Preface

Purpose – The study of multiagent systems began in the field of distributed artificial intelligence (DAI) about 20 years ago. Today these systems are not simply a research topic, but are also beginning to become an important subject of academic teaching and industrial and commercial application. While there are several high-quality collections of articles on multiagent systems and DAI in print, most of these are proceedings of conferences and workshops. What is urgently needed is a book that offers a comprehensive and up-to-date introduction and is suitable as a textbook for the field. The purpose of this volume is to fulfill this need.

Features – The book offers a number of features that make it especially useful to readers:

- *Scope.* It is designed as an introductory text and a textbook that covers the whole range of multiagent systems. The book reflects the state of the art in this field, and treats basic themes (Part I) as well as several closely related themes (Part II) in detail.
- *Theory.* It gives a clear and careful presentation of the key concepts, methods, and algorithms that form the core of the field. Many illustrations and examples are provided.
- *Practice.* The emphasis is not only on theory, but also on practice. In particular, the book includes a number of thought-provoking exercises of varying degrees of difficulty at the end of each chapter that allow the reader to gain practical experience.
- *Glossary.* It contains an extensive glossary that provides the reader with compact explanations of relevant terminology used in the field.
- *Expertise.* Its chapters have been written by leading and outstanding authorities. This guarantees that the book is built on a very broad and diverse basis of knowledge and experience.

It is worth saying a little more about the last-mentioned feature. It is clear that a book prepared by just a few authors, as textbooks usually are, is likely to be more coherent than a book in which many authors are involved. But as the reader will see, the contributors to *Multiagent Systems* have invested considerable effort in ensuring the coherence of this book (and, in so doing, they practiced some of the basic issues—cooperation and negotiation—described in their chapters).

Readership – The book is primarily intended to meet the interests of the following audiences:

- *Professors and students* who require an up-to-date, in-depth source of material for their courses on multiagent systems and DAI. Below it is described how the book can be used as the basis of a number of different courses.
- *Researchers in the field* who wish to branch out beyond the area in which they are specialized to better understand the field as a whole, to investigate relationships between their own work and work by others, and to obtain valuable stimuli for their future research activities.
- *Software practitioners and professionals from industry* who want to find out whether and how the technologies available in the field can be usefully applied in their working domains.

Owing to the potential impact of multiagent systems on a variety of disciplines, this book can also serve as a repository and primary reference volume for computer scientists, sociologists, economists, management and organization scientists, engineers, psychologists, and philosophers.

How to Use This Book – The book can be used for teaching as well as self-study. The chapters and consequently the overall book are designed to be self-contained and understandable without additional material. Of course, there are many relationships between the chapters, but in principle they can be treated independently and read in any sequence. I recommended, however, to start with Chapters 1 and 2.

This book can be used as a text for a *graduate or advanced undergraduate course*. A one-quarter course should concentrate on the first three chapters of Part I of the book; with whatever time remains, further chapters of Part I, or parts of them, could be covered. A course based on Part I could comfortably occupy a full semester. A course fully covering Part I, Part II, and some separate material could take an entire year. The book is also useful as a *supplementary text for a general AI course*; for instance, within such a course the considerations on "classical" AI topics like problem solving and search could be enriched by Chapter 3 and Chapter 4, respectively. Moreover, most chapters could be also used as the *starting material for speciality courses and seminars*; for instance, Chapter 5, Chapter 6, and Chapter 7 could be used for courses devoted to distributed decision making, distributed machine learning, and computational organization theory, respectively. Although it is obvious, I finally want to mention that Chapter 8 should be part of courses with an emphasis on theory, while Chapter 9 should be part of courses with a focus on applications.

The exercises allow the reader to further deepen her or his knowledge, and course instructors might use them for putting more emphasis on practical aspects. Some exercises are fairly simple and are intended to make sure that the material provided in the chapters is mastered. Others are much more difficult and may serve as a subject of class discussions or advanced team work.

Throughout the book numerous references to the source literature are provided. They enable interested students to further pursue specific aspects, and they support professors in choosing additional course material.

The chapters can be understood without specific prior knowledge. However, a background in computer science and mathematics/logic definitely would be helpful in using all parts of the book most efficiently.

One Final Word – When working through this book, the reader is asked to keep in mind that multiagent systems and DAI constitute a young and dynamic field of interdisciplinary nature whose defining boundaries are not yet fully clear. It is my particular hope that this book contributes to the search for sharper boundaries by spurring further research, teaching, and application in this fascinating field.

Acknowledgments – This book would not have happened without the help of many people. I am most greateful to the authors for participating in this challenging project. They contributed significantly to this book not only by preparing and coordinating their texts—the chapters, the chapter descriptions included in the Prologue, and the index and glossary entries—but also by providing many useful comments and suggestions on how the book's overall quality could be further improved. It was the authors' enthusiasm and encouragement that often made my editorial work easier. Particular thanks are due to Mike Wooldridge and Munindar Singh for reading a draft of the Prologue.

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Of course, despite the authors' influencing comments and suggestions, responsibility for the conception of this book and the final selection of the chapter themes ultimately lies with me.

Gerhard Weiß