Preface

This book is intended to be a quick reference on basic concepts of adaptive filtering for students, practising engineers, and researchers. In order to use it for a graduate level course on adaptive filtering, it should be complemented with some introductory background material and more importantly, with exercises and computer projects. Therefore, it is important that the reader has some familiarity with basic concepts from probability theory and stochastic processes (first and second order statistics, correlation, stationarity, ergodicity, etc.), algebra, matrix analysis, and linear systems (stability, linearity, etc.)

We wanted to do more than just derive algorithms and perform simulations showing their behavior. We prioritized to present the material under a solid theoretical background. However, after showing several different interpretations associated to each algorithm, we included some intuitive thoughts in order to improve the understanding of how they operate. We believe this is important since equations, as exact and important as they are, can sometimes obscure some simple and fundamental aspects of an algorithm. We also developed a convergence analysis using standard and non-standard approaches. Theoretical results are important since they allow us to make predictions about the performance of an algorithm, which is very interesting at the design stage when solving a particular problem. In addition, we covered a few applications so the reader can see how adaptive filters can be used in solving real-world problems. Several references are included so the interested reader can look for more in-depth discussions about several important topics in adaptive filtering.

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