Barrier Coverage With Wireless Sensors Iti Algorithmik Ii

This book introduces various coverage control problems for mobile sensor networks including barrier, sweep and blanket. Unlike many existing algorithms, all of the robotic sensor and actuator motion algorithms developed in the book are fully decentralized or distributed, computationally efficient, easily implementable in engineering practice and based only on information on the closest neighbours of each mobile sensor and actuator and local information about the environment. Moreover, the mobile robotic sensors have no prior information about the environment in which they operation. These various types of coverage problems have never been covered before by a single book in a systematic way. Another topic of this book is the study of mobile robotic sensor and actuator networks. Many modern engineering applications include the use of sensor and actuator networks to provide efficient and effective monitoring and control of industrial and environmental processes. Such mobile sensor and actuator networks are able to achieve improved performance and efficient monitoring together with reduction in power consumption and production cost. This book constitutes the refereed proceedings of the 13th International Conference on Mobile Ad-hoc and Sensor Networks, MSN 2017, held in Beijing, China, in December 2017. The 39 revised full papers presented were carefully reviewed and selected from 145 submissions. The papers address issues such as multi-

hop wireless networks and wireless mesh networks; sensor and actuator networks; vehicle ad hoc networks; mobile social network; delay tolerant networks and opportunistic networking; cyber-physical systems; internet of things; system modeling and performance analysis; routing and network protocols; data transport and management in mobile networks; resource management and wireless QoS provisioning; security and privacy; cross layer design and optimization; novel applications and architectures.

This book constitutes revised selected papers from the 14th International Symposium on Algorithms and Experiments for Wireless Sensor Networks, ALGOSENSORS 2018, held in Helsinki, Finland, in August 2018.The 15 full papers presented in this volume were carefully reviewed and selected from 39 submissions. ALGOSENSORS is an international symposium dedicated to the algorithmic aspects of wireless networks. Originally focused on sensor networks, it now covers algorithmic issues arising in wireless networks of all types of computational entities, static or mobile, including sensor networks, sensor-actuator networks, autonomous robots. The focus is on the design and analysis of algorithms, models of computation, and experimental analysis.

Barrier coverage is a critical issue in wireless sensor networks (WSNs) for security applications, which aims to detect intruders attempting to penetrate protected areas. However, it is difficult to achieve desired barrier coverage after initial random deployment of sensors because their locations cannot be controlled or

predicted. In this dissertation, we explore how to leverage the mobility capacity of mobile sensors to improve the quality of barrier coverage. We first study the 1-barrier coverage formation problem in heterogeneous sensor networks and explore how to efficiently use different types of mobile sensors to form a barrier with pre-deployed different types of stationary sensors. We introduce a novel directional barrier graph model and prove that the minimum cost of mobile sensors required to form a barrier with stationary sensors is the length of the shortest path from the source node to the destination node on the graph. In addition, we formulate the problem of minimizing the cost of moving mobile sensors to fill in the gaps on the shortest path as a minimum cost bipartite assignment problem and solve it in polynomial time using the Hungarian algorithm. We further study the k-barrier coverage formation problem in sensor networks. We introduce a novel weighted barrier graph model and prove that determining the minimum number of mobile sensors required to form k-barrier coverage is related with but not equal to finding k vertex-disjoint paths with the minimum total length on the WBG. With this observation, we propose an optimal algorithm and a faster greedy algorithm to find the minimum number of mobile sensors required to form k-barrier coverage. Finally, we study the barrier coverage formation problem when sensors have location errors. We derive the minimum number of mobile sensors needed to fill in a gap with a guarantee when location errors exist and propose a progressive method for mobile sensor deployment. Furthermore, we propose a

fault tolerant weighted barrier graph to find the minimum number of mobile sensors needed to form barrier coverage with a guarantee. Both analytical and experimental studies demonstrated the effectiveness of our proposed algorithms.

