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AN EFFICIENT INTRUSION DETECTION SYSTEM WITH CUSTOM FEATURES USING FPA-GRADIENT BOOST MACHINE LEARNING ALGORITHM

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ABSTRACT

An efficient Intrusion Detection System has to be given high priority while connecting systems with a network to prevent the system before an attack happens. It is a big challenge to the network security group to prevent the system from a variable types of new attacks as technology is growing in parallel. In this paper, an efficient model to detect Intrusion is proposed to predict attacks with high accuracy and less false-negative rate by deriving custom features UNSW-CF by using the benchmark intrusion dataset UNSW-NB15. To reduce the learning complexity, Custom Features are derived and then Significant Features are constructed by applying meta-heuristic FPA (Flower Pollination algorithm) and MRMR (Minimal Redundancy and Maximum Redundancy) which reduces learning time and also increases prediction accuracy. ENC (ElasicNet Classifier), KRRC (Kernel Ridge Regression Classifier), IGBC (Improved Gradient Boosting Classifier) is employed to classify the attacks in the datasets UNSW-CF, UNSW and recorded that UNSW-CF with derived custom features using IGBC integrated with FPA provided high accuracy of 97.38% and a low error rate of 2.16%. Also, the sensitivity and specificity rate for IGB attains a high rate of 97.32% and 97.50% respectively.

KEYWORDS

Intrusion Detection, IDS, UNSW-B15, Custom Features, Feature Selection, FPA, Gradient Boost Classifier.

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GPS SYSTEMS LITERATURE: INACCURACY FACTORS AND EFFECTIVE SOLUTIONS

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ABSTRACT

Today, Global Positioning System (GPS) is widely used in almost every aspect of our daily life. Commonly, users utilize the technology to track the position of a vehicle or an object of interest. They also use it to safely navigate to the destination of their choice. As a result, there are countless number of GPS based tracking application that has been developed. But, a main recurring issue that exists among these applications are the inaccuracy of the tracking faced by users and this issue has become a rising concern. Most existing research have examined the effects that the inaccuracy of GPS have on users while others identified suitable methods to improve the accuracy of GPS based on one or two factors. The objective of this survey paper is to identify the common factors that affects the accuracy of GPS and identify an effective method which could mitigate or overcome most of those factors. As part of our research, we conducted a thorough examination of the existing factors for GPS inaccuracies. According to an initial survey that we have collected, most of the respondents has faced some form of GPS inaccuracy. Among the common issues faced are inaccurate object tracking and disconnection of GPS signal while using an application. As such, most of the respondents agree that it is necessary to improve the accuracy of GPS. This leads to another objective of this paper, which is to examine and evaluate existing methods as well as to identify the most effective method that could improve the accuracy of GPS.

KEYWORDS

GPS, accuracy factors, improve accuracy, global positioning system

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MULTI-OBJECTIVE OPTIMIZATION ASSISTED NETWORK CONDITION AWARE QOS-ROUTING PROTOCOL FOR MANETS: MNCQM

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ABSTRACT

The exponential rise in wireless communication systems and allied applications has revitalized academiaindustries to achieve more efficient data transmission system to meet Quality-of-Service (QoS) demands. Amongst major wireless communication techniques, Mobile Ad-hoc Network (MANET) is found potential to provide decentralized and infrastructure less communication among multiple distributed nodes across network region. However, dynamic network conditions such as changing topology, congestion, packet drop, intrusion possibilities etc often make MANET's routing a tedious task. On the other hand, mobile network feature broadens the horizon for intruders to penetrate the network and causes performance degradation. Unlike classical MANET protocols where major efforts have been made on single network parameter based routing decision, this research paper proposes a novel Elitist Genetic Algorithm (EGA) Multi-Objective Optimization assisted Network Condition Aware QoS-Routing Protocol for Mobile Ad-hoc Networks (MNCQM). Our proposed MNCQM protocol exhibits two phase implementation where at first it performs node-profiling under dynamic network topology for which three factors; irregular MAC information exchange, queuing overflow and topological variations have been considered. Towards this objective node features like Packet Forwarding Probability (PFP) at the MAC layer, Success Probability of Data Transmission (SPDT) of a neighboring node, and Probability of Successful Data Delivery (PSDD) have been obtained to estimate Node-Trustworthiness Index (NTI), which is further used to eliminate untrustworthy nodes. In the second phase of implementation, a novel Evolutionary Computing assisted nondisjoint best forwarding path selection model is developed that exploits node's and allied link's connectivity and availability features to identify the quasi-sub-optimal forwarding paths. EGA algorithm intends to reduce hop-counts, connectivity-loss and node or link unavailability to estimate best forwarding node. One key feature of the proposed model is dual-supplementary forwarding path selection that enables alternate path formation in case of link outage and thus avoids any iterative network discovery phase.

