

Preface

Aims and Major Themes

I have written this book to help you to explore ambient intelligence (AmI) in all its complexity, intricacy, variety, and breadth, the many faces of a topical subject that encompasses so much of modern and future life's issues and practicalities, and can be applied and made useful to the everyday lifeworld. Indeed, AmI technology will pervade and impact virtually every