January 2025 : Top10 Cited Articles in Computer Networks & Communications

International Journal of Computer Networks& Communications (IJCNC)

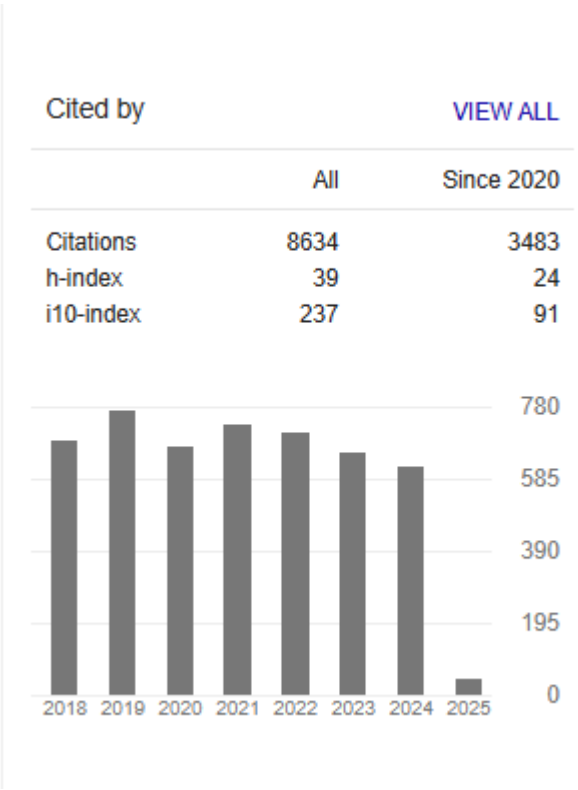
http://airccse.org/journal/ijcnc.html

(Scopus, ERA Listed, WJCI Indexed)

Scopus Cite Score 2023—1.6

ISSN 0974 - 9322 (Online); 0975 - 2293 (Print)

Citations, h-index, i10-index



MODELING LOW-COST INERTIAL NAVIGATION SYSTEMS AND THEIR ERRORS

Mohammed AFTATAH, Khalid ZEBBARA and Soufiane EL ASRI

Laboratory of Research in Innovation in Mathematics and Intelligent Systems (IMIS), Faculty of Applied Sciences, Ibn Zohr University, BP: 523 Agadir, Morocco

ABSTRACT

Inertial Navigation Systems (INS) are critical for a wide range of applications due to their ability to provide reliable navigation information, even without external references. This paper presents a comprehensive study of the modeling of low-cost INS sensors and their inherent errors, focusing on how these errors impact the accuracy of the system's localization outputs. A MATLAB-based simulation platform was developed to analyze the effects of common sensor errors on position, velocity, and attitude over time. The experimental results show that these errors accumulate, leading to significant deviations from the true trajectory. Notably, the maximum positional error in the upward direction reached 65 meters by the end of the simulated trajectory, while the velocity error in the same direction deviated by 0.8 m/s. Initially, the estimated trajectory closely followed the reference path, but as the simulation progressed, a substantial divergence occurred, highlighting the cumulative impact of sensor errors. These findings underscore the necessity of advanced error mitigation techniques to enhance the long-term accuracy and reliability of INS in practical applications.

KEYWORDS

Low-Cost Inertial Navigation System, Sensor errors, Navigation, Modeling, Mechanization

For More Details: https://aircconline.com/ijcnc/V16N6/16624cnc08.pdf

Volume Link: https://airccse.org/journal/ijc2024.html

REFERENCES

[1] Hecker, P., Angermann, M., Bestmann, U. et al, (2019) “Optical Aircraft Positioning for Monitoring of the Integrated Navigation System during Landing Approach”, Gyroscopy Navig. 10, 216–230.

[2] Li N, Guan L, Gao Y, Du S, Wu M, Guang X, Cong X, (2020), “Indoor and Outdoor Low-Cost Seamless Integrated Navigation System Based on the Integration of INS/GNSS/LIDAR System”, Remote Sensing. 12(19):3271.

[3] Abdelaziz N, El-Rabbany A, (2022) “An Integrated INS/LiDAR SLAM Navigation System for GNSS-Challenging Environments”, Sensors. 22(12):4327.

[4] Zhanke He, Erhu Wei, Qiyuan Zhang, Lingxuan Wang, Yanlin Li, Jingnan Liu, (2023) “Earth rotation parameters from BDS, GPS, and Galileo data: An accuracy analysis”, Advances in Space Research, Volume 71, Issue 10, Pages 3968-3980.

