Texts in Theoretical Computer Science
An EATCS Series

Subir Bandyopadhyay

Dissemination of Information in Optical Networks

From Technology to Algorithms

In Cooperation with Ralf Klasing

With 95 Figures and 4 Tables

Springer

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This book is dedicated to the memory of my parents Sushobhan and Nandini and my grandparents Krishnadhan, Dhirabati, Atulyadhan, Nirabati, Sudhansu, and Usha.

Preface

For the last twenty years, communication between computers has been one of the most important and all-pervasive features of the computer revolution. Early computer networks used copper wires as the physical medium for communication. Important limitations of copper as a medium include its relatively high attenuation, susceptibility to malicious attacks, and electromagnetic interference. The tremendous growth of the Internet and the World Wide Web has made high-bandwidth computer communication a crucial and strategic infrastructure. Deregulation of the telephone industry and the dramatic increase of data, as opposed to voice, traffic over communication networks have also spurred the deployment of high-speed networks. The rapid growth of optical networks is primarily due to the inherent high speed and the reliability of optical communication. First-generation optical networks simply replaced copper wires by optical cables, to take advantage of the higher bandwidth of optical communication, with switching and other network operations handled, as before, by electronics. The speed of electronic processing is the bottleneck for such networks. In second-generation optical networks, the routing, switching, and many other network operations are done at the optical level. Second-generation optical networks are being increasingly deployed to meet the ever increasing demand for high speed backbone networks.

This book is the second in a series of books on communication networks. The first book, entitled "Dissemination of Information in Communication Network", by Juraj Hromkovič, Ralf Klasing, Andrzej Pelc, Peter Ružička, and Walter Unger, dealt with classical direct communication between connected pairs of nodes of a communication network. This book primarily deals with second-generation optical networks and is intended to be a textbook for graduate students, as well as a monograph, surveying the main areas of research in second-generation optical networks. Every effort has been made to create a self-contained book that stresses the fundamentals, in depth and in detail. In particular, the mathematical programs, often used in optimizing optical networks, have been explained carefully so that the readers can feel confident in developing similar formulations. Interesting problems have been posed as exercises. Appendices on topics such as linear programming and network flow programming have been included to help readers unfamiliar with these areas. Students will find it convenient to test their understanding of the subject by solving problems given in each chapter. The bibliographic notes section in each chapter gives a comprehensive review of work in the area. Students interested in pursuing further studies in a subtopic should find the bibliographic notes helpful in narrowing down their literature search.

Professor Dr. Juraj Hromkovič, ETH, Zurich, invited me to write this book. I would like to take this opportunity to thank him for his unstinting help and generous advice throughout this period. I also very much enjoyed the warm hospitality I enjoyed during my trips to Zurich. Dr. Ralf Klasing, CNRS, LaBRI, Université Bordeaux, wrote most of Chapter 4. He took enormous pains to proofread the book several times and made many significant improvements to it. I am most grateful to him for his advice, and have learned a lot from his meticulous approach to this project. Drs. Arunita Jaekel and Yash Aneja of the University of Windsor read the book carefully and made numerous useful suggestions for improvements. Dr Jaekel was also very helpful in finalizing the bibliographic notes sections in different chapters. The help I received from my graduate students was very useful. In particular, I would like to mention Ataul Bari, Abul Kalam, Vic Ho, Quazi Rahman, A. K. M. Aktaruzzaman, and Delwar Faruque for their help and suggestions.

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