Johannes Lambrechts Saurabh Sinha

Microsensing Networks for Sustainable Cities



Microsensing Networks For Sustainable Cities Smart Sensors Measurement And Instrumentation

Burak Kantarci, Sema Oktug

Microsensing Networks For Sustainable Cities Smart Sensors Measurement And Instrumentation:

Microsensing Networks for Sustainable Cities Johannes Lambrechts, Saurabh Sinha, 2016-01-20 This book explores the microsensing technologies and systems now available to monitor the quality of air and water within the urban environment and examines their role in the creation of sustainable cities against the background of the challenges posed by rapid urbanization The opening section addresses the theoretical and conceptual background of microsensing networks The coverage includes detailed description of microsensors supported by design specific equations and clear explanation of the ways in which devices that harvest energy from ambient sources can detect and quantify pollution The practical application of such systems in addressing environmental impacts within cities and in sustainable urban planning is then discussed with the aid of case studies in developing countries The book will be of interest to all who wish to understand the benefits of microsensing networks in promoting sustainable cities through better delivery of information on health hazards and improved provision of data to environmental agencies and regulatory bodies in order to assist in monitoring decision making and regulatory enforcement Sensor Network Methodologies for Smart Applications Krit, Salahddine, B?la?, Valentina Emilia, Elhoseny, Mohamed, Benlamri, Rachid, B?la?, Marius M., 2020-06-26 Technologies in today s society are rapidly developing at a pace that is challenging to stay up to date with As an increasing number of global regions are implementing smart methods and strategies for sustainable development they are continually searching for modern advancements within computer science sensor networks software engineering and smart technologies A compilation of research is needed that displays current applications of computing methodologies in the progression of global cities and how smart technologies are being utilized Sensor Network Methodologies for Smart Applications is a collection of innovative research on the methods of intelligent systems and technologies and their various applications within sustainable development practices While highlighting topics including machine learning network security and optimization algorithms this book is ideally designed for researchers scientists developers programmers engineers educators policymakers geographers planners and students seeking current research on smart technologies and sensor networks Intelligent Sensing, Instrumentation and Measurements Subhas Chandra Mukhopadhyay, 2013-03-21 Intelligent Sensing Instrumentation and Measurements addresses issues towards the development of sensor nodes for wireless Sensor Networks The fundamentals of sensors interfacing power supplies configuration of sensor node and GUI development are covered The book will be useful for engineers and researchers in the field especially for higher undergraduate and postgraduate students as well as practitioners working on the development of Wireless Sensor Networks or Smart Sensors Wireless Sensor Networks and Ecological Monitoring Subhas C Mukhopadhyay, Joe-Air Jiang, 2013-02-11 This book presents the state of the art technologies and solutions to tackle the critical challenges faced by the building and development of the WSN and ecological monitoring system but also potential impact on society at social medical and technological level This book is dedicated to Sensing

systems for Sensors Wireless Sensor Networks and Ecological Monitoring The book aims at Master and PhD degree students researchers practitioners especially WSN engineers involved with ecological monitoring The book will provide an opportunity of a dedicated and a deep approach in order to improve their knowledge in this specific field **Sensor Networks for** Sustainable Development Mohammad Ilyas, Sami S. Alwakeel, Mohammed M. Alwakeel, el-Hadi M. Aggoune, 2014-06-25 Recent advances in technology and manufacturing have made it possible to create small powerful energy efficient cost effective sensor nodes for specialized telecommunication applications nodes smart enough to be capable of adaptation self awareness and self organization Sensor Networks for Sustainable Development examines sensor network technologies that increase the quality of human life and encourage societal progress with minimal effect on the earth's natural resources and environment Organized as a collection of articles authored by leading experts in the field this valuable reference captures the current state of the art and explores applications where sensor networks are used for sustainable development in Agriculture Environment Energy Healthcare Transportation Disaster management Beneficial to designers and planners of emerging telecommunication networks researchers in related industries and students and academia seeking to learn about the impact of sensor networks on sustainable development Sensor Networks for Sustainable Development provides scientific tutorials and technical information about smart sensor networks and their use in everything from remote patient monitoring to Citizen in Sensor Networks Jordi Nin, Daniel Villatoro, 2013-12-19 This book improving safety on the roadways and beyond constitutes the proceedings of the Second International Conference on Citizen Sensor Networks CitiSens 2013 held in Barcelona Spain in September 2013 The 8 papers presented in this volume were carefully reviewed and selected from 16 submissions The topics covered are trajectory mining smart cities multi agents systems networks simulation smart sensors and clustering or data anonymization Smart Sensors Networks Fatos Xhafa, Fang-Yie Leu, Li-Ling Hung, 2017-06-14 Smart Sensors Networks Communication Technologies and Intelligent Applications explores the latest sensor and sensor networks techniques and applications showing how networked wireless sensors are used to monitor and gather intelligence from our surrounding environment It provides a systematic look at the unique characteristics of wireless sensor networks through their usage in a broad range of areas including healthcare for the elderly energy consumption industrial automation intelligent transportation systems smart homes and cities and more The book shows how sensor networks work and how they are applied to monitor our surrounding environment It explores the most important aspects of modern sensors technologies providing insights on the newest technologies and the systems needed to operate them Readers will find the book to be an entry point for understanding the fundamental differences between the various sensor technologies and their use in for different scenarios Indexing The books of this series are submitted to EI Compendex and SCOPUS Presents numerous specific use cases throughout showing practical applications of concepts Contains contributions from leading experts around the globe Collects in one place the latest thinking on an emerging topic Addresses the security and privacy issues inherent in