[5] Boguspayev N, Akhmedov D, Raskaliyev A, Kim A, Sukhenko A, (2023) “A Comprehensive Review of GNSS/INS Integration Techniques for Land and Air Vehicle Applications”, Applied Sciences. 13(8):4819.

[6] K. Zhu, C. Deng, F. Zhang, H. Kang, Z. Wen and G. Guo, (2023) “A Multi-Source Fusion Navigation System to Overcome GPS Interruption of Unmanned Ground Vehicles”, IEEE Access, vol. 11, pp. 61070-61081.

[7] Mohamad Hashim IS, Al-Hourani A, (2023) “Satellite-Based Localization of IoT Devices Using Joint Doppler and Angle-of-Arrival Estimation”, Remote Sensing. 15(23):5603.

[8] Shengyu Li, Xingxing Li, Huidan Wang, Yuxuan Zhou, Zhiheng Shen, (2023) “Multi-GNSS PPP/INS/Vision/LiDAR tightly integrated system for precise navigation in urban environments”, Information Fusion, Volume 90, Pages 218-232.

[9] Zhang Y, Sun H, Zhang F, Zhang B, Tao S, Li H, Qi K, Zhang S, Ninomiya S, Mu Y, (2023) “RealTime Localization and Colorful Three-Dimensional Mapping of Orchards Based on Multi-Sensor Fusion Using Extended Kalman Filter”, Agronomy. 13(8):2158.

[10] Yuelin Yuan, Fei Li, Jialiang Chen, Yu Wang, and Kai Liu, (2023) “An improved Kalman filter algorithm for tightly GNSS/INS integrated navigation system”, MBE, 21 (1): 963–983.

AN INNOVATIVE HYBRID MODEL FOR EFFECTIVE DDOS ATTACK DETECTION IN SOFTWARE DEFINED NETWORKS

Quang Truong Can, Tien Dat Nguyen, Minh Bao Pham, Thanh Tung Nguyen, Thi Hanh AnTran, Thi Thai Mai Dinh

Faculty of Telecommunication System, UET, VNU, 203-G2, 144 Xuan Thuy Street, Hanoi, Viet Nam

ABSTRACT

Software-Defined Networking (SDN) is a sophisticated network architecture that offers enhanced flexibility and streamlined management through a centralized controller. While these advantages allow SDNs to adapt to growing network demands, they also introduce potential security risks. Specifically, the centralized nature of SDN makes it vulnerable to network attacks, such as Distributed Denial of Service (DDoS) attacks, which can overwhelm network resources and cause widespread congestion. In this study, we propose a DDoS detection model that combines entropy-based features with Support Vector Machine (SVM) machine learning to create a hybrid approach. This model capitalizes on the strengths of both methods to improve detection accuracy. Our results, based on simulations and practical SDN implementation, show that our approach effectively and rapidly detects DDoS attacks with high precision. This paper addresses the challenge of enhancing the efficiency and accuracy of DDoS attack detection by providing a comprehensive dataset collected from both simulated and practical environments, thereby improving the detection system's performance in real-time situations.

KEYWORDS

SDN, DDoS attacks, network security, machine learning, statistical analysis method, entropy, dynamic entropy.

For More Details: https://aircconline.com/ijcnc/V16N6/16624cnc07.pdf

Volume Link: https://airccse.org/journal/ijc2024.html

REFERENCES

[1] Cisco, “Cisco Annual Internet Report (2018–2023) White Paper,” 10-Mar-2020. [Online]. Available: https://www.cisco.com.

[2] SDX Central, “Understanding the SDN Architecture.” [Online]. Available: https://www.sdxcentral.com/resources/sdn/insidesdn-architecture/. [Accessed Dec. 2022].

[3] Ali, T. E., Chong, Y., & Manickam, S. (2022). Machine Learning Techniques to Detect a DDoS Attack in SDN: A Systematic Review. Applied Sciences, 13(5), 3183. https://doi.org/10.3390/app13053183

[4] Y. Cui, L. Yan, S. Li, H. Xing, W. Pan, J. Zhu, and X. Zheng, “SDAnti-DDoS: Fast and Efficient DDoS Defence in Software-Defined Networks,” Journal of Network and Computer Applications, vol. 65, pp. 65-79, 2016.

[5] S. Salaria, S. Arora, N. Goyal, P. Goyal, and S. Sharma, “Implementation and Analysis of an Improved PCA Technique for DDoS Detection,” in 2020 IEEE 5th International Conference on Computing Communication and Automation (ICCCA), pp. 280-285, 2020.

[6] Abdul Adhim, Satoshi Okada, and Takuho Mitsunaga, “SDN-Based Detection Method Against DoS/DDoS Attacks in an IoT Environment,” in Symposium on Cryptography and Information Security, Osaka, Japan & Online, Jan. 18–21, 2022.