KEYWORDS

MANET, QoS communication, Node-trustworthiness, Network awareness, Evolutionary computing based routing decision.

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On the Migration of a Large Scale Network from IPv4 to IPv6 Environment

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ABSTRACT

This work mainly addresses the design a large scale network using dual stack mechanisms. We focused on the most important theoretical concepts of the IPv6 protocol, such as addressing, address allocation, routing with the OSPF and BGP protocols and routing protocols performance in dual stack network using GNS3 and Wireshark simulators. we have a tendency to measure a perfect model and a true large-scale network atmosphere victimization out there end-to-end activity techniques that focuses on a large-scale IPv4 and IPv6 backbone and created performance the IPv4 and IPv6 network. In this paper, we compiled IPv6 address planning in large scale network, performance statistics of each network in terms of TCP throughput, delay jitters, packet loss rate, and round trip time. It is found that, a minor degradation within the throughput of the TCP, delay jitter, a lower packet loss rate, and a rather longer round trip time are occurred in a real large scale dual stack network.

KEYWORDS

IPv6, IPv4, double stack, BGPv4, OSPFv3, ISP, throughput, TCP and RTT

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LOCALIZATION SCHEMES FOR UNDERWATER WIRELESS SENSOR NETWORKS: SURVEY

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ABSTRACT

Underwater Wireless Sensor Networks (UWSNs) enable a variety of applications such as fish farming and water quality monitoring. One of the critical tasks in such networks is localization. Location information can be used in sensor networks for several purposes such as (i) data tagging in which sensed information is not useful for the application unless the location of the sensed information is known, (ii) tracking objects or (iii) multi-hop data transmission in geographic routing protocols. Since GPS does not work well underwater, several localization schemes have been developed for UWSNs. This paper surveys the state-ofthe-art of localization schemes for UWSNs. It describes the existing schemes and classifies them into different categories. Furthermore, the paper discusses some open research issues that need further investigation in this area.

KEYWORDS

Underwater Wireless Sensor Networks, Localization, Ranging Methods, Positioning, Range-based &Range-free.

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Comparative and QoS Performance Analysis of Terrestrial-aerial Platforms-satellites Systems for Temporary Events

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ABSTRACT

Wireless communications, nowadays, becomes a vital element of people's daily life. Providing global connectivity in future communication systems via the heterogeneous network opens up many research topics to investigate potentialities, enabling technologies, and challenges from the perspective of the integrated wireless systems. This paper aims to drive a comprehensive and comparative study on terrestrial-aerial platforms- satellite wireless communications systems, includes their characteristics and unravelling challenges. The comparison focuses on issues that reportedly can evaluate any wireless systems for temporary events. These issues are altitude and coverage, Radio Frequency (RF) propagation, interference, handover, power supply constraints, deployment and maintenance challenges, reliability on special events or disaster relief, cost-effectiveness and environmental impact. Last, Quality of service (QoS) performance is analysed for the four wireless communication systems from the temporary events perspective using the OPNET Modeller simulation tool. Results infer that space-based wireless systems outperform terrestrial ones.

KEYWORDS

Terrestial, Aerial Platforms, Satellites, QoS Performance, Temporary Events.