sensor deployment Wireless Sensor and Actuator Networks for Smart Cities Burak Kantarci, Sema Oktug, 2019-01-15 This book is a printed edition of the Special Issue Wireless Sensor and Actuator Networks for Smart Cities that was published in Battery-Free Sensor Networks for Sustainable Next-Generation IoT Connectivity G. S. Karthick, 2025-04-08 Battery free sensor networks emerge as a pivotal technology for enabling sustainable next generation Internet of Things IoT connectivity These networks leverage energy harvesting techniques such as solar thermal or radiofrequency RF energy to power sensors and devices eliminating the need for traditional batteries. This reduces the environmental impact of battery disposal while extending the operational lifetime of IoT devices making them more reliable and cost effective By harnessing energy sources battery free sensor networks hold the potential to revolutionize applications in smart cities industrial monitoring healthcare and agriculture contributing to the development of energy efficient self sustaining IoT systems Battery Free Sensor Networks for Sustainable Next Generation IoT Connectivity explores contemporary developments in battery free sensor networks and their pivotal role in advancing sustainable connectivity within the next generation IoT landscape It delves into the latest advancements challenges and applications of battery free sensor technologies offering insights into their design principles energy harvesting techniques communication protocols and deployment strategies This book covers topics such as healthcare monitoring sensor technology and sustainability and is a useful resource for engineers scientists environmentalists business owners academicians researchers and security professionals Smart Sensor Networks Umang Singh, Ajith Abraham, Arturas Kaklauskas, Tzung-Pei Hong, 2021-09-01 This book provides IT professionals educators researchers and students a compendium of knowledge on smart sensors and devices types of sensors data analysis and monitoring with the help of smart sensors decision making impact of machine learning algorithms and artificial intelligence related methodologies for data analysis and understanding of smart applications in networks Smart sensor networks play an important role in the establishment of network devices which can easily interact with physical world through plethora of variety of sensors for collecting and monitoring the surrounding context and allowing environment information Apart from military applications smart sensor networks are used in many civilian applications nowadays and there is a need to manage high volume of demands in related applications This book comprises of 9 chapters and presents a valuable insight on the original research and review articles on the latest achievements that contributes to the field of smart sensor networks and their usage in real life applications like smart city smart home e healthcare smart social sensing networks etc Chapters illustrate technological advances and trends examine research opportunities highlight best practices and standards and discuss applications and adoption Some chapters also provide holistic and multiple perspectives while examining the impact of smart sensor networks and the role of data analytics data sharing and its control along with future prospects Wireless Sensor and Actuator Networks for Smart Cities Burak Kantarci, Sema Oktug, 2018 Our lives are being transformed by the interplay between mobile networks wireless communications and artificial intelligence This transformation is an outcome of