[7] Haymarn Oo, Nan, Risdianto, Aris Cahyadi, Teck, Chaw Ling, and Maw, Aung Htein. "Flooding Attack Detection and Mitigation in SDN with Modified Adaptive Threshold Algorithm." International Journal of Computer Networks & Communications, vol. 12, no. 3, May 2020, pp. 75– 95. Academy and Industry Research Collaboration Center (AIRCC). DOI: 10.5121/ijcnc.2020.12305.

[8] Ranyelson N. Carvalho, Jacir L. Bordim, and Eduardo A. P. Alchier, "Entropy-Based DoS Attack Identification in SDN," in 2019 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW).

[9] Ming Xuanyuan, Visham Ramsurrun, and Amar Seeam, "Detection and Mitigation of DDoS Attacks Using Conditional Entropy in Software-Defined Networking," in 2019 11th International Conference on Advanced Computing (ICoAC).

[10] i. Özçelik and R.R. Brooks, “Deceiving Entropy-Based DoS Detection,” Computers & Security, vol. 48, pp. 234-245, 2014. doi:10.1016/j.cose.2014.10.013.

ROUTING PERFORMANCES IN WIRELESS SENSOR NETWORKS: DETERMINING SHORTEST PATH ALGORITHMS EFFECTIVENESS

Khine Thazin Min [1] and N. Jeyanthi [2]

[1] Faculty of Computer System & Technology, Myanmar Institute of Information Technology (MIIT), Mandalay, Myanmar

[2] School of Computer Science Engineering and Information Systems, Vellore Institute of Technology, Vellore, India

ABSTRACT

Wireless Sensor Networks (WSNs) play a pivotal role in a myriad of diverse fields, ranging from crucial healthcare applications to the creation of smart cities and effective environmental monitoring systems. Within the realm of WSNs, the feature of efficient routing assumes paramount importance as it exerts a profound influence on resource utilization and the overall performance of the network. In light of their remarkable efficiency and straightforwardness, shortest-path algorithms have emerged as a prevailing choice for routing mechanisms in WSNs. Hence, the primary objective of this specialized research is to understand a comprehensive investigation into the calculating performance of sensor network routing, with a particular circle on leveraging the potential of shortest-path algorithms. This ambitious effort will involve the establishment of a rigorous evaluation framework encompassing various performance metrics, enabling a meticulous assessment of the routing performance and the efficacy of the carefully selected algorithms. The culmination of this research holds tremendous significance, as it is poised to bestow invaluable insights into the practical implementation of WSNs. To attire with a comprehensive understanding of their performance across various scenarios and metrics, the research community can make informed decisions when choosing the most appropriate routing protocols suited to particular Wireless Sensor Network (WSN) deployments. The potential results of this research promise to not only improve the network's efficiency, reliability, and lifespan safe but also to pave the way for innovative applications of Wireless Sensor Networks in critical areas of societal significance.

KEYWORDS

Wireless Sensor Networks (WSNs), Routing Protocols, Shortest -Path algorithms

For More Details: https://aircconline.com/ijcnc/V16N6/16624cnc06.pdf

Volume Link: https://airccse.org/journal/ijc2024.html

REFERENCES

[1]. Sharma, Shweta, and Tarun Kumar. "Energy Efficient Modified Cluster Routing Algorithm for Maximizing Stability Period of WSN." International Journal of Innovative Research in Computer and Communication Engineering 3, no. 9 (2015).

[2]. Jayadharshini, P., T. Abirami, S. Santhiya, N. Bhavatharini, and G. Rithanya. "Energy efficient wireless sensors architecture with LSTM based on Machine Learning Technique." In Intelligent Wireless Sensor Networks and the Internet of Things, pp. 107-125. CRC Press, 2024.

[3]. Hussein, Wael Ali, Borhanuddin M. Ali, M. F. A. Rasid, and Fazirulhisyam Hashim. "Smart geographical routing protocol achieving high QoS and energy efficiency based for wireless multimedia sensor networks." Egyptian Informatics Journal 23, no. 2 (2022): 225-238.

[4]. Sinduja, M. S., K. R. Rekha, and Raghavendra Manjegowda. "Wireless Sensor Networks: A Methodical Analysis." In ICDSMLA 2020: Proceedings of the 2nd International Conference on Data Science, Machine Learning and Applications, pp. 1355-1367. Springer Singapore, 2022.

