Preface

Brain–computer interface (BCI) uses devices that enable their users to interact with computers and machines by using only their brain activity, which is measured and processed by the system. This handbook provides researchers, students, and practitioners, including those with no formal training in BCI research and development, with a synopsis of key findings, and theoretical and technical advances from BCI-related fields that have direct bearing on human brain–computer interfacing. Many BCI applications currently exist, allowing users to perform tasks such as writing sentences by selecting letters, moving a cursor on a computer screen, playing an electronic ping-pong game, and controlling an orthosis that provides a graspable hand. BCIs are also used to study the human brain in relation to performance at work, transportation, and other everyday settings, which can provide important guidelines and constraints for theories of information presentation and task design. These research approaches also aim at applications that are not necessarily in the clinical field and for impaired users. It is making BCI use possible for new potential user groups such as gamers and for applications in the domestic domain, human–computer interaction, robotics, and team performance.

This handbook is organized into an introductory chapter with an emphasis on BCI technology trend and historical events that paved the way for flourishing BCI technology, six main parts, and a conclusion chapter. Part I opens with various BCI applications and consists of four sections in which BCI introductory (Section A), therapeutic application (Section B), affective and artistic application (Section C), and BCI control of entertainment and multimedia application (Section D) chapters are presented. Part II focuses on the different ways to acquire brain signals and a summary of BCI software. Part III deals with various methods to process acquired brain signals, extract features, and classify the user's intention. Part IV is devoted to various BCI paradigms including guided tutorial chapters. Part V presents five chapters that discuss various issues associated with human factors, design, and evaluation of BCI systems. Part VI, consisting of four chapters, presents emerging issues and future BCI research directions. This book wraps up with final thoughts on what is on the horizon for BCI research and development and a variety of strategies and tasks that BCI researchers must take into account.

It is our hope that our readers will find something new and/or valuable in this handbook. We notably hope that, thanks to this book, readers would better understand the underlying neural bases of human brains, possess new insights into interfacing human brains with computing systems, and subsequently appreciate the opportunities afforded by BCI research and development.

We thank the contributing authors for their commitment to the success of this handbook, and we are honored to have worked with each one of contributors. We would also like to thank the many reviewers who contributed their time and expertise reviewing this handbook's chapters, thus improving the overall book quality. The production of the handbook was made possible with the very valuable assistance of Cindy Carelli (Taylor & Francis Acquiring Editor), Renee Nakash (Taylor & Francis Editorial Assistant), and Jonathan Achorn (MTC Project Manager), who so effectively coordinated the management of contributions.

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