Preface

The technologies of wireless communications have experienced a rapid growth over the past two decades. The demands for high-data-rate services have motivated numerous research activities to be carried out. However, the demands are limited by the very scarce bandwidth resource. Commonly, Channel State Information (CSI) and Carrier Frequency Offset (CFO) estimations are performed by using training signals, which reduce the spectral efficiency further. Therefore, it is very urgent and important to improve the bandwidth usage.

Independent Component Analysis (ICA) is an efficient Higher-Order Statistics (HOS)-based blind source separation technique by maximizing non-Gaussianity of the ICA output signals. So far, ICA has been applied to a range of fields, including separation of signals in audio applications or brain imaging, the analysis of economic data, and feature extraction. Since the use of ICA has the benefit of not requiring the Channel State Information (CSI) to perform blind or semi-blind equalization, it has been proven to be effective for a number of wireless communications systems, like blind channel estimation, blind equalization, and blind multiuser detection. Thus, it is very interesting to investigate the application of ICA to a number of OFDM-based wireless communication systems.

In this book, we apply ICA for a number of OFDM-based wireless communication systems, with the effect of CFO. In Chap. 1, a few concepts are introduced, such as Orthogonal Frequency Division Multiplexing (OFDM), equalization, CFO, etc. In Chap. 2, a number of wireless communication systems are introduced, such as Multiple-Input Multiple-Output (MIMO), Coordinated Multi-Point (CoMP), and Carrier Aggregation (CA). In Chap. 3, some existing preamble-based and blind CFO estimation methods are described. Then, a number of the training-based and blind channel estimation and equalization methods are reviewed. This is followed by a review of the basics of ICA and the application to a number of semi-blind OFDM-based wireless communication systems. In Chap. 4, a precoding-based CFO estimation method and an ICA-based equalization structure are proposed for semi-blind single-user MIMO OFDM systems, where a number of reference data sequences are superimposed on the source data sequences via a precoding process, for CFO estimation and ambiguity elimination in the ICA equalized signals. In

Chap. 5, a semi-blind multiuser CoMP OFDM system is proposed, with a low-complexity multi-CFO estimation method and an ICA-based equalization structure, where a small number of pilots are designed to perform multi-CFO estimation and ambiguity elimination in the ICA equalized signals. In Chap. 6, a semi-blind ICA-based joint ICI mitigation and equalization scheme is proposed for CA-based CoMP OFDMA systems, where the CFO-induced ICI is mitigated implicitly via an ICA-based semi-blind equalization. Finally, the findings are summarized and conclusions are drawn in Chap. 7.

Liverpool, UK — Yufei Jiang
Liverpool, UK — Xu Zhu
Suzhou, China — Eng Gee Lim
Liverpool, UK — Yi Huang
Osaka, Japan — Hai Lin

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Jiang, Y.; Zhu, X.; Lim, E.G.; Huang, Y.; Lin, H.

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