[5]. Sinduja, M. S., K. R. Rekha, and Raghavendra Manjegowda. "Wireless Sensor Networks: A Methodical Analysis." In ICDSMLA 2020: Proceedings of the 2nd International Conference on Data Science, Machine Learning and Applications, pp. 1355-1367. Springer Singapore, 2022.

[6]. Jayadharshini, P., T. Abirami, S. Santhiya, N. Bhavatharini, and G. Rithanya. "Energy efficient wireless sensors architecture with LSTM based on Machine Learning Technique." In Intelligent Wireless Sensor Networks and the Internet of Things, pp. 107-125. CRC Press, 2024.

[7]. Yang, Xiaoping, Mengjie Li, Zhihong Qian, and Te Di. "Improvement of GPSR protocol in vehicular ad hoc network." IEEE Access 6 (2018): 39515-39524.

[8]. Oreku, George S., and Tamara Pazynyuk. Security in wireless sensor networks. Cham, Switzerland: Springer International Publishing, 2016.

[9]. Patel, Nileshkumar R., and Shishir Kumar. "Wireless sensor networks' challenges and future prospects." In 2018 International Conference on System Modeling & Advancement in Research Trends (SMART), pp. 60-65. IEEE, 2018.

[10]. Gong, Yadong. "Network-structure-based energy aware routing in wireless sensor networks." In 2019 IEEE 4th Advanced Information Technology, Electronic and Automation Control Conference (IAEAC), pp. 1602-1605. IEEE, 2019.

INTRUSION DETECTION MODEL USING MACHINE LEARNING ALGORITHMS ON NSL-KDD DATASET

Reem Alshamy and Muhammet Ali Akcayol

Department of Computer Science, Gazi University, Ankara, Turkey

ABSTRACT

Big data, generated by various sources such as mobile devices, sensors, and the Internet of Things (IoT),has many characteristics such as volume, velocity, variety, variability, veracity, validity, vulnerability, volatility, visualization, and value. An Intrusion Detection System (IDS) is essential for cybersecurity to detect intrusions before or after attacks. Traditional software methods struggle to store, manage, and analyze big data, developing new techniques for effective and rapid intrusion detection in organizations and enterprises. This study introduces the IDS Random Forest (RF) model in binary and multiclass classification for intrusion detection. In this model, we used the Synthetic Minority Oversampling TEchnique (SMOTE) to address class imbalances, and the RF classifier to classify attacks using the Network Security Laboratory (NSL)-KDD dataset. In the experiment, we compared the IDS-RF model with the Support Vector Machine (SVM), k-Nearest Neighbor (k-NN), and Logistic Regression (LR) classifiers in terms of accuracy, precision, recall, f1-score, and times for training and testing. The experimental results showed that the IDS-RF model achieved high performance in binary and multiclass classification compared to others. In addition, the proposed model also achieved high accuracies for each class (Normal, DoS, Probe, U2R, or R2L) and obtained 98.69%, 99.72%, 98.93%, 95.13%, and 89%, respectively.

KEYWORDS

Intrusion Detection, Network Security Laboratory (NSL)-KDD dataset, SMOTE, Machine Learning

For More Details: https://aircconline.com/ijcnc/V16N6/16624cnc05.pdf

Volume Link: https://airccse.org/journal/ijc2024.html

REFERENCES

[1] F. Bannat Wala and M. J. a. e.-p. Kiran, "5G Network Security Practices: An Overview and Survey," p. arXiv: 2401.14350, 2024.

[2] S. M. Othman, N. T. Alsohybe, F. M. Ba-Alwi, A. T. J. I. J. o. C.-S. Zahary, and D. Forensics, "Survey on intrusion detection system types," vol. 7, no. 4, pp. 444-463, 2018.

[3] A. Touzene, A. Al Farsi, N. J. I. J. o. C. N. Al Zeidi, and Communications, "HIGH PERFORMANCE NMF BASED INTRUSION DETECTION SYSTEM FOR BIG DATA IOT TRAFFIC," vol. 16, no. 2, pp. 43-58, 2024.

[4] X. Sun, L. Zhao, J. Chen, Y. Cai, D. Wu, and J. Z. J. E. A. o. A. I. Huang, "Non-MapReduce computing for intelligent big data analysis," vol. 129, p. 107648, 2024.

[5] F. Louati, F. B. Ktata, and I. J. C. C. Amous, "Big-IDS: a decentralized multi agent reinforcement learning approach for distributed intrusion detection in big data networks," pp. 1-19, 2024.

[6] K. Pramilarani and P. V. J. A. S. C. Kumari, "Cost based Random Forest Classifier for Intrusion Detection System in Internet of Things," vol. 151, p. 111125, 2024.

