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Ning Lu

Xuemin (Sherman) Shen

Capacity Analysis of Vehicular Communication Networks

Vehicular Communication Springerbriefs Electrical Engineering

**Shaoquan Ni, Tsu-Yang Wu, Jingchun
Geng, Shu-Chuan Chu, George A.
Tsihrintzis**

Vehicular Communication Springerbriefs Electrical Engineering:

Mobility Modeling for Vehicular Communication Networks Khadige Abboud, Weihua Zhuang, 2016-02-19 This brief presents a stochastic microscopic mobility model that describes the temporal changes of intervehicle distances The model is consistent with simulated and empirical vehicle traffic patterns Using stochastic lumpability methods the proposed mobility model is mapped into an aggregated mobility model that describes the mobility of a group of vehicles In addition the proposed mobility model is used to analyze the spatiotemporal VANET topology Two metrics are proposed to characterize the impact of vehicle mobility on VANET topology the time period between successive changes in communication link state connection and disconnection and the time period between successive changes in node s one hop neighborhood Using the proposed lumped group mobility model the two VANET topology metrics are probabilistically characterized for different vehicular traffic flow conditions Furthermore the limiting behavior of a system of two hop vehicles and the overlap state of their coverage ranges is modeled and the steady state number of common vehicle neighbors between the two vehicles is approximately derived The proposed mobility model will facilitate mathematical analysis in VANETs The spatiotemporal VANET topology analysis provides a useful tool for the development of mobility aware vehicular network protocols Mobility Modeling for Vehicular Communication Networks is designed for researchers developers and professionals involved with vehicular communications It is also suitable for advanced level students interested in communications transport infrastructure and infotainment applications

Capacity Analysis of Vehicular Communication Networks Ning Lu, Xuemin (Sherman) Shen, 2013-09-21 This SpringerBrief focuses on the network capacity analysis of VANETs a key topic as fundamental guidance on design and deployment of VANETs is very limited Moreover unique characteristics of VANETs impose distinguished challenges on such an investigation This SpringerBrief first introduces capacity scaling laws for wireless networks and briefly reviews the prior arts in deriving the capacity of VANETs It then studies the unicast capacity considering the socialized mobility model of VANETs With vehicles communicating based on a two hop relaying scheme the unicast capacity bound is derived and can be applied to predict the throughput of real world scenarios of VANETs The downlink capacity of VANETs is also investigated in which access infrastructure is deployed to provide pervasive Internet access to vehicles Different alternatives of wireless access infrastructure are considered A lower bound of downlink capacity is derived for each type of access infrastructure The last section of this book presents a case study based on a perfect city grid to examine the capacity cost trade offs of different deployments since the deployment costs of different access infrastructure are highly variable

Cooperative Vehicular Communications in the Drive-thru Internet Haibo Zhou, Lin Gui, Quan Yu, Xuemin (Sherman) Shen, 2015-07-21 This brief presents a unified analytical framework for the evaluation of drive thru Internet performance and accordingly proposes an optimal spatial access control management approach A comprehensive overview and in depth discussion of the research literature is included It summarizes the main concepts and

methods and highlights future research directions The brief also introduces a novel cooperative vehicular communication framework together with a delicate linear cluster formation scheme and low delay content forwarding approach to provide a flexible and efficient vehicular content distribution in the drive thru Internet The presented medium access control and vehicular content distribution related research results in this brief provide useful insights for the design approach of Wi Fi enabled vehicular communications and it motivates a new line of thinking for the performance enhancements of future vehicular networking Advanced level students researchers and professionals interested in vehicular networks or coordinated network sharing will find Cooperative Vehicular Communications in the Drive thru Internet a valuable reference