This book constitutes the proceedings of the 14th International Conference on Ad Hoc Networks and Wireless, ADHOC-NOW 2015, held in Athens, Greece in June/July 2015. The 25 full papers presented in this volume were carefully reviewed and selected from 52 submissions. The book also contains 3 full-paper invited talks. The contributions are organized in topical sections named: routing, connectivity, and resource allocation; localization, sensor deployment, and mobility management; distributed computing with mobile agents; efficient, reliable, and secure smart energy networks; and emerging communications, networking and computing technologies for VANETs 2.0.

This Springer Brief presents recent research results on area coverage for intruder detection from an energy-efficient perspective. These results cover a variety of topics, including environmental surveillance and security monitoring. The authors also provide the background and range of applications for area coverage and elaborate on system models such as the formal definition of area coverage and sensing models. Several chapters focus on energy-efficient intruder detection and intruder trapping under the well-known binary sensing model, along with intruder trapping under the probabilistic sensing model. The brief illustrates efficient algorithms rotate the duty of each sensor to prolong the network

lifetime and ensure intruder trapping performance. The brief concludes with future directions of the field. Designed for researchers and professionals working with wireless sensor networks, the brief also provides a wide range of applications which are also valuable for advanced-level students interested in efficiency and networking.

The advances in sensor design have decreased the size, weight, and cost of sensors by orders of magnitude, yet with the increase of higher spatial and temporal re- lution and accuracy. With the fast progress of sensors design and communications technique, sensor networks have also been quickly evolving in both research and practical domains in the last decade. More and more sensor networks have been - ployed in real-world to gather information for our daily life. Applications of sensor networks can be found in battle?eld surveillance, environmental monitoring, b- logical detection, smart spaces, industrial diagnostics, etc. Although the technique of sensor networks has a very promising future, many challenges are still deserving lots of research efforts for its successful applications. Thisbooki sdevotedtocoveragecontrol,oneofthemostfundamentalan dimportant research issues in sensor networks. The aim of the book is to provide tutorial-like and up-to-date reference resources on various coverage control problems in sensor networks, a hot topic that has been intensively researched in recent years. Due to some unique characteristics of sensor networks such as energy constraint and - hoc topology, the coverage problems in sensor networks have many new scenarios

and features that entitle them an important research issue in recent years. I have done my best to include in the book the most recent advances, techniques, protocols, results, and ?ndings in this ?eld.

This book constitutes the refereed proceedings of six workshops of the 14th International Conference on Web-Age Information Management, WAIM 2013, held in Beidaihe, China, June 2013. The 37 revised full papers are organized in topical sections on the six following workshops: The International Workshop on Big Data Management on Emerging Hardware (HardBD 2013), the Second International Workshop on Massive Data Storage and Processing (MDSP 2013), the First International Workshop on Emergency Management in Big Data Age (BigEM 2013), the International Workshop on Trajectory Mining in Social Networks (TMSN 2013), the First International Workshop on Location-based Query Processing in Mobile Environments (LQPM 2013), and the First International Workshop on Big Data Management and Service (BDMS 2013).

Abstract: Wireless sensor networks (WSN) promise to revolutionize the way we monitor our surroundings by enhancing our senses. Prototype systems are already being demonstrated. Several fundamental research issues, however, remain unaddressed. Sensing events being the main task of a WSN, appropriately addressing the issue of coverage is critical. In this dissertation, we make a two fold contribution on establishing a strong foundation for the issue of coverage. First, we argue that a single concept of coverage such as k-full coverage (where every point in the deployment region needs to be

within the monitoring range of at least k sensors) does not fit all applications. We propose a new concept of coverage called k-barrier coverage that is appropriate for intrusion detection applications. A WSN provides k-barrier coverage} if it guarantees that every penetrating object is detected by at least k sensors before crossing the barrier of sensors. Second, we address five foundational problems for the issue of k-barrier coverage: optimal deployment pattern, critical conditions, coverage status determination, coverage restoration, and optimal sleep wakeup. The problem of optimal deployment pattern is to determine a pattern of deployment that uses the minimum number of sensors. The problem of critical conditions is to derive conditions that can be used to determine the minimum number of sensors to deploy in probabilistic deployments. The problem of coverage status determination is to determine whether a deployed WSN provides a desired quality of monitoring. The problem of coverage restoration is to determine the minimum number of sensors to deploy, and their locations, such that a desired quality of monitoring can be restored in a deployed WSN. The problem of optimal sleep wakeup is to produce a sleeping schedule for sensors that maximizes the network lifetime. We comprehensively solve four of the five foundational problems. For the problem of critical conditions, we derive the conditions for a weaker notion of k-barrier coverage, called weak k-barrier coverage. In addition, we derive critical conditions for the case of k-full coverage.
Barrier Coverage with Wireless Sensor Networks