[7] M. Ghurab, G. Gaphari, F. Alshami, R. Alshamy, and S. J. A. J. o. R. i. C. S. Othman, "A detailed analysis of benchmark datasets for network intrusion detection system," vol. 7, no. 4, pp. 14-33, 2021.

[8] M. Ghurab, R. Alshamy, S. J. I. J. o. S. R. Othman, and E. Development, "Performance Evaluation for Attack Detection in Intrusion Detection System," vol. 4, no. 5, 2021.

[9] Trrad, "Applying Deep Learning Techniques for Network Traffic Classification: A Comparison Study on the NSL-KDD Dataset," 2024.

[10] H. Lin, Q. Xue, J. Feng, and D. Bai, "Internet of things intrusion detection model and algorithm based on cloud computing and multi-feature extraction extreme learning machine," Digital Communications and Networks, vol. 9, no. 1, pp. 111-124, 2023.

FUZZY-BASED CLUSTERING OF WIRELESS SENSOR NETWORKS FOR MULTIPLE MOBILE AGENT ITINERARY PLANNING

Nidhi Kashyap [1], Shuchita Upadhyaya [1,] Monika Poriye [1], Sachin Lalar [2]

[1] Department of Computer Science and Applications, Kurukshetra University, Kurukshetra, India
[4] Department of Engineering and Technology, Gurugram University Gurugram

ABSTRACT

Mobile agent (MA) technology exhibits remarkable efficiency when integrated into Wireless Sensor Networks (WSNs) for information processing tasks. MAs reduce network overhead by executing processing code locally on nodes and selectively transmitting significant data to designated remote sensor nodes, thereby enhancing data fusion and acquisition while minimizing energy depletion. However, in large-scale networks, relying on a single MA leads to significant delays, necessitating the use of multiple MAs to operate asynchronously and minimize latency. The challenge lies in effectively grouping nodes to ensure MAs reach their intended destinations. To address this challenge, this paper introduces a novel approach, the Adaptive FCM Clustering Algorithm (AFCM), a fuzzy-based clustering algorithm designed for addressing network partitioning challenges in Multiple Mobile Agent Itinerary Planning (MIP). A systematic analysis of the existing literature examines various MIP algorithms, emphasizing their strengths and uncovering potential research gaps. AFCM is specifically developed to create disjoint and load-balanced partitions tailored for multi-mobile agent itinerary planning. A Methodical analysis with three traditional clustering algorithms is conducted. The correctness of the Adaptive Fuzzy C-Means (AFCM) algorithm is demonstrated through a detailed manual application on a wireless network comprising 15 nodes.

KEYWORDS

Clustering, Itinerary planning, Mobile agent, Routing, Wireless sensor networks.

For More Details: https://aircconline.com/ijcnc/V16N6/16624cnc04.pdf

Volume Link: https://airccse.org/journal/ijc2024.html

REFERENCES

[1] E. Fissaoui, M. Beni-hssane and S. A. Ouhmad, "A survey on mobile agent itinerary planning for information fusion in wireless sensor networks," Archives of computational methods in engineering, vol. 28, pp. 1323-1334., 2021.

[2] S. Khan, A. Tariq, H. Richard and A. A. Hussain, "Multi-Mobile Agent Security by Design Itinerary Planning Approach in Wireless Sensor Network," in International Conference on Ubiquitous Security (pp. 534-544).:Springer Nature S, Singapore, December, 2022.

[3] Chen, M., Cai, W., Gonzalez, S., & Leung, V. C., "Balanced itinerary planning for multiple mobile agents in wireless sensor networks," in International conference on ad hoc networks., Berlin, Heidelberg, 2010.

[4] Chou, Y. C., & Nakajima, M., "A clonal selection algorithm for energy-efficient mobile agent itinerary planning in wireless sensor networks," Mobile Networks and Applications, vol. 23, no. 5, pp. 1233-1246, 2018.

[5] Hong, W., Liu, Z., Chen, Y., & Guo, W., "Energy-efficient mobile agent communications for maximizing lifetime of wireless sensor networks," in Wireless Communications, Networking and Applications, New Delhi, 2016.

[6] S. P. Ardakani, "Data aggregation routing protocols in wireless sensor networks: A taxonomy," International Journal of Computer Networks & Communications, vol. 9, no. 2, 2017.

[7] S. P and S. R., "Invesigation of Ant Colony Optimization Algorithm for Efficient Energy Utilization in Wireless Sensor Network," International Journal of Computer Networks & Communications, vol. 15, no. 4, 2023.

[8] Chen, Min, et al., "Mobile agent-based directed diffusion in wireless sensor networks," EURASIP Journal on Advances in Signal Processing, pp. 1-13, 2006.