Managing Electric Vehicle Power Sam Davis,2020-08-31 Power management involves all the power consumed in an electric vehicle EV so it impacts the vehicle s performance safety and driving range To provide these vehicle characteristics power management Ensures that the proper power voltage and current are applied to each electronic circuit Ensures that there is isolation between low voltage and highvoltage HV circuits Offers power circuit protection against electrical disturbances that can affect internal or external circuits Managing Electric Vehicle Power provides complete coverage for understanding how best to utilize the primary power source across all the EV s Electric Control Units Readers will also be introduced to the qualification standards of the Automotive Electronics Council AEC AEC standards are a one time qualification that typically takes place at the end of the development cycle

Opportunistic Spectrum Utilization in Vehicular Communication Networks Nan Cheng,Xuemin (Sherman) Shen,2015-08-04 This brief examines current research on improving Vehicular Networks VANETs examining spectrum scarcity due to the dramatic growth of mobile data traffic and the limited bandwidth of dedicated vehicular communication bands and the use of opportunistic spectrum bands to mitigate congestion It reviews existing literature on the use of opportunistic spectrum bands for VANETs including licensed and unlicensed spectrum bands and a variety of related technologies such as cognitive radio WiFi and device to device communications Focused on analyzing spectrum characteristics designing efficient spectrum exploitation schemes and evaluating the data delivery performance when utilizing different opportunistic spectrum bands the results presented in this brief provide valuable insights on improving the design and deployment of future VANETs

Heterogeneous Vehicular Networks Kan Zheng,Lin Zhang,Wei Xiang,Wenbo Wang,2016-03-18 This brief examines recent developments in the Heterogeneous Vehicular NETworks HETVNETs integrating cellular networks with Dedicated Short Range Communication DSRC for meeting the communications requirements of the Intelligent Transport System ITS services Along with a review of recent literature a unified framework of the HetVNET is presented The brief focuses on introducing efficient MAC mechanisms for vehicular communications including channel access protocols broadcast multicast protocols the location based channel congestion control scheme and the content based resource allocation scheme The cooperative communication between vehicles is discussed This brief concludes with a discussion on future research directions and provides the readers

with useful insights into the future designs in the HetVNETs to motivate new ideas for performance improvements in vehicular networks

Time Division Multiple Access For Vehicular Communications Hassan Aboubakr Omar, Weihua Zhuang, 2014-09-02 This brief focuses on medium access control MAC in vehicular ad hoc networks VANETs and presents VeMAC a novel MAC scheme based on distributed time division multiple access TDMA for VANETs The performance of VeMAC is evaluated via mathematical analysis and computer simulations in comparison with other existing MAC protocols including the IEEE 802.11p standard This brief aims at proposing TDMA as a suitable MAC scheme for VANETs which can support the quality of service requirements of high priority VANET applications

Vehicular-2-X Communication Radu Popescu-Zeletin, Ilja Radusch, Mihai Adrian Rigani, 2010-04-26 Universal vehicular communication promises many improvements in terms of accident avoidance and mitigation better utilization of roads and resources such as time and fuel and new opportunities for infotainment applications However before widespread acceptance vehicular communication must meet challenges comparable to the trouble and disbelief that accompanied the introduction of traffic lights back then The first traffic light was installed in 1868 in London to signal railway but only later in 1912 was invented the first red green electric traffic light And roughly 50 years after the first traffic light in 1920 the first four way traffic signal comparable to our today's traffic lights was introduced The introduction of traffic signals was necessary after automobiles soon became prevalent once the first car in history actually a wooden motorcycle was constructed in 1885 Soon the scene became complicated requiring the introduction of the right of way philosophy and later on the very first traffic light In the same way the traffic light was a necessary mean to regulate the beginning of the automotive life and to protect drivers passengers as well as pedestrians and other inhabitants of the road infrastructure vehicular communication is necessary to accommodate the further growth of traffic volume and to significantly reduce the number of accidents

Communication Systems for Electrical Engineers Mohammad A. Matin, 2017-12-28 This book is written as a very concise introduction for students taking a first course in communication systems It provides the reader with fundamentals of digital communication systems and disseminates the essentials needed for the understanding of wire and wireless communication systems for Electrical Engineers It covers important topics right from the beginning of the subject which communication engineers must understand Example problems in each chapter will help them in understanding the materials well The study of data networking will include multiple access reliable packet transmission routing and protocols of the internet The concepts taught in class will be discussed in the context of aerospace communication systems aircraft communications satellite communications The book includes example problems in each chapter to help the reader in understanding the materials well

