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Pervasive Computing: A Networking Perspective and Future Directions

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The editors would like to express their utmost gratitude to all the authors for their valuable and quality contributions towards making this book a comprehensive study of the area. We also want to thank the reviewers for their time and expertise, constructive comments and valuable insight.

Foreword

This book is a spectacular collection of chapters related to *pervasive computing, its' networking perspective and its' future directions*. There are 14 papers in this collection, and all the authors claim responsibility of handling their subjects in a remarkable manner.

Through this book, the readers will have the chance to find the technical obstacles to pervasive computing, existing off-the-shelf technologies and proposed novel algorithms and techniques in the areas like underwater sensor networks, ant colony-based routing, heterogeneous networks, agent-based distributed networks, cognitive radio networks, real-time WSN applications, machine translation, intelligent computing and ontology-based bit masking.

We congratulate the editors and the contributors who had put in a lot of effort and time in bringing out this book to address networking perspective of pervasive computing for a better understanding of the issues and future aspects.

We hope you will like this book as much as we do.

Beau Bassin-Rose Hill, Mauritius

Mangeshkumar Demkah
Dean-Universite Des Mascareignes

Preface

Pervasive Computing: A Networking Perspective and Future Directions is an inclusive guide to ubiquitous computing with an emphasis on pervasive networking.

The purpose of this book is to make the readers aware of the concepts and issues in pervasive computing and the future developments of pervasive systems. The organization of this book covers the explanation of complex issues in a fairly easy-to-understand manner. This book covers various facets of pervasive networking like novel algorithms and techniques in underwater sensor networks, ant colony-based routing, heterogeneous networks, agent-based distributed networks, cognitive radio networks, real-time wireless sensor network applications, machine translation, intelligent computing and ontology-based bit masking.

Organization of the Book

Chapter "Implementation of Authentication and Access Control Protocol for Heterogeneous Network" by Vivek Ugale et al. illustrates the implementation of mutual authentication and access control based on elliptic curve cryptography (MAACE) and ENergy-efficient Access control scheme Based on eLliptic curvE cryptography (ENABLE) for heterogeneous network on Network Simulator 2 platform with a comparison of performance evaluation of the authentication protocols.

Chapter "A Framework for Agent-Based Detection and Prevention of DDoS Attacks in Distributed P2P Networks" by Gera Jaideep et al. proposes an agent based architecture which would be capable to identify and prevent DDoS attacks. They have proposed an architecture that can detect and defend DDoS attacks. The proposed methodology takes care of traffic control, agent-based trace back and detection of DDoS attacks. The agent-based approach can keep track of details of all nodes. They have made extensive simulations in NS2 to demonstrate the proof of concept. The results revealed that the proposed methodology is capable of

detecting and preventing DDoS attacks and thus ensures Quality of Service (QoS) for genuine traffic.

Chapter "Comparative Analysis of Routing Algorithms for Underwater Sensor Network" by Gulista Khan et al. reviews various routing protocols for underwater sensor networks and classifies these protocols into two major categories based on location information and without location information. A comparison of all these protocols has been given along with the main idea of research articles and their research gap. After that, some ideas are given on which further research can be done in the field of underwater sensor networks.

Chapter "Resource Utilization of DTN Routing Protocols by Calculating Energy Consumption of Mobile Nodes" by Atul Sharma proposes the resource utilization of DTN routing protocols by calculating energy consumption of mobile nodes. In this chapter, the energy consumption of nodes during data transmission is calculated and the impact of node mobility on routing protocols has been observed.

Chapter "A Multiband Octagonal Slot Patch Antenna for Various Wireless Applications" by Anshul Jain et al. proposes a multiband octagonal slot patch antenna for various wireless applications. The proposed antenna works on three frequency bands with bandwidths 2.33–2.53 GHz, 5.08–5.3 GHz and 5.72–5.843 GHz with their resonant frequencies as 2.47 GHz, 5.2 GHz and 5.78 GHz, respectively. These three bands lay their uses for Bluetooth/IEEE 102.11b, HiperLAN/2 and WiMAX/ IEEE 802.11a. The return loss is much below -20 dB which justifies the efficient working of the antenna. However, the first frequency band of 2.33–2.53 GHz is much broader than that required for the application and hence will lead to interference. VSWR, radiation pattern, gain and directivity of the proposed antenna are also presented.