the emerging Internet of Things IoT concept and advancements in computer architecture that translate into high computing power high performance processing and huge memory capacities In addition to the IoT cyber physical systems aim for the seamless integration of physical systems with computing and communication resources Furthermore in urban areas the integration of software defined sensor networks and sensing as a service concepts with legacy WSN based systems is leading to the transformation of conventional city services towards smart cities Smart energy smart driving smart homes smart living smart governance and smart health are just a few services that smart cities can offer This book focuses on novel solutions for wireless sensor and actuator networks in smart cities This Special Issue invites academic and industry researchers in computer science and engineering electrical engineering and communication engineering as well as ICT industry engineers and practitioners to contribute original articles in all aspects of wireless sensor networks and actuator systems for smart Smart Wireless Acoustic Sensor Network Design for Noise Monitoring in Smart Cities Rosa Ma Alsina-Pagès, Patrizia Bellucci, Giovanni Zambon, 2021-01-15 The Environmental Noise Directive END requires that a five year updating of noise maps is carried out to check and report on the changes that have occurred during the reference period The updating process is usually achieved using a standardized approach consisting of collecting and processing information through acoustic models to produce the updated noise maps This procedure is time consuming and costly and has a significant impact on the financial statement of the authorities responsible for providing the maps Furthermore the END requires that easy to read noise maps are made available to the public to provide information on noise levels and the subsequent actions to be undertaken by local and central authorities to reduce noise impacts In order to update the noise maps more easily and in a more effective way it is convenient to design an integrated system incorporating real time noise measurement and signal processing to identify and analyze the noise sources present in the mapping area e g road traffic noise leisure noise etc as well as to automatically generate and present the corresponding noise maps This wireless acoustic sensor network design requires transversal knowledge from accurate hardware design for acoustic sensors to network structure design and management of the information with signal processing to identify the origin of the measured noise and graphical user interface application design to present the results to end users This book is collection in which several views of methodology and technologies required for the development of an efficient wireless acoustic sensor network from the first stages of its design to the tests conducted during deployment its final performance and possible subsequent implications for authorities in terms of the definition of policies Contributions include several LIFE and H2020 projects aimed at the design and implementation of intelligent acoustic sensor networks with a focus on the publication of good practices for the design and deployment of intelligent networks in other locations Citizen in Sensor Networks Jordi Nin, Daniel Villatoro, 2013-01-05 This book constitutes the thoroughly refereed post conference proceedings of the First International Workshop on Citizen Sensor Networks CitiSens 2012 in Montpellier France on August 27 2012 The 7 revised full papers

presented together with 1 keynote lectures were carefully reviewed and selected from 16 submissions. The accepted papers deal with topics like crowdsourcing smart cities multi agent systems privacy in social networks data anonymity or smart Sensors and Actuators in Smart Cities Mohammad Hammoudeh, Mounir Arioua, 2018-05-04 This book is a printed edition of the Special Issue Sensors and Actuators in Smart Cities that was published in JSAN An Urban Citizen-sensor-network Approach. - Klein Innovatie Project, Leer-pilot Met Testbed, Inclusive Citizen Sensing Transparency and democracy of pollution monitoring Citizen sensor networks for fine grained measurements Assess fine grained measurements make time space cross cuttings visualize heath maps Data piping through channels using SOS Sensor no empty cockpit Brining together the best of experts crowds and systems algorithms for learning transacting teaching prioritizing Boulos et all 2011 Crowdsourcing citizen sensing and sensor web technologies for public and environmental health surveillance and crisis management trends OGC standards and application examples Visual Josene small sensor network in the city using wifi https vimeo com 128993807 Citizen sensor network Nijmegen Visual Josene small sensor network in the city using wifi https vimeo com 128993807 https vimeo com 128993807 https vimeo com 128993807 https vimeo com The Rise of Smart Cities Amir Hossein Alavi, Maria Feng, Pengcheng Jiao, Zahra Sharif-Khodaei, 2022-04-12 12899380 The Rise of Smart Cities Advanced Structural Sensing and Monitoring Systems provides engineers and researchers with a guide to the latest breakthroughs in the deployment of smart sensing and monitoring technologies The book introduces readers to the latest innovations in the area of smart infrastructure enabling technologies and howthey can be integrated into the planning and design of smart cities With this book in hand readers will find a valuable reference in terms of civil infrastructure health monitoring advanced sensor network architectures smart sensing materials multifunctional material and structures crowdsourced social sensing remote sensing and aerial sensing and advanced computation in sensornetworks Reviews the latest development in smart structural health monitoring SHM systems Introduces all major algorithms with a focus on practical implementation Includes real world applications and case studies Opens up a new horizon for robust structural sensing methods and their applications in smart cities Sustainable Wireless Sensor Networks Yen Kheng Tan, Winston Seah, 2010-12-14 Wireless Sensor Networks came into prominence around the start of this millennium motivated by the omnipresent scenario of small sized sensors with limited power deployed in large numbers over an area to monitor different phenomenon The sole motivation of a large portion of research efforts has been to maximize the lifetime of the network where network lifetime is typically measured from the instant of deployment to the point when one of the nodes has expended its limited power source and becomes in operational commonly referred as first node failure Over the years research has increasingly adopted ideas from wireless communications as well as embedded systems development in order to move this technology closer to realistic deployment scenarios In such a rich research area as wireless sensor networks it is