Current Technologies in Vehicular Communication George Dimitrakopoulos, 2016-11-13 This book provides a concise and comprehensive overview of vehicular communication technologies It classifies all relevant standards protocols and applications so as to enable the reader to gain a holistic approach towards the subject of vehicular communications The primary methods are algorithmic processes and

simulation results First an overview and classification of vehicular technologies is presented Then the book focuses on specific applications of V2V and V2I communications Special attention is given to recent research and development results regarding R D projects in the field in cooperation with car manufacturing companies and universities at a global level Designed to facilitate understanding of vehicle to vehicle and vehicle to infrastructure technologies this textbook is appropriate for undergraduate and graduate students of vehicular communications or mobile networks

Advances in Smart Vehicular Technology, Transportation, Communication and Applications Shaoquan Ni,Tsu-Yang Wu,Jingchun Geng,Shu-Chuan Chu,George A. Tsihrintzis,2023-05-14 This book includes selected papers from the fifth International Conference on Smart Vehicular Technology Transportation Communication and Applications VTCA 2022 held in online mode during December 24 26 2022 The book includes research works from engineers researchers and practitioners interested in the advances and applications in the field of vehicle technology and communication The book covers four tracks namely 1 vehicular networking security 2 vehicular electronics 3 intelligent transportation systems and applications and 4 smart vehicular communication networks and telematics

Vehicular Networking Marc Emmelmann,Bernd Bochow,Christopher Kellum,2010-03-30 During the last 15 years the interest in vehicular communication has grown especially in the automotive industry Due to the envisioned mass market projects focusing on Car to X communication experience high public visibility This book presents vehicular communication in a broader perspective that includes more than just its application to the automotive industry It provides researchers engineers decision makers and graduate students in wireless communications with an introduction to vehicular communication focussing on car to x and train based systems Emphasizes important perspectives of vehicular communication including market area application areas and standardization issues as well as selected topics featuring aspects of developing prototyping and testing vehicular communication systems Supports the reader in understanding common characteristics and differences between the various application areas of vehicular communication Offers both an overview of the application area and an in depth discussion of key technologies in these areas Written by a wide range of experts in the field

Emerging Trends in Communication Networks Syed Faraz Hasan,2014-06-06 This book covers the state of the art in communication networks with the help of illustrative diagrams and recent references published in reputed journals and magazines The book gives readers a glimpse into the next generation of communication networks It explores topics that are currently in the research phase and or are expected to be deployed in recent future such as LTE networks and IPv6 networks This book is written for students researchers who wish to come up to date with the recent trends in telecommunications

Intelligent Transportation Systems Syed Faraz Hasan,Nazmul Siddique,Shyam Chakraborty,2017-09-18 This new edition continues to focus on the nuts and bolts of wireless network access for devices on board vehicles It has been updated to reflect on the most recent trends in the broad domain of Intelligent Transport Systems It covers 802 11ac a recent standard that is very useful in context where a large amount of

information is to be sent in a limited time window The new edition includes a thorough revision of the Vehicular Communication Issues and Standards chapter with new citations and a new subsection on security The new edition also cites numerous fresh research works to give readers an updated overview of the field An update on the time delay incurred by applications that always run in the background Skype etc is also covered The Future Directions and Research Ideas chapter is also largely re written An entirely new chapter on D2D communication keeping in view the vehicular context has been added in this edition This volume will be a useful addition to the libraries for both the students of wireless communication and those studying applied probability