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CONGESTION AND ENERGY AWARE MULTIPATH LOAD BALANCING ROUTING FOR LLNS

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ABSTRACT

The Internet of Things (IoT) is presently in its golden era with its current technological evolution towards digital transformation. Low-power and Lossy Networks (LLNs) form the groundwork for IoT, where the IPv6 Routing Protocol for Low-Power and Lossy Networks (RPL) is designated by Internet Engineering Task Force as the benchmark protocol for routing. Although RPL, with its unique capabilities, has addressed many IoT routing requirements, Load balancing and Congestion control are the outliers. This paper builds on the RPL protocol and proposes a multipath Congestion and Energy Aware RPL (CEARPL) that alleviates the load balancing and congestion concerns associated with RPL and improves the network performance. For congestion avoidance, a Congestion and Energy Aware Objective Function (CEA-OF) is suggested during parent selection that considers multiple metrics like Child Count metric, Estimated Lifetime metric, and Queue Occupancy metric, to equally distribute the traffic in LLNs. The Queue Occupancy metric is used to detect congestion in the network, and a Multipath routing strategy is utilized to mitigate the congestion in the network. A comparison of the performance of CEA-RPL was made against the existing Objective Functions of RPL, OFO, and MRHOF, as well as COM-OF, utilizing Contiki OS 3.0's Cooja emulator. CEA-RPL projected superior results with power consumption lowering by 33%, endto-end delay decreasing by 30%, queue loss ratio reducing by 49%, and packet receiving rate and network lifetime improving by 7% and 49%, on an average, respectively.

KEYWORDS

Congestion, Multipath routing, Internet of Things, Load balancing, Low-power Lossy Networks, Objective function & RPL

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A SECURE DATA COMMUNICATION SYSTEM USING CRYPTOGRAPHY AND STEGANOGRAPHY

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ABSTRACT

The information security has become one of the most significant problems in data communication. So it becomes an inseparable part of data communication. In order to address this problem, cryptography and steganography can be combined. This paper proposes a secure communication system. It employs cryptographic algorithm together with steganography. The jointing of these techniques provides a robust and strong communication system that able to withstand against attackers. In this paper, the filter bank cipher is used to encrypt the secret text message, it provide high level of security, scalability and speed. After that, a discrete wavelet transforms (DWT) based steganography is employed to hide the encrypted message in the cover image by modifying the wavelet coefficients. The performance of the proposed system is evaluated using peak signal to noise ratio (PSNR) and histogram analysis. The simulation results show that, the proposed system provides high level of security.

KEYWORDS

Steganography, Cryptography, DWT, Filter bank, PSNR

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NEW DESIGN OF LEAKY WAVE ANTENNA BASED ON SIW TECHNOLOGY FOR BEAM STEERING

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ABSTRACT

This paper presents the results of an investigation of a new version of a leaky wave antenna that is based on a substrate integrated waveguide (SIW). The structure of SIW is composed of two rows of cylinders between metal plates; it can be easily produced by the standard method PCB" circuit" or LTCC method, the antenna is designed so that it can radiate in C-band. The direction of the main lobe of the antenna radiation pattern can be steered by changing the frequency in the band from backward direction to forward direction; the effect of increasing the number of slot arrays has also been analyzed to study the effect on radiation patterns. The numerical simulations have been performed using a commercial CST Microwave studio.

KEYWORDS

Leaky wave antenna, substrate integrated waveguide, slots, C-band, CST, moment's method

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Developing an Adaptive Channel Modelling using a Genetic Algorithm Technique to Enhance Aerial Vehicle-to-Everything Wireless Communications

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ABSTRACT

In this digital era, Internet of Everything (IoE) has a potential to bring out drastic changes to how we live today, where billions of people and devices require wireless connectivity. Where Unmanned Aerial Vehicles contribute positively in paving the way for IoE and Fifth Generation technologies, and tackle some of their comms challenges. Thus, this paper aims to provide an adaptive approach using a Genetic Algorithm (GA) technique by combining indoor and outdoor propagation models to enhance aerial vehicle-to-everything wireless connectivity. The proposed adaptive approach uses a GA multi-objective function that yield optimum values of UAV altitude, elevation angles, and type of building for indoor environment. The proposed GA optimization technique has met the demand of a typical dense-populated urban environment, as well as empowering the IoE with greater coverage footprint, high Quality of Service benchmark, and line-of-sight adaptability. The output results emphasized that the proposed adaptive approach using the GA technique can help in smart decision-making and selecting a proper setup and find the optimum parameters to provide seamless wireless connections from aerial vehicle-to-everything.

KEYWORDS

Unmanned Aerial Vehicles, Internet of Everything, Channel Modelling, Propagation Model, Fifth Generation.

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