[9] Lingaraj, K., Biradar, R. V., & Patil, V. C., "Eagilla: An enhanced mobile agent middleware for wireless sensor networks," Alexandria engineering journal, vol. 57, no. 3, pp. 1197-1204, 2018.

[10] M. M. Islam and J. Fariha Tasmin, "MAXIMIZING NETWORK INTERRUPTION IN WIRELESS SENSOR NETWORK: AN INTRUDER'S PERSPECTIVE," International Journal of Computer Networks & Communications, vol. 7, no. 2, p. 103, 2015.

PRIORITIZED SCHEDULING ROUTING PROTOCOL FOR MINIMIZING PACKET DROP IN WIRELESS BODY AREA NETWORK

Md. Taslim Arefin [1,2] and Md Abul Kalam Azad [1]

[1] Department of Computer Science and Engineering, Jahangirnagar University, Dhaka, Bangladesh
[2] Department of ICE, Daffodil International University, Dhaka, Bangladesh.

ABSTRACT

The development of wireless body area networks, or WBANs, has altered people's lives through their utilization in the fields of athletics, cultural activities, fitness, including healthcare, among others. Energy conservation and ensuring the quality of offerings, however, are two of the main design difficulties for WBAN. In a WBAN, the load balancing of various packet buffers is crucial to the construction of a dependable and environmentally friendly technology. This paper proposes a prioritized scheduling-based protocol for minimizing packet drops in wireless body area networks on IEEE 802.15.6. This paper's primary goal is to reduce packet drops in the queues to increase WBAN throughput. In this instance, we take into account the data packet's importance as well as its source location to ensure that no packet is held in the designated buffer for an extended period before being sent to the connection point. PyCrypto is used to replicate the suggested approach in order to research and contrast its results with those of its competitors. According to the findings from the simulation, the suggested protocol performs more efficiently in delay, throughput, and energy consumption than the current approaches.

KEYWORDS

Routing Protocol, Wireless Body Area Network, Data Packet, Energy Consumption, Priority Scheduling

For More Details: https://aircconline.com/ijcnc/V16N6/16624cnc03.pdf

Volume Link: https://airccse.org/journal/ijc2024.html

REFERENCES

[1] Samanta, A., Bera, S., Misra, S.: Link-Quality-Aware Resource Allocation With Load Balance in Wireless Body Area Networks. In: IEEE Systems Journal. 12. (2015). 10.1109/JSYST.2015.2458586.

[2] Mohanty, Rasmita Kumari, Satya Prakash Sahoo, and Manas Ranjan Kabat. "Sustainable remote patient monitoring in wireless body area networks with Multi-hop routing and scheduling: a four-fold objective based optimization approach." Wireless Networks 29.5 (2023): 2337-2351.

[3] Samal, Tusharkanta, and Manas Ranjan Kabat. "A prioritized traffic scheduling with load balancing in wireless body area networks." Journal of King Saud university-computer and information sciences 34.8 (2022): 5448-5455.

[4] Zuhra, F. T., Bakar, K. B. A., Arain, A. A., Almustafa, K. M., Saba, T., Haseeb, K., Islam, N. (2019). LLTP-QoS: low latency traffic prioritization and QoS-aware routing in wireless body sensor networks. IEEE Access, 7, 152777-152787.

[5] Forestieri, Sara D., Taylor M. Helgestad, Andrew T. Lambe, Lindsay Renbaum-Wolff, Daniel A. Lack, Paola Massoli, Eben S. Cross et al. "Measurement and modeling of the multiwavelength optical properties of uncoated flame-generated soot." Atmospheric Chemistry and Physics 18, no. 16 (2018): 12141-12159.

[6] Mohammed, K. I., A. A. Zaidan, B. B. Zaidan, Osamah Shihab Albahri, M. A. Alsalem, Ahmed Shihab Albahri, Ali Hadi, and M. Hashim. "Real-time remote-health monitoring systems: a review on patients prioritisation for multiple-chronic diseases, taxonomy analysis, concerns and solution procedure." Journal of medical systems 43 (2019): 1-21.

[7] Saba, Tanzila, Khalid Haseeb, Imran Ahmed, and Amjad Rehman. "Secure and energy-efficient framework using Internet of Medical Things for e-healthcare." Journal of Infection and Public Health 13, no. 10 (2020): 1567-1575.

[8] Pramanik, Pijush Kanti Dutta, Anand Nayyar, and Gaurav Pareek. "WBAN: Driving e-healthcare beyond telemedicine to remote health monitoring: Architecture and protocols." In Telemedicine technologies, pp. 89-119. Academic Press, 2019.