Safety Message Broadcast in Vehicular Networks Yuanguo Bi, Haibo Zhou, Weihua Zhuang, Hai Zhao, 2016-12-16 This book presents the current research on safety message dissemination in vehicular networks covering medium access control and relay selection for multi hop safety message broadcast Along with an overall overview of the architecture characteristics and applications of vehicular networks the authors discuss the challenging issues in the research on performance improvement for safety applications and provide a comprehensive review of the research literature A cross layer broadcast protocol is included to support efficient safety message broadcast by jointly considering geographical location physical layer channel condition and moving velocity of vehicles in the highway scenario To further support multi hop safety message broadcast in a complex road layout the authors propose an urban multi hop broadcast protocol that utilizes a novel forwarding node selection scheme Additionally a busy tone based medium access control scheme is designed to provide strict priority to safety applications in vehicle to infrastructure communications This book offers useful insights into protocol design and inspires a new line of thinking in performance improvements for safety applications in vehicular networks It is a valuable resource for professionals researchers or advanced level students working in vehicular networks or quality of service

Vehicle Communications and Networks Weidong Xiang, 2015-02-07 This book collects the most recent and influential outcomes written by the active researchers and groups in the frontier of DSRC and LTE communities mainly focusing on physical layer challenges The main contents are vehicular channel measurement and modeling OFDM transmission under diverse Doppler shifts conditions high dynamic RF front ends Antenna and antenna array for vehicles advanced baseband processing link level simulations prototyping activities and experiments

VANET Hannes Hartenstein, Kenneth Laberteaux, 2009-11-04 This book provides an invaluable introduction to inter vehicular communications demonstrating the networking and communication technologies for reducing fatalities improving transportation efficiency and minimising environmental impact This book addresses the applications and technical aspects of radio based vehicle to vehicle and vehicle to infrastructure communication that can be established by short and medium range communication based on wireless local area network technology primarily IEEE 802.11 It contains a coherent treatment of the important topics and technologies contributed by leading experts in the field covering the potential applications for and their requirements on the communications system The authors cover physical and medium access

control layer issues with focus on IEEE 802 11 based systems and show how many of the applications benefit when information is efficiently disseminated and the techniques that provide attractive data aggregation also includes design of the corresponding middleware The book also considers issues such as IT security means and fundamental trade off between security and privacy current standardization activities such as IEEE 802 11p and the IEEE 1609 standard series Key Features Covers the state of the art in the field of vehicular inter networks such as safety and efficiency applications physical and medium access control layer issues middleware and security Shows how vehicular networks differ from other mobile networks and illustrates the idea of vehicle to vehicle communications with application scenarios and with current proofs of concept worldwide Addresses current standardization activities such as IEEE 802 11p and the IEEE 1609 standard series Offers a chapter on mobility models and their use for simulation of vehicular inter networks Provides a coherent treatment of the important topics and technologies contributed by leading academic and industry experts in the field This book provides a reference for professional automotive technologists OEMs and suppliers professionals in the area of Intelligent Transportation Systems and researchers attracted to the field of wireless vehicular communications Third and fourth year undergraduate and graduate students will also find this book of interest For additional information please visit <http://www.vanetbook.com>

Vehicular ad hoc Networks Claudia Campolo,Antonella Molinaro,Riccardo Scopigno,2015-06-11 This book presents vehicular ad hoc networks VANETs from the their onset gradually going into technical details providing a clear understanding of both theoretical foundations and more practical investigation The editors gathered top ranking authors to provide comprehensiveness and timely content the invited authors were carefully selected from a list of who s who in the respective field of interest there are as many from Academia as from Standardization and Industry sectors from around the world The covered topics are organized around five Parts starting from an historical overview of vehicular communications and standardization harmonization activities Part I then progressing to the theoretical foundations of VANETs and a description of the day one standard compliant solutions Part II hence going into details of vehicular networking and security Part III and to the tools to study VANETs from mobility and channel models to network simulators and field trial methodologies Part IV and finally looking into the future of VANETs by investigating alternative complementary communication technologies innovative networking paradigms and visionary applications Part V The way the content is organized with a differentiated level of technical details makes the book a valuable reference for a large pool of target readers ranging from undergraduate graduate and PhD students to wireless scientists and engineers to service providers and stakeholders in the automotive ITS ICT sectors

