires efficient dynamic routing protocol to determine the routes subsequent to a set of rules that enables two or more devices to communicate with each others. This paper basically classifies and evaluates the mobility metrics into two categories - direct mobility metrics and derived mobility metrics. These two mobility metrics has been used to measure different mobility models, this paper considers some of mobility models i.e Random Waypoint Model, Reference Point Group Mobility Model, Random Direction Mobility Model, Random Walk Mobility Model, Probabilistic Random Walk, Gauss Markov, Column Mobility Model, Nomadic Community Mobility Model and Manhattan Grid Model.

KEYWORDS

Mobility metrics, Mobility Models, Connectivity Graph

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A REVIEW OF INTERFERENCE REDUCTION IN WIRELESS NETWORKS USING GRAPH COLORING METHODS

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ABSTRACT

The interference imposes a significant negative impact on the performance of wireless networks. With the continuous deployment of larger and more sophisticated wireless networks, reducing interference in such networks is quickly being focused upon as a problem in today’s world. In this paper we analyze the interference reduction problem from a graph theoretical viewpoint. A graph coloring methods are exploited to model the interference reduction problem. However, additional constraints to graph coloring scenarios that account for various networking conditions result in additional complexity to standard graph coloring. This paper reviews a variety of algorithmic solutions for specific network topologies.

KEYWORDS

Interference Reduction, Wireless Networks, Graph Coloring, Vertex & Edge Coloring

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Coverage and Connectivity Aware Neural Network Based Energy Efficient Routing in Wireless Sensor Networks

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Abstract

There are many challenges when designing and deploying wireless sensor networks (WSNs). One of the key challenges is how to make full use of the limited energy to prolong the lifetime of the network, because energy is a valuable resource in WSNs. The status of energy consumption should be continuously monitored after network deployment. In this paper, we propose coverage and connectivity aware neural network based energy efficient routing in WSN with the objective of maximizing the network lifetime. In the proposed scheme, the problem is formulated as linear programming (LP) with coverage and connectivity aware constraints. Cluster head selection is proposed using adaptive learning in neural networks followed by coverage and connectivity aware routing with data transmission. The proposed scheme is compared with existing schemes with respect to the parameters such as number of alive nodes, packet delivery fraction, and node residual energy. The simulation results show that the proposed scheme can be used in wide area of applications in WSNs.

Keywords

Sensor networks, Energy Efficiency, Routing metric, Linear Programming, Neural Networks, coverage and connectivity.

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Secure Key Exchange and Encryption Mechanism for Group Communication in Wireless Ad Hoc Networks

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ABSTRACT

Secured communication in ad hoc wireless networks is primarily important, because the communication signals are openly available as they propagate through air and are more susceptible to attacks ranging from passive eavesdropping to active interfering. The lack of any central coordination and shared wireless medium makes them more vulnerable to attacks than wired networks. Nodes act both as hosts and routers and are interconnected by Multi-hop communication path for forwarding and receiving packets to/from other nodes. The objective of this paper is to propose a key exchange and encryption mechanism that aims to use the MAC address as an additional parameter as the message specific key to encrypt and forward data among the nodes. The nodes are organized in spanning tree fashion, as they avoid forming cycles and exchange of key occurs only with authenticated neighbors in ad hoc networks, where nodes join or leave the network dynamically.

Keywords

Ad hoc networks, Spanning tree, Neighborhood key, Message specific key

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