

## Preface

This book is an outcome of the Socionics Research Framework.<sup>1</sup> The roots of Socionics lie in the 1980s when computer scientists in search of new methods and techniques of distributed and coordinated problem-solving first began to take an engineering interest in sociological concepts and theories. Just as biological phenomena are conceived of as a source of inspiration for new technologies in the new research field of bionics, computer scientists working in Distributed Artificial Intelligence (DAI) became interested in exploiting phenomena from the social world in order to construct Multiagent Systems (MAS) and, generally, to build open agent societies or complex artificial social systems.

Socionics is driven by the underlying assumption that there is an inherent parallel between the ‘up-scaling’ of MAS and the ‘micro-macro link’ in sociology. Accordingly, one of the fundamental challenges of Socionics is to build large-scale multiagent systems which are capable of managing ‘societies of autonomous computational agents ... in large open information environments’ ([9, p. 112]). As more sophisticated interactions become common in open MAS, the demand to design reliable mechanisms coordinating large-scale networks of intelligent agents grows. Suitable design mechanisms may enhance the development of ‘truly open and fully scalable multiagent systems, across domains, with agents capable of learning appropriate communications protocols upon entry to a system, and with protocols emerging and evolving through actual agent interactions’ ([10, pp. 3]) which is considered as the ultimate goal in fulfilling the roadmap of agent technology. With the introduction of mobile agent platforms for e-commerce applications, the quest for reliable mechanisms coordinating large-scale networks of intelligent agent programs has been put on the agenda. To illustrate the practical need for large-scale architectures and techniques, one might mention the growing demand for agent-based applications such as electronic commerce, business process management, entertainment, medical care, tele-voting, tele-shopping, real-time sports brokering, etc. (for a detailed list of agent-based applications, cf. [10]).

In relation to the Internet and the World Wide Web, scalability turns out to be crucial for DAI systems. Since achieving run-time efficiency in small environments does not guarantee achieving run-time efficiency also in large environments, it is clear that designing large-scale applications for open societies with several thousand agents differs significantly from designing small-size applications with around a hundred agent programs. With regard to open agent platforms that will have to support a new generation of e-commerce applications on the Internet, scalability as a technological desideratum is still in its infancy. What we need is to address the problem of scalability in a new way by relating specific engineering demands to general dimensions of complexity (most obvious: number and heterogeneity of agents and inter-agent linkages; less obvious: robustness, flexibility).

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<sup>1</sup> The Socionics Research Framework SPP 1077 is funded by the German national research foundation (DFG) from 1998 to 2005 and has published several books: [1], [2], [3], [4], [5], [6], [7], [8].

Having done that, we need to turn to sociological concepts, asking the following questions: How is coordination (by means of normative structures, power relations, and so on) achieved in human societies at different levels of aggregation (micro-interaction, meso-organisation, macro-society) and how can we translate these achievements into engineering methods and tools for social simulation? Of course, there is no such thing as the ‘one best way’ of posing or answering these questions, neither in sociology nor in DAI. Thus, the articles collected in this volume take different stances, exposing a wide array of sociological research approaches and a plurality of engineering perspectives, and leaving it to the reader to draw his or her own conclusions.

A book like this is the result of the successful cooperation of a significant number of people to whom the editors are now indebted. The minimum that we can do is to express our gratitude to all who were involved in making the book a reality. First to be mentioned are the authors who actively contributed to the book with articles. However, most of the articles are results of fruitful discussion and cooperation in the context of the Socionics Research Framework funded by the DFG. We are therefore also grateful for the cooperation and support that we got from people working in this context. We further want to thank people at Springer supporting us in the publishing process of this volume. Last but not least, we would like to say thanks to the people that gave feedback to the authors by reviewing the articles and especially to Christian Hahn, who went through the trouble doing the final editing of the master copy.

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