

Preface

As an effective means to improve the spectral efficiency in wireless communications, multiple-input multiple-output (MIMO) systems equipped with multiple antennas at both transmitter and receiver sides have been well studied in recent years. In MIMO systems, more careful receiver design than in single-input single-output (SISO) systems is highly desirable in order to achieve good performances due to interfering signals by multiple antennas. To this end, we may consider joint detection and decoding. However, it leads to prohibitively high computational complexity, which grows exponentially with the number of equipped antennas and thus it becomes impractical for actual systems. Therefore, it is desirable to develop suboptimal MIMO receivers to provide good performances with reasonably low complexities, especially for large systems.

In the book entitled *Low Complexity MIMO Detection* published by Springer in 2012, a number of complexity-efficient MIMO detection methods and algorithms have been reviewed and studied. However, the MIMO detection was discussed only for uncoded systems. Since the separation of signal detection and decoding may lead to a performance degradation for coded MIMO systems, the MIMO detection has to be considered with decoding, which becomes the motivation of this book.

In this book, we focus on the design of low-complexity and high-performance MIMO receivers, where two techniques, successive interference cancellation (SIC) and lattice reduction (LR), become the key ingredients in deriving such receivers. In addition, in conjunction with the receiver design, other topics including the channel estimation, multiuser, and multicell systems, are further discussed in the later part of the book. Our book is summarized as follows.

We first present point-to-point MIMO systems and various low complexity detection methods. In order to provide a background, the detection theory is reviewed in [Chap. 2](#), the signal detection in a vector space and principles of MIMO detection are introduced in [Chap. 3](#), different computationally efficient SIC-based detection approaches are presented in [Chap. 4](#), and the principles of LR and corresponding detection schemes are discussed in [Chap. 5](#).

In the second part of this book, we focus on iterative detection and decoding (IDD) schemes in MIMO-bit interleaved coded modulation (MIMOBICM) systems. A background of MIMO iterative receivers is introduced in [Chap. 6](#). Low

complexity iterative receivers using LR at bit-level are studied in [Chap. 7](#). Randomized sampling-based IDD is presented in [Chap. 8](#).

Other issues in conjunction with the LR-based detection schemes are presented in [Chaps. 9](#) and [10](#). In particular, various channel estimation techniques are discussed in [Chap. 9](#). Multiuser and multicell MIMO systems are considered in [Chap. 10](#).

Our book is intended to introduce the low complexity receiver design in MIMO systems from fundamentals to practical applications. This book makes an easy-to-follow presentation from the elementary to the profound level and includes not only theories, but also updated research outcomes that could be useful for both graduate students and practicing engineers in wireless communications.

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