difficult if not impossible to provide a comprehensive coverage of all relevant aspects In this book we hope to give the reader with a snapshot of some aspects of wireless sensor networks research that provides both a high level overview as well as detailed discussion on specific areas Sensor Technologies Michael J. McGrath, Cliodhna Ni Scanaill, 2013-12-17 Sensor Technologies Healthcare Wellness and Environmental Applications explores the key aspects of sensor technologies covering wired wireless and discrete sensors for the specific application domains of healthcare wellness and environmental sensing It discusses the social regulatory and design considerations specific to these domains The book provides an application based approach using real world examples to illustrate the application of sensor technologies in a practical and experiential manner The book guides the reader from the formulation of the research question through the design and validation process to the deployment and management phase of sensor applications The processes and examples used in the book are primarily based on research carried out by Intel or joint academic research programs Sensor Technologies Healthcare Wellness and Environmental Applications provides an extensive overview of sensing technologies and their applications in healthcare wellness and environmental monitoring From sensor hardware to system applications and case studies this book gives readers an in depth understanding of the technologies and how they can be applied I would highly recommend it to students or researchers who are interested in wireless sensing technologies and the associated applications Dr Benny Lo Lecturer The Hamlyn Centre Imperial College of London This timely addition to the literature on sensors covers the broad complexity of sensing sensor types and the vast range of existing and emerging applications in a very clearly written and accessible manner It is particularly good at capturing the exciting possibilities that will occur as sensor networks merge with cloud based big data analytics to provide a host of new applications that will impact directly on the individual in ways we cannot fully predict at present It really brings this home through the use of carefully chosen case studies that bring the overwhelming concept of big data down to the personal level of individual life and health Dermot Diamond Director National Centre for Sensor Research Principal Investigator CLARITY Centre for Sensor Web Technologies Dublin City University Sensor Technologies Healthcare Wellness and Environmental Applications takes the reader on an end to end journey of sensor technologies covering the fundamentals from an engineering perspective introducing how the data gleaned can be both processed and visualized in addition to offering exemplar case studies in a number of application domains It is a must read for those studying any undergraduate course that involves sensor technologies It also provides a thorough foundation for those involved in the research and development of applied sensor systems I highly recommend it to any engineer who wishes to broaden their knowledge in this area Chris Nugent Professor of Biomedical Engineering University of Ulster What you ll learnThe relevant sensing approaches and the hardware and software components required to capture and interpret sensor data The importance of regulations governing medical devices A design methodology for developing and deploying successful home and community based technologies supported by relevant case studies Health wellness and environmental