Chapter "Improving Network Lifetime of SEECH Clustering Algorithm Using Mobile Sinks and Rendezvous Nodes" by Vicky Kumar et al. proposes SEECH clustering algorithm which combines the concepts of mobile sink and rendezvous nodes. The new algorithm preserved the benefits of the SEECH algorithm, such as its self-organizing nature. Using the proposed algorithm, energy consumption decreased, particularly for large-scale networks. Improving the selection process for cluster heads was based on the energy remaining in the nodes. It is found that the first node death and the death of 25% of the nodes occur later in the presented algorithm; this improves as the size of the region increases.

Chapter "A Low Noise Figure and High-Gain Inductive Source Degenerative LNA for Wireless Application" by Anandini Devi et al. discusses a low noise figure and high-gain inductive source degenerative LNA for wireless application. A cascode inductive source degeneration LNA is presented which was designed using UMC 0.18-µm CMOS technology. The proposed LNA exhibits a very low noise figure of 0.88 dB, the minimum noise figure of 0.65 dB and a high gain of S21 of 14.42 dB with a power consumption of 5.22 mW from 1.8 V supply.

Chapter "Energy-Efficient Wireless Sensor's Routing Using Balanced Unequal Clustering Technique" by Mallika Mhatre et al. proposes an energy-efficient routing in unequal clustering (EERUC) technique. This technique starts with the preparation phase. During the setup phase, final CHs are selected based on internal

competition between temporary CHs whose competitive radius range intercepts with each other. In this technique, distance factor and node's residual energy are considered as important clustering parameters. This method effectively reduces clustering overhead by balancing energy consumption of the network. The results showed that the proposed technique improves the network lifetime as compared to the existing techniques.

Chapter "Performance Evaluation of Unitary Measurement Matrix in Compressed Data Gathering for Real-Time Wireless Sensor Network Applications" by Prateek Dolas et al. conducts the performance evaluation of unitary measurement matrix in compressed data gathering for real-time WSN applications. The authors proposed to use a unitary matrix as a measurement matrix to perform distributed compressed sensing to exploit both spatial correlation and temporal correlation in sensor network data. The parameters used for measuring the performance of the proposed scheme are the percentage by which overall network lifetime increases and the mean square error in reconstruction of the original signal from compressed signal at the sink.

Chapter "Energy-Efficient LEACH Protocol with Multipower Amplification for Wireless Sensor Networks" by Mr. A. Krishnakumar et al. proposes multipower amplification of energy-efficient LEACH protocol for WSNs. In this work, the traditional LEACH protocol is chosen for observation and cluster formation is considered for this scheme. The proposed model introduced the threshold energy and power amplification metrics which add together with the LEACH's probability function. The novel scheme identified, sets the purpose of the proposed metrics and is compared with some of the existing modified LEACH schemes. The comparison is processed using simulation, and the results show the proposed scheme and its betterment.

Chapter "Ontology-based Bitmasking Approach for Smart e-tourism System" by Monika Rani et al. proposes Dijkstra's algorithm with bitmasking to provide an optimal itinerary to e-tourist. The e-tourist needs only to mention his/her requirements as input and can immediately obtain an optimal path that fulfils all his/her requirements, with minimal time and cost.

Chapter "Prediction of Bus Arrival Time Using Intelligent Computing Methods" by Aditya Khamparia and Rubina Choudhary proposes a method for prediction of bus arrival time using intelligent computing methods. The objective of this research was to exploit the artificial neural network (ANN) techniques on the collected historical data using GPS. In this work, artificial neural network (ANN) and radial basis function (RBF) have been applied to collect data through GPS. In this work, the model is evaluated against a standard feedforward backpropagation algorithm (BPA) and radial basis function (RBF), which is used for prediction of bus arrival/departure time. Hence, it is proved that radial basis function (RBF) is observed as an intelligent model used in the computing bus arrival time using unpredictable factors as compared to the backpropagation algorithm.

