

Resource Allocation for Wireless Networks

Merging the fundamental principles of resource allocation with the state of the art in research and application examples, Han and Liu present a novel and comprehensive perspective for improving wireless system performance. Cross-layer multiuser optimization in wireless networks is described systematically. Starting from the basic principles, such as power control and multiple access, coverage moves to the optimization techniques for resource allocation, including formulation and analysis and game theory. Advanced topics, such as dynamic resource allocation and resource allocation in antenna-array processing and in cooperative, sensor, personal-area, and ultrawide-band networks, are then discussed. Unique in its scope, timeliness, and innovative author insights, this invaluable work will help graduate students and researchers understand the basics of wireless resource allocation while highlighting modern research topics and will help industrial engineers improve system optimization.

Zhu Han is currently an assistant professor in the Electrical and Computer Engineering Department at Boise State University, Idaho. In 2003, he was awarded his Ph.D. in electrical engineering from the University of Maryland, College Park. Zhu Han has also worked for a period in industry, as an R & D Engineer for JDSU. Dr. Han is PHY/MAC Symposium Vice Chair of the IEEE Wireless Communications and Networking Conference, 2008.

K. J. Ray Liu is a Distinguished Scholar–Teacher of the University of Maryland, College Park. Dr. Liu is the recipient of numerous honors and awards, including best paper awards from IEEE Signal Processing Society (twice), IEEE Vehicular Technology Society, and EURASIP, as well as recognitions from University of Maryland, including the university-level Invention of the Year Award and the college-level Poole and Kent Company Senior Faculty Teaching Award.

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Zhu Han and K. J. Ray Liu

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Basics, Techniques, and Applications

ZHU HAN

Boise State University, Idaho

K. J. RAY LIU

University of Maryland, College Park



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To my wife as well as my parents and sister in China.

– Zhu Han

To Lynne Liu.

– K. J. Ray Liu

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Preface

Because of fading channels, user mobility, energy/power resources, and many other factors, cross-layer design and multiuser optimization are the keys to ensuring overall system performance of wireless networks. And resource allocation is one of the most important issues for implementing future wireless networks.

In the past decade, we have witnessed significant progress in the advance of resource allocation over wireless networks. It is not only an important research topic, but is also gradually becoming an integral teaching material for graduate-level networking courses.

Yet there are few books available to date that can serve such a purpose. Why? Because the field of resource allocation is such a versatile area that covers a broad range of issues, it is not easy to develop a comprehensive book to cover them all. For instance, resource allocation across various networking layers encounters different design constraints and parameters; different networking scenarios have different performance goals and service objectives; and different formulations of resource allocations need to employ different optimization tools.

To respond to the need of such a book for graduate students, researchers, and engineers, we try to tackle the difficulties by bringing together our research in resource allocation over the past decade and the basic material of resource allocation and optimization techniques to form the foundation of this book. Its intent is to serve either as a textbook for advanced graduate-level courses on networking or as a reference book for self-study by researchers and engineers.

This book covers three main parts. In Part I, the basic principles of resource allocation is discussed. Part II provides the background of optimization tools needed to conduct research and development in resource allocation. And in Part III, examples of advanced topics in resource allocation for different networking scenarios are the focus, to illustrate what one may encounter in different applications.

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Zhu Han
K. J. Ray Liu