Intelligent Computing and Communication for the Internet of Vehicles Mushu Li,Jie Gao,Xuemin (Sherman) Shen,Lian Zhao,2023-01-04 This book investigates intelligent network resource management for IoV with the objective of maximizing the communication and computing performance of vehicle users Focusing on two representative use cases in IoV i e safety message broadcast and autonomous driving the authors

propose link layer protocol design and application layer computing task scheduling to achieve the objective given the unique characteristics and requirements of IoV In particular this book illustrates the challenges of resource management for IoV due to network dynamics such as time varying traffic intensity and vehicle mobility and presents intelligent resource management solutions to adapt to the network dynamics The Internet of Vehicles IoV enables vehicle to everything connectivity and supports a variety of applications for vehicles on the road Intelligent resource management is critical for satisfying demanding communication and computing requirements on IoV while the highly dynamic network environments pose challenges to the design of resource management schemes This book provides insights into the significance of adaptive resource management in improving the performance of IoV The customized communication protocol and computing scheduling scheme are designed accordingly by taking the network dynamics information as an integral design factor Moreover the decentralized designs of the proposed solutions guarantee low signaling overhead and high scalability A comprehensive literature review summarizing recent resource management schemes in IoV followed by the customized design of communication and computing solutions for the two IoV use cases is included which can serve as a useful reference for professionals from both academia and industry in the area of IoV and resource management Researchers working within this field and computer science and electrical engineering students will find this book useful as well

Low Power Wireless Data Communication and Vehicle Navigation System Srinivas Bandi,1999

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Table of Contents Vehicular Communication Springerbriefs Electrical Engineering

1. Understanding the eBook Vehicular Communication Springerbriefs Electrical Engineering
 - The Rise of Digital Reading Vehicular Communication Springerbriefs Electrical Engineering
 - Advantages of eBooks Over Traditional Books
2. Identifying Vehicular Communication Springerbriefs Electrical Engineering
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Vehicular Communication Springerbriefs Electrical Engineering
 - User-Friendly Interface
4. Exploring eBook Recommendations from Vehicular Communication Springerbriefs Electrical Engineering
 - Personalized Recommendations
 - Vehicular Communication Springerbriefs Electrical Engineering User Reviews and Ratings
 - Vehicular Communication Springerbriefs Electrical Engineering and Bestseller Lists
5. Accessing Vehicular Communication Springerbriefs Electrical Engineering Free and Paid eBooks

- Vehicular Communication Springerbriefs Electrical Engineering Public Domain eBooks
- Vehicular Communication Springerbriefs Electrical Engineering eBook Subscription Services
- Vehicular Communication Springerbriefs Electrical Engineering Budget-Friendly Options
- 6. Navigating Vehicular Communication Springerbriefs Electrical Engineering eBook Formats
 - ePub, PDF, MOBI, and More
 - Vehicular Communication Springerbriefs Electrical Engineering Compatibility with Devices
 - Vehicular Communication Springerbriefs Electrical Engineering Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Vehicular Communication Springerbriefs Electrical Engineering
 - Highlighting and Note-Taking Vehicular Communication Springerbriefs Electrical Engineering
 - Interactive Elements Vehicular Communication Springerbriefs Electrical Engineering
- 8. Staying Engaged with Vehicular Communication Springerbriefs Electrical Engineering
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Vehicular Communication Springerbriefs Electrical Engineering
- 9. Balancing eBooks and Physical Books Vehicular Communication Springerbriefs Electrical Engineering
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Vehicular Communication Springerbriefs Electrical Engineering
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Vehicular Communication Springerbriefs Electrical Engineering
 - Setting Reading Goals Vehicular Communication Springerbriefs Electrical Engineering
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Vehicular Communication Springerbriefs Electrical Engineering
 - Fact-Checking eBook Content of Vehicular Communication Springerbriefs Electrical Engineering
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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