sensing applications and how they work The challenges and future directions of sensing in these domains Who this book is for Sensor Technologies Healthcare Wellness and Environmental Applications is targeted at clinical and technical researchers engineers and students who want to understand the current state of the art in sensor applications in these domains The reader gains a full awareness of the key technical and non technical challenges that must be addressed in the development of successful end to end sensor applications Real world examples help give the reader practical insights into the successful development deployment and management of sensor applications The reader will also develop an understanding of the personal social and ethical impact of sensor applications now and in the future Table of ContentsChapter One Introduction Chapter Goal Reader should understand the key challenges and drivers for sensor application development The reader should also understand how sensor technologies can play a role in addressing some of the key challenges facing global society in the short to medium term 1 Book overview 2 Drivers for Sensor Applications Infrastructure Growth in Developing Countries Advances in Energy Harvesting New Applications Cost reduction Real time monitoring of situations to avoid unplanned downtime Security personal and national the internet of things 3 Challenges for Sensor Applications Power Efficient Operation in Harsh Environments Number of Deployable Nodes Safety and Regulations High Cost of Installation Security and Reliability sensor management 4 Global Megatrends and the opportunities for sensing technologies o Water and Food Constraints o Aging Demographics o Public Health o Pandemics o Security Chapter 2 Sensing and Sensor Fundamentals Chapter Goal Reader should understand existing sensor technologies which can be used in healthcare wellness and environmental domains They should also understand the role of smart sensors and smart phones as mobile sensing platforms and aggregators 1 Sensing Modalities Mechanical MEMS Optical ISFET TAS 2 Sensing Domains Air Water Noise Bacterial Chemical Kinematic DNA Physiological 3 Functional Characterisation of Sensors o Communication methods discrete wired wireless o Smart Sensors and Sensor Platforms MSP430 SHIMMER and telosB motes ATmega PIC 4 Smart Phones as mobile sensor platforms 5 Selecting and specifying sensors Chapter 3 Key Sensor Technology Components Hardware and Software Overview Chapter Goal Reader should have a high level understanding of the key hardware and software components which are necessary for the development of sensors systems and why technologies are selected for specific applications 1 Overview Sensor systems 2 MCU s TI MSP430 ATmega PIC a ADCs b Interrupts c Real time Clocks 3 Sensor Interfaces a Digital b Analog c I2C 4 Communications wired and wireless interfaces RS232 485 USB Ethernet FieldbusProprietary Short Range Wireless Protocols e g ANT BodyLAN Sensium Standard Short Range Protocols i IEEE 802 15 6 ii Bluetooth Smart Bluetooth iii 802 15 4 iv UWB Medium Range i Wi Fi 5 Data storage EEPROM sd card data forwarding 6 Power management and Energy Harvesting 7 Operating Systems and Software Development Environments SDK s Chapter 4 Sensor Network Architectures Chapter Goal Reader should understand the various approaches to the design of sensor network architectures scaling from body worn systems to ambient sensing to city scale deployments The reader

should also understand the advantages and disadvantages of current and evolving sensor network architectures 1 Sensor network architectures o Discrete Sensor o Sensor to aggregator o PAN WPAN smart clothing o Pervasive Ambient sensor networks o Wide area networks city wide country wide 2 Challenges in developing and deploying sensor networks 3 Current and Proposed Solutions o Remote sensor management o Edge Processing o Power harvesting o New communication standards Chapter 5 Adding Vibrancy to Sensor Data Chapter Goal Reader should understand the various methods to interpret and display sensor data to the user They will understand the importance of creating a data analysis plan from the outset and the different types of data analysis throughout the application stack 1 Data Literacy How can we intuitively answer questions with sensor data and contextualise answers 2 Data Quality a Calibration b Trust and Repudiation 3 Sensor Fusion combining sensory data from disparate sources 4 Data Mining 5 Data Visualisation 6 Openness data integration virtual sensors 7 Exploiting the power of the cloud Chapter 6 Regulation and Standards Chapter Goal Reader should understand the key technologies which impact or influence the development of sensor deployment and applications including the emerging standards and regulatory considerations 1 Regulatory Standards US EU Japan why which and how standards impact your application 2 Regulatory Issues Certification 3 Smartphones Considerations o Privacy and data security 4 Standards Bodies and Industry Groups o Continua Healthcare Alliance o ISO IEEE 11073 5 Wearable Wireless Health Communication Standards Chapter 7 Biosensing in Everyday Life Driving Biocontextual Aware Computing Chapter Goal Reader should understand the social relationships that create opportunities and barriers for widespread consumer based biosensing The reader should understand how the social world is shifting from sensor technologies of should to sensor technologies of could to facilitate new understandings of health and wellness and drive new methods and practices of personal data sharing 1 Data Security and Ownership Sharing and Managing Personal Data 2 Game Changing Pressure for Affordable Healthcare 3 Continuous Personal Data is Improving Lives 4 Emerging Tech Empowered Citizens 5 Sensing for Self Discovery Culture and Play 6 User feedback Supporting sustainable human behaviours leveraging the gaming culture Chapter 8 Development and Deployment of Sensor Technologies for Home and Community Settings Chapter Goal Reader should understand how to design a sensor deployment for a home or community The chapter informs the reader how to formulate the research question the deployment will address how to develop prototypes and manage and deploy them successful The chapter will finish with exemplar case studies of real world sensor deployments Study Design The Right QuestionHome Deployment ElementsHome Deployment ManagementThe Prototyping Design ProcessCase Studies Chapter 9 Body Worn and Ambient Sensor Applications for Assessment Monitoring and Diagnostics Chapter Goal Reader should at the end of this chapter have an understanding of the key characteristics of how body worn and ambient sensor applications and how they vary according to the domain in which they are deployed The reader will be presented with the key challenges faced in each domain and emerging solutions for these challenges 1 Drivers and Inhibitors Incidence of chronic diseases

aging demographics Adjusting provider compensation prevention medical work practice changes 2 Hospital based sensing for assessment and diagnosis 3 Supervised Assessment and Monitoring in Community Settings 4 Home Based Applications o Clinical grade sensing for patient monitoring o Body worn sensing e g PERS for monitoring and alerting o Passive sensing for monitoring and alerting e g ADL s 5 Key challenges Chapter 10 Wellness Fitness and Lifestyle Chapter Goal Reader should understand the key trends in how people use body worn sensors to manage their fitness and wellbeing Key applications include sensors for measuring activities in sports performance activity weight management and sleep tracking 1 Drivers and Inhibitors 2 Sports and fitness applications running walking cycling field sports Vital signs and physiological parameters Fitness gaming Wii Fit Kinect muscle movement body stress levels speed distance location Fitness Statistics and Analysis 3 Outdoor Activities o Pressure mountaineer and paragliding o GPS hiking cycling golf 4 Obesity and weight management 5 Sleep o Baby Monitoring o Sleep Quality health and social impacts o Sleep Apnoea Chapter 11 Environmental Monitoring for Health and Wellness Chapter Goal Reader should understand how sensors and sensor networks are used for environmental monitoring one of the key emerging applications domains Apart from disaster monitoring sensing also has the potential for air quality weather monitoring pollution etc with benefits for both urban and rural dwellers 1 Drivers and Inhibitors o Correlations to health impacts 2 Home Sensing o Carbon Monoxide o Smoke Detectors o Passive Infrared PIR o Temperature o Sound o Sustainable Living 3 Smart Environments 4 Environmental Parameters Noise Water Bacteria Air Quality Radiation Urban Heat Islands 5 Weather Exceptional Event and Disaster Management Intelligence Chapter 12 Conclusions and Future Directions Chapter Goal Reader should understand the key conclusions that the authors have outlined in the previous chapters The reader should also gain an understanding of the key trends which will affect future sensor applications and how people will utilise these novel applications in their everyday lives 1 Summary of the overall conclusions 2 Future Directions for Sensing o Use Centred Healthcare o Citizen centric sensing o Influence of urbanisation on health wellness and lifestyle choices o Sustainable human behaviour change **Advancement in Sensing Technology** Subhas Mukhopadhyay, Krishanthi Jayasundera, Anton Fuchs, 2012-09-06 The book presents the recent advancements in the area of sensors and sensing technology specifically in environmental monitoring structural health monitoring dielectric magnetic electrochemical ultrasonic microfluidic flow surface acoustic wave gas cloud computing and bio medical This book will be useful to a variety of readers namely Master and PhD degree students researchers practitioners working on sensors and sensing technology The book will provide an opportunity of a dedicated and a deep approach in order to improve their knowledge in this specific field Wireless Sensor Networks Fadi Al-Turjman, 2018-01-03 Wireless Sensor Networks overcome the difficulties of other monitoring systems However they require further efficiencies for Outdoor Environment Monitoring OEM applications due to their harsh operational conditions huge targeted areas limited energy budget and required 3D setups A fundamental issue in defeating these practical challenges is deployment planning The deployment plan

is a key factor of many intrinsic properties of OEM networks summarized in connectivity lifetime fault tolerance and cost effectiveness This book investigates the problem of WSNs deployments that address these properties in order to overcome the unique challenges and circumstances in OEM applications

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