[9] Ahmad, Naveed, Basit Shahzad, Muhammad Arif, Diana Izdrui, Ioan Ungurean, and Oana Geman. "An Energy-Efficient Framework for WBAN in Health Care Domain." Journal of Sensors 2022, no. 1 (2022): 5823461.

[10] Habib, Carol, Abdallah Makhoul, Rony Darazi, and Raphaël Couturier. "Health risk assessment and decision-making for patient monitoring and decision-support using wireless body sensor networks." Information fusion 47 (2019): 10-22..

OUTSTANDING FRAMEWORK FOR SIMULATING AND GENERATING ANCHOR TRAJECTORY IN WIRELESS SENSOR NETWORKS

Abdelhady Naguib [1, 2]

[1] Department of Computer Science, College of Computer and Information Sciences, Jouf University, Sakaka, Saudi Arabia
[2] Department of Systems and Computers Engineering, Faculty of Engineering, Al-Azhar University, Cairo, Egypt

ABSTRACT

This paper proposes a framework that has the ability to animate and generate different scenarios for the mobility of a movable anchor which can follow various paths in wireless sensor networks (WSNs). When the researchers use NS-2 to simulate a single anchor-assisted localization model, they face the problem of creating the movement file of the movable anchor. The proposed framework solved this problem by allowing them to create the movement scenario regarding different trajectories. The proposed framework lets the researcher set the needed parameters for simulating various static path models, which can be displayed through the graphical user interface. The researcher can also view the mobility of the movable anchor with control of its speed and communication range. The proposed framework has been validated by comparing its results to NS-2 outputs plus comparing it against existing tools. Finally, this framework has been published on the Code Project website and downloaded by many users.

KEYWORDS

Localization, Movable anchor, Simulation, Path planning, Wireless sensor networks

For More Details: https://aircconline.com/ijcnc/V16N6/16624cnc02.pdf

Volume Link: https://airccse.org/journal/ijc2024.html

REFERENCES

[1] Singh, Saurabh, et al., (2024) "Advanced lightweight encryption algorithms for IoT devices: survey, challenges and solutions", Journal of Ambient Intelligence and Humanized Computing, 1- 18.

[2] Kumar, Saureng & Sharma, Subhash. (2023) “Optimal Coverage Path Planning in a Wireless Sensor Network for Intelligent Transportation System”, International journal of Computer Networks & Communications, 15. 55-72. 10.5121/ijcnc.2023.15504.

[3] Güler, Samet., (2024) IEEE "Range-Based Wireless Sensor Network Localization by a Circumnavigating Mobile Anchor without Position Information.", 2024 32nd Mediterranean Conference on Control and Automation (MED).

[4] Docquier, Théo, et al., (2023) "Performance evaluation methodologies for smart grid substation communication networks: A survey", Computer Communications, 198, 228-246.

[5] Razdan, Rahul, et al., (2023) "Polyverif: An open-source environment for autonomous vehicle validation and verification research acceleration", IEEE Access, 11, 28343-28354.

[6] Yago, Carmen María, and Francisco Javier Díez., (2023) "DESnets: A Graphical Representation for Discrete Event Simulation and Cost-Effectiveness Analysis", Mathematics, 11.7, 1602.

[7] Fonseca i Casas, Pau., (2023) "A continuous process for validation, verification, and accreditation of simulation models", Mathematics, 11.4, 845.

[8] Fathi, Sahand, Soheil Fathi, and Vahid Balali, (2023) "Time–space conflict management in construction sites using discrete event simulation (DES) and path Planning in unity", Applied Sciences, 13.14, 8128.

[9] Abbasi, Mohammad & Abdullah, A.. (2023) “Optimize the Network Coding Paths to Enhance the Coding Protection in Wireless Multimedia Sensor Network”, International journal of Computer Networks & Communications, 15. 17-36. 10.5121/ijcnc.2023.15502.

