Preface

Thousands of mini computers (comparable to a stick of chewing gum in size), equipped with sensors, are deployed in some terrain or other. After activation the sensors form a self-organized network and provide data, for example about a forthcoming earthquake.

The trend towards wireless communication increasingly affects electronic devices in almost every sphere of life. Conventional wireless networks rely on infrastructure such as base stations; mobile devices interact with these base stations in a client/server fashion. In contrast, current research is focusing on networks that are completely unstructured, but are nevertheless able to communicate (via several hops) with each other, despite the low coverage of their antennas. Such systems are called *sensor* or *ad hoc networks*, depending on the point of view and the application.

Wireless ad hoc and sensor networks have gained an incredible research momentum. Computer scientists and engineers of all flavors are embracing the area. Sensor networks have been adopted by researchers in many fields: from hardware technology to operating systems, from antenna design to databases, from information theory to networking, from graph theory to computational geometry.

Both the tremendous growth of the subject and the broad interdisciplinary community make research progress in wireless ad hoc and sensor networking incredibly difficult to follow and apprehend. What are the key concepts of wireless multi-hop networks? Which of the fundamentals that will still be valid in 10 or 20 year's time? What are the main techniques, and why do they work?

This book is a naïve snapshot of the current research on wireless ad hoc and sensor networks. Whenever possible, we focus on algorithmic results, that is, algorithms and protocols that allow for an analysis of their efficiency and efficacy. Often these algorithmic results are complemented by lower bounds, showing that some problems cannot be solved in a better way. Many of our chapters deal with distributed algorithms, in particular local and localized

algorithms. Many problems are of an inherently distributed nature, as nodes locally sense data, or locally need to decide on a media access scheme.

Our survey is by no means complete; some topics presented in the book may be identified as wrong paths in a few year's time, and other important aspects might be missing. Most likely, some topics have made it into the book because of their *algorithmic* beauty rather than their *practical* importance. Not surprisingly, one might add. After all, these topics were either proposed or selected (from a much larger list of topics) by the participants of a *GI-Dagstuhl Seminar* held in Dagstuhl on November 23-25, 2005.

The idea of the GI-Dagstuhl Seminars is to provide young researchers with the opportunity to become actively involved in new relevant and interesting areas of computer science. Based on a list of topics and references offered by the organizers, the participants prepared overview lectures that were presented and discussed at the research seminar in Dagstuhl. Each chapter was then elaborated and carefully cross-reviewed by the participants. Although we are aware that further progress has been made since this book was written, we hope to provide at least a first overview of algorithmic results in the field, making the book a suitable basis for an advanced course.

It is our pleasure to thank the young researchers who put a huge amount of work into this book, not only as authors of the chapters but also as reviewers of other chapters. Special thanks go to Steffen Mecke and Frank Schulz who invested a lot of administrative work in the preparation of the seminar. Moreover, Steffen Mecke handled most of the technical parts of the editing process. Finally, we would like to thank the *Gesellschaft für Informatik e.V.* (GI) and *IBFI Schloss Dagstuhl* for supporting this book and the GI-Dagstuhl Seminar.

April 2007   Dorothea Wagner
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