

# Preface

During the past decade, many wireless communication techniques have been developed to achieve various goals such as higher data rate, more robust link quality, and higher number of users in a given bandwidth. For wireless communication systems, depending on the availability of a feedback link, two approaches can be considered: namely open and closed loop. Open loop communication system that does not exploit the channel knowledge at the transmitter is now well understood from both a theoretical and practical point of view. On the other hand, closed loop based communication systems have emerged as a promising solution to increase the data rate and the robustness of the communication links by using channel state information. The performance of single input single output (SISO) closed loop wireless communication systems can be improved with adaptive modulation and coding and power allocation by exploiting channel state information at the transmitter. The potential gains are tremendous in the case of multiuser multiple input multiple output (MIMO) systems where it can be possible to communicate to more than one user. Furthermore, cooperative multicell transmission is a recent solution to increase data rate and reduces outage in wireless networks by mitigating intercell interference caused by the other cells. The channel state information at the transmitter can be obtained through the feedback link. Since it is important to limit the amount of information to feed back, different strategies have been considered up to now. This book will address all these feedback strategies to design efficient wireless communication systems from both theoretical and practical issues including the study of the quantization of the channel state information on the performance.

This book is intended to provide a comprehensive review of feedback strategies in wireless communication systems from a signal processing perspective. While there are many manuscripts on MIMO systems and LTE standard, the literature is quite scarce when it comes to wireless communication with feedback. We came up with the conclusion that there is a need for a monograph that carefully explains the theory and implementation of feedback strategies in wireless communication systems. We believe that this book which summarizes the most useful ideas and

state-of-the-art algorithms and results in this important area of research will help to understand this emerging field.

The book is written for graduate students and researchers at universities and research institutes, as well as researchers and engineers working in the telecommunication industry, who are already familiar with technical concepts such as probability, digital communication systems, and signal processing for communication. We hope that the book will contribute to a better understanding of the value of feedback strategies for wireless communication systems and may motivate further investigation in this exciting research area.

In the first part of the book, we overview different feedback strategies and analyze the impact of feedback information on the capacity for single user SISO/MIMO and multiuser SISO/MIMO wireless communication systems.

In the second part of the book, we focus on advanced topics on wireless communications and examine different feedback strategies for multicell networks and the usage of feedback information on LTE/LTE-A standard.

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