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This book constitutes the refereed proceedings of the 5th Annual International Conference on Wireless Algorithms, Systems, and Applications, WASA 2010, held in Beijing, China, in August 2010. The 19 revised full papers and 10 revised short papers presented together with 18 papers from 4 workshops were carefully reviewed and selected from numerous submissions. The papers are organized in topica sections on topology control and coverage, theoretical foundations, energy-aware algorithms and protocol design, wireless sensor networks and applications, applications and experimentation, scheduling and channel assignment, coding, information

theory and security, security of wireless and ad-hoc networks, data management and network control in wireless networks, radar and sonar sensor networks, as well as compressive sensing for communications and networking.

This book constitutes the refereed proceedings of the 15th Algorithms and Data Structures Symposium, WADS 2017, held in St. John's, NL, Canada, in July/August 2017. The 49 full papers presented together with 3 abstracts of invited talks were carefully reviewed and selected from 109 submissions. They present original research on the theory and application of algorithms and data structures in many areas, including combinatorics, computational geometry, databases, graphics, and parallel and distributed computing. The WADS Symposium, which alternates with the Scandinavian Symposium and Workshops on Algorithm Theory, SWAT, is intended as a forum for researchers in the area of design and analysis of algorithms and data structures.

Papers presenting original research on the theory and application of algorithms and data structures

A concise and clear guide to the concepts and applications of wireless sensor networks, ideal for students, practitioners and researchers.

For some intrusion detection applications, it may be the case that only one direction of crossing (the belt) is illegal. Therefore, we introduce a new coverage model called one-way barrier coverage. We investigate necessary conditions and sufficient conditions for one-way barrier coverage. We then study how to make a sensor network provide one-way barrier coverage with different barrier models or sensor models.

Lastly, this dissertation addresses another barrier-coverage problem. In many practical scenarios in barrier-coverage, it may be desirable to detect an intruder that enters the region through any of its sides and exits through any other of its sides. That is, not only detect top-down movement, but also side-to-side, and even turning from one side to another. We define a new barrier-coverage problem, namely, the Maximum Lifetime Reinforced Barrier-coverage (MaxLRB) problem, whose objective is to maximize the network lifetime such that any penetration of the intruder is detected. To solve the problem, we create a new form of sensor barriers, which we refer to as reinforced barriers, which can detect any movement variation of the intruder. Also, we propose three approaches to obtain these barriers from a given layout of sensor nodes, and we compare their relative performances through extensive simulations.

This book constitutes the refereed proceedings of the 14th China Conference on Wireless Sensor Networks, CWSN 2020 held in Dunhuang, China, in September 2020. The 20 full papers were carefully reviewed and selected from 85 submissions. The papers are organized in topical sections on wireless sensor network theory and technology, basic theory and application of internet of things, internet of things security and privacy protection, and perception and positioning.

This book will serve as a reference, presenting state-of-the-art research on theoretical aspects of optimal sensor coverage problems. Readers will find it a useful tool for furthering developments on theory and applications of optimal coverage; much of the content can serve as material for advanced topics courses at the graduate level. The book is well versed with the hottest research topics such as Lifetime of Coverage, Weighted Sensor Cover, k-Coverage, Heterogeneous Sensors, Barrier, Sweep and Partial Coverage, Mobile Sensors, Camera Sensors and Energy-

Harvesting Sensors, and more. Topics are introduced in a natural order from simple covers to connected covers, to the lifetime problem. Later, the book begins revisiting earlier problems ranging from the introduction of weights to coverage by k sensors and partial coverage, and from sensor heterogeneity to novel problems such as the barrier coverage problem. The book ends with coverage of mobile sensors, camera sensors, energy-harvesting sensors, underwater sensors, and crowdsensing.