[10] Antonante, Pasquale, Heath G. Nilsen, and Luca Carlone, (2023) "Monitoring of perception systems: Deterministic, probabilistic, and l

A COMPARATIVE STUDY OF COOPERATIVE AND NON-COOPERATIVE WIDEBAND SPECTRUM SENSING IN COGNITIVE RADIO NETWORKS FOR 5G APPLICATIONS

Blessing C. Dike, Cajetan M. Akujuobi, and
Shumon Alam

Center of Excellence for Communication Systems Technology Research, ECE Dept,
rairie View A&M University Prairie View, Texas, USA

ABSTRACT

The rapid advancements in 5G technologies have created an unprecedented need for efficient spectrum utilization to support increasing data traffic and diverse communication services. In this context, accurate and reliable spectrum sensing is essential. This study explores wideband spectrum sensing strategies, comparing non-cooperative cognitive radio (CR) techniques with cooperative methods across multiple subbands. A novel cooperative wideband spectrum sensing framework was developed, incorporating a K-outof-N fusion rule at the fusion center to make optimal decisions by selecting an appropriate K for a given number of cooperating CRs. This approach addresses noise uncertainty, a common challenge in traditional non-cooperative energy detection methods, particularly in 5G environments under Additive White Gaussian Noise (AWGN) conditions, assumed to be identically and independently distributed (i.i.d.). However, while cooperative sensing significantly improves detection in low signal-to-noise ratio (SNR) scenarios with higher false alarm rates (between 0.5 and 1), our findings reveal that it does not consistently outperform non-cooperative methods at very low false alarm rates (0.01 and 0.1) under poor SNR conditions. These findings highlight the need for further research to enhance cooperative sensing strategies for various operational environments.

KEYWORDS

Cooperative wideband spectrum sensing, non-cooperative wideband spectrum sensing, energy detection, additive white gaussian noise, hard fusion rule, Cooperative Radio.

For More Details: https://aircconline.com/ijcnc/V16N6/16624cnc01.pdf

Volume Link: https://airccse.org/journal/ijc2024.html

REFERENCES

[1] O. M. Khodayer Al-Dulaimi, M. K. Hassan Al-Dulaimi and A. M. KhodayerAl-Dulaimi, "Cognitive Radio Technologies and Applications in Dynamic Spectrum Access Method," 2022 IEEE 9th International Conference on Problems of Infocommunications, Science, and Technology (PIC S&T), Kharkiv, Ukraine, 2022,

[2] A. Chaturvedi, K. Prasad, S. K. Jha, V. Srinivas, N. Anil Kumar and V. Dankan Gowda, "Approaches for Advanced Spectrum Sensing in Cognitive Radio Networks," 2023 7th International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2023, pp. 1485-1490, doi: 10.1109/ICICCS56967.2023.10142500.

[3] E. Kasem, D. Lekomtcev and R. Marsalek, "Cooperative spectrum sensing in real channel conditions," 2015 13th International Conference on Telecommunications (ConTEL), Graz, Austria, 2015, pp. 1-6, doi: 10.1109/ConTEL.2015.7231192

[4] H. Tangsen, L. Xiaowu and C. Qingjiao, "Research on an Evaluation Algorithm of Sensing Node Reliability in Cognitive Networks," in IEEE Access, vol. 8, pp. 11848-11855, 2020, doi: 10.1109/ACCESS.2020.2965292

[5] A. Singh Kushwah and V. Nigam, "Evaluation of Hard Fusion Sensing Techniques under AWGN and Rayleigh Flat-fading channel for Cognitive Radio Network," 2022 IEEE 11th International Conference on Communication Systems and Network Technologies (CSNT), Indore, India, 2022, pp. 493-498,

[6] C. M. Dharmapuri and B. V. R. Reddy, "Performance Analysis of Different Fusion Rules for Cooperative Spectrum Sensing in Cognitive Radio Communication," 2023 10th International Conference on Computing for Sustainable Global Development (INDIACom), New Delhi, India, 2023, pp. 1061-1064.

[7] Trigka M, Dritsas E. An Efficient Distributed Approach for Cooperative Spectrum Sensing in Varying Interests Cognitive Radio Networks. Sensors. 2022; 22(17):6692. https://doi.org/10.3390/s22176692

[8] Gupta, V., Beniwal, N.S., Singh, K.K. et al. Optimal cooperative spectrum sensing for 5G cognitive networks using evolutionary algorithms. Peer-to-Peer Netw. Appl. 14, 3213–3224 (2021). https://doi.org/10.1007/s12083-021-01159-6

[9] Mengistu, F.G., Melesse, G.A. (2023). Detection Performance Analysis of Cooperative Spectrum Sensing UFMC-Based Cognitive Radio for 5G System. In: Arai, K. (eds) Proceedings of the Future Technologies Conference (FTC) 2023, Volume 1. FTC 2023. Lecture Notes in Networks and Systems, vol 813. Springer, Cham. https://doi.org/10.1007/978-3-031-47454-5_33

[10] J. Kim and J. P. Choi, "Sensing Coverage-Based Cooperative Spectrum Detection in Cognitive Radio Networks," in IEEE Sensors Journal, vol. 19, no. 13, pp. 5325-5332, 1 July1, 2019, doi: 10.1109/JSEN.2019.2903408