Chapter "Energy-Efficient WSN Using Membership Handshaking Clustering Technique for Isolated Nodes" by Mallika Mhatre et al. proposes a new energy-efficient clustering technique with an isolated node (EEC-IN) which

overcomes node isolation issue. The technique could reduce networking traffic load and prolongs the lifetime of the network. Simulation results showed that the proposed technique improves the network lifetime more efficiently than existing technique.

Chapter "Comparative Analysis of Tree-Based Data Aggregation Protocols to Maximize Lifetime of Wireless Sensor Networks" by Manoj Kumar et al. conducts the comparative analysis of tree-based data aggregation protocols to maximize lifetime of wireless sensor networks. In this paper, the authors presented an analysis-based survey of data aggregation protocols for tree-based architecture in wireless sensor networks. The authors analysed each algorithm on the basis of performance measurements such as network lifetime, energy consumption and node distance. An approach was proposed to construct the data aggregation tree to maximize the network lifetime. In the proposed approach, authors used distance parameter to construct minimum spanning tree, and other parameters such as load and energy are preferred in a balanced manner to reduce the energy consumption and to maximize the network lifetime.

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Last but not least, we are also grateful to all the authors whose valued contributions have enriched the volume.

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About the Editors

Prof. (Dr.) Deepshikha Bhargava has rich experience of around two decades as an academician. At present, she is Professor at School of Computer Science, University of Petroleum and Energy Studies, Dehradun. She had been Director and Head at Amity Institute of Information Technology, Amity University Rajasthan, Jaipur, and had been associated for 12 years with Amity University. She has authored 15 books and more than 70 research papers in journals and conference proceedings of international and national repute. She is member of ACM; IEEE; International Association of Computer Science and Information Technology (IACSIT), Singapore; Computer Science Teachers Association (CSTA), USA; Computer Society of India (CSI); Project Management Institute (PMI); Indian Society of Lighting Engineers (ISLE); and Vigyan Bharati (VIBHA).

She is also serving as editor, member and *reviewer of Editorial Board of more than 10 international and national journals.* She is also Visiting Professor at Université des Mascareignes (UDM), Ministry of Education and Human Resources, Tertiary Education and Scientific Research, Mauritius. She is Past-chairman CSI Jaipur Chapter.

She has received the awards such as "Active Participation Woman Award" from CSI India and "Best Faculty of the Year" under subcategory "Authoring Books on Contemporary Subjects" at the CSI TechNext India in

2018; "Nobel Contribution in Education" in Jaipur; and "Late Smt. Nani Devi-Narayan Swaroop Bhargava Puraskar" for Outstanding Contribution in Research in the year 2013. She was also awarded by the Ministry of Human Resources and Development (Department of Education), Government of India, in the year 1992. She was also awarded "Outstanding Woman Educator and Scholar Award" at Women's Day Awards and Celebration 2015 organized by National Foundation for Entrepreneurship Development (NFED), Coimbatore, Tamil Nadu. She has received "Distinguished Professor" Award from Computer Society of India in 2017.

Her research areas include soft computing, bio-inspired computation and software agents.

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Dr. Sonali Vyas is serving as academician and research person for a decade. Currently, she is working as Assistant Professor, Amity Institute of Information Technology, Amity University Rajasthan, Jaipur. She completed her Ph.D. in computer science from the Jaipur National University, Rajasthan. Her research areas are database virtualization, data mining and big data analytics. At present, she is supervising four Ph.D. research scholars in the fields of data mining, big data analytics and data mining in IoT. She has also supervised M.Tech. scholar in computer science. Also, she has acted as project supervisor of master's degree in computer science and guided undergraduate and graduate students. She has published research papers in referred journals/conference proceedings such as *National Conference on Computational and Mathematical Sciences*, *Journal of Global Research Computer Science & Technology* (JGRCST), *International Conference on Computer Science and Information Technology: Trends, Challenges and Issues* (CSIT-TCI 2015), IEEE Delhi Section, *International Journal of Innovative Research in*

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