In the last decade, wireless or wired sensor networks have attracted much attention. However, most designs target general sensor network issues including protocol stack (routing, MAC, etc.) and security issues. This book focuses on the close integration of sensing, networking, and smart signal processing via machine learning. Based on their world-class research, the authors present the fundamentals of intelligent sensor networks. They cover sensing and sampling, distributed signal processing, and intelligent signal learning. In addition, they present cutting-edge research results from leading experts.

ALGOSENSORS, the International International Workshop on Algorithmic - pectsofWirelessSensorNetworks,isanannualforu mforpresentationofresearch on all algorithmic aspects of sensor networks, including the theory, design, an- ysis, implementation, and application of algorithms for sensor networks. The 5th edition of ALGOSENSORS was held during July 10–11, 2009, on Rhodes, Greece. There were 41 extended abstracts submitted to ALGOSENSORS this year, and this volume contains the 21 contributions selected by the Program C- mittee. All submitted papers were read and evaluated by at least three Program Committeemembers,assi stedbyexternalreviewers.The?naldecisionregarding every paper was taken following an electronic discussion. The proceedings also include two two-page-long Brief

Announcements (BA). TheseBAsarepresentationsofongoingw orksforwhichfullpapersarenotready yet, or of recent results whose full description will soon be presented or has been recently presented in other conferences. Researchers use the BA track to quickly draw the attention of the community to their experiences, insights and results from ongoing distributed computing research and projects. ALGOSENSORS 2009 was organized in cooperation with the EATCS and ICALP 2009. The support of Ben-Gurion University, the Foundations of Ad- tiveNetworkedSocieties ofTinyArtefacts(FRONTS) project,andCTIisgra- fully acknowledged. August 2009 Shlomi Dolev S C T A E Organization ALGOSENSORS, the International International Workshop on Algorithmic - pects of WirelessSensor Networks,is an annual forum for researchpresentations on all algoritmicfacets of sensor networks.ALGOSENSORS 2009 wasorganized in cooperation with the EATCS and ICALP 2009.

This book constitutes the refereed proceedings of the 10th International Symposium on Parallel Architectures, Algorithms and Programming, PAAP 2019, held in Guangzhou, China, in December 2019. The 39 revised full papers and 8 revised short papers presented were carefully reviewed and selected from 121 submissions. The papers deal with research results and development activities in all aspects of parallel architectures, algorithms and programming techniques.

This book constitutes the refereed proceedings of the 6th China Conference on Advances in Wireless Sensor Networks, held in Huangshan, China, in October 2012. The 70 revised full papers were carefully reviewed and selected from 458 submissions. The papers cover a wide range of topics including in the wireless sensor network fields nodes systems, infrastructures, communication

protocols, and data management.
This book constitutes the refereed proceedings of the 4th
International Symposium on Ubiquitous Networking,
UNet 2018, held in Hammamet, Morocco, in May 2018.
The 35 full papers presented together with 5 short
papers in this volume were carefully reviewed and
selected from 87 submissions. The focus of UNet is on
technical challenges and solutions related to such a
widespread adoption of networking technologies,
including broadband multimedia, machine-to-machine
applications, Internet of things, security and privacy, data
engineering, sensor networks and RFID technologies.
During the last one and a half decades, wireless sensor
networks have witnessed significant growth and
tremendous development in both academia and industry.
A large number of researchers, including computer
scientists and engineers, have been interested in solving
challenging problems that span all the layers of the
protocol stack of sensor networking systems. Several
venues, such as journals, conferences, and workshops,
have been launched to cover innovative research and
practice in this promising and rapidly advancing field.
Because of these trends, I thought it would be beneficial
to provide our sensor networks community with a
comprehensive reference on as much of the findings as
possible on a variety of topics in wireless sensor
networks. As this area of research is in continuous
progress, it does not seem to be a reasonable solution to
keep delaying the publication of such reference any
more. This book relates to the second volume and
focuses on the advanced topics and applications of

wireless sensor networks. Our rationale is that the second volume has all application-specific and non-conventional sensor networks, emerging techniques and advanced topics that are not as matured as what is covered in the first volume. Thus, the second volume deals with three-dimensional, underground, underwater, body-mounted, and societal networks. Following Donald E. Knuth's above-quoted elegant strategy to focus on several important fields (The Art of Computer Programming: Fundamental Algorithms, 1997), all the book chapters in this volume include up-to-date research work spanning various topics, such as stochastic modeling, barrier and spatiotemporal coverage, tracking, estimation, counting, coverage and localization in three-dimensional sensor networks, topology control and routing in three-dimensional sensor networks, underground and underwater sensor networks, multimedia and body sensor networks, and social sensing. Most of these major topics can be covered in an advanced course on wireless sensor networks. This book will be an excellent source of information for graduate students majoring in computer science, computer engineering, electrical engineering, or any related discipline. Furthermore, computer scientists, researchers, and practitioners in both academia and industry will find this book useful and interesting. This monograph covers different aspects of sensor network security including new emerging technologies. The authors present a mathematical approach to the topic and give numerous practical examples as well as case studies to illustrate the theory. The target audience

primarily comprises experts and practitioners in the field of sensor network security, but the book may also be beneficial for researchers in academia as well as for graduate students.
Adaptive techniques play a key role in modern wireless communication systems. The concept of adaptation is emphasized in the Adaptation in Wireless Communications Series through a unified framework across all layers of the wireless protocol stack ranging from the physical layer to the application layer, and from cellular systems to next-generation wireless networks. Adaptation and Cross Layer Design in Wireless Networks is devoted to adaptation in the data link layer, network layer, and application layer. The book presents state-of-the-art adaptation techniques and methodologies, including cross-layer adaptation, joint signal processing, coding and networking, selfishness in mobile ad hoc networks, cooperative and opportunistic protocols, adaptation techniques for multimedia support, self –organizing routing, and tunable security services. It presents several new theoretical paradigms and analytical findings which are supported with various simulation and experimental results. Adaptation in wireless communications is needed in order to achieve high capacity and ubiquitous communications. The current trend in wireless communication systems is to make adaptation dependent upon the state of the relevant parameters in all layers of the system. Focusing on simplified cross layer design approaches, this volume describes advanced techniques such as adaptive resource management, adaptive modulation and coding,

4G communications, QoS, diversity combining, and energy and mobility aware MAC protocols. The first volume in the series, Adaptive Signal Processing in Wireless Communications (cat no.46012) covers adaptive signal processing at the physical layer.
This book constitutes the refereed proceedings of the 8th International Conference on Combinatorial Optimization and Applications, COCOA 2014, held on the island of Maui, Hawaii, USA, in December 2014. The 56 full papers included in the book were carefully reviewed and selected from 133 submissions. Topics covered include classic combinatorial optimization; geometric optimization; network optimization; optimization in graphs; applied optimization; CSoNet; and complexity, cryptography, and games.
This book features selected papers presented at the 3rd International Conference on Wireless Communications and Applications (ICWCA 2019), held at Hainan University, China. Focusing on applications of the latest smart theories and approaches, and recent advances in the field, it covers topics such as OFDM and multi-carrier techniques; smart antenna and space-time signal processing; MIMO, multi-user MIMO, and massive MIMO; modulation, coding, and diversity techniques; dynamic spectrum access and cognitive radio; interference management and radio resource allocation; equalization techniques; synchronization, estimation, and detection techniques; and wireless multiple access (e.g. CDMA, OFDMA, NOMA,).
This book constitutes the refereed proceedings of the 8th China Conference of Wireless Sensor

Networks, held in Xi'an, China, in October/November 2014. The 64 revised full papers were carefully reviewed and selected from 365 submissions. The papers are organized in topical sections on power control and management; network architecture and deployment; positioning and location-based services in wireless sensor networks; security and privacy; wireless communication systems and protocols; routing algorithm and transport protocols in wireless sensor networks; wireless communication protocols and sensor data quality, integrity and trustworthiness; Internet of Things; wireless mobile network architecture, in-vehicle network; indoor positioning and location-based services; applications of wireless sensor networks.

"This book is structured into sections that look at some of the challenges related to coalition operations in different types of networks, such as communications and information networks and human and cognitive networks, and looks at other issues that impact the operations of coalitions, the management and use of policies across different organizations"--Provided by publisher.

This book constitutes the refereed proceedings of the 13th China Conference on Wireless Sensor Networks, CWSN 2019, held in Chongqing, China, in October 2019. The 27 full papers were carefully reviewed and selected from 158 submissions. The papers are organized in topical sections on

fundamentals on Internet of Things; applications on Internet of Things; and IntelliSense, location and tracking.

We study the problem of barrier coverage with a wireless sensor network. Each sensor is modelled by a point in the plane and a sensing disk or coverage area centered at the sensor's position. The barriers are usually modelled as a set of line segments on the plane. The barrier coverage problem is to add new sensors or move existing sensors on the barriers such that every point on every barrier is within the coverage area of some sensors. Barrier coverage using sensors has important applications, including intruder detection or monitoring the perimeter of a region. Given a set of barriers and a set of sensors initially located at general positions in the plane, we study three problems for relocatable sensors in the centralized setting: the feasibility problem, and the problems of minimizing the maximum or the average relocation distances of sensors (MinMax and MinSum respectively) for barrier coverage. We show that the MinMax problem is strongly NP-complete when sensors have arbitrary ranges and can move to arbitrary positions on the barrier. We also study the case when sensors are restricted to use perpendicular movement to one of the barriers. We show that when the barriers are parallel, both the MinMax and MinSum problems can be solved in polynomial time. In contrast, we show

that even the feasibility problem is strongly NP-complete if two perpendicular barriers are to be covered. For the barrier coverage problem in distributed settings, we give the first distributed local algorithms for fully synchronous unoriented sensors. Our algorithms achieve barrier coverage for a line segment barrier when there are enough sensors to cover the entire barrier. Our first algorithm is oblivious and terminates in n2? time, whereas our second one uses two bits of memory at each sensor, and takes n steps, which is asymptotically optimal. However, if the sensors are semi-synchronous, and do not share the same orientation, we show that no algorithm exists that always terminates within finite time. Finally, for sensors that share the same orientation we give an algorithm that terminates within finite time, even if all sensors are fully asynchronous. Finally, we study barrier coverage with multi-round random deployment using stationary sensors. We analyze the probability of barrier coverage with uniformly dispersed sensors as a function of parameters such as length of the barrier, the width of the intruder, the sensing range of sensors, as well as the density of deployed sensors. We propose two specific deployment strategies and analyze the expected number of deployment rounds and deployed sensors for each strategy. We present a cost model for multi-round sensor deployments, and for each deployment strategy we find the optimal

density of sensors to be deployed in each round that minimizes the total expected cost. Our results are validated by extensive simulations.

This book constitutes revised selected papers from the 13th International Symposium on Algorithms and Experiments for Wireless Sensor Networks, ALGOSENSORS 2017, held in Vienna, in September 2017. The 17 full papers presented in this volume were carefully reviewed and selected from 30 submissions. ALGOSENSORS is an international symposium dedicated to the algorithmic aspects of wireless networks. Originally focused on sensor networks, it now covers algorithmic issues arising in wireless networks of all types of computational entities, static or mobile, including sensor networks, sensor-actuator networks, autonomous robots. The focus is on the design and analysis of algorithms, models of computation, and experimental analysis.

This book constitutes the thoroughly refereed post-conference proceedings of the 8th International Workshop on Algorithms for Sensor Systems, Wireless Ad Hoc Networks, and Autonomous Mobile Entities, ALGOSENSORS 2012, held in Ljubljana, Slovenia, in September 2012. The 11 revised full papers presented together with two invited keynote talks and two brief announcements were carefully reviewed and selected from 24 submissions. The papers are organized in two tracks: sensor networks

- covering topics such as barrier resilience, localization, connectivity with directional antennas, broadcast scheduling, and data aggregation; and ad hoc wireless and mobile systems - covering topics such as: SINR model; geometric routing; cognitive radio networks; video delivery; and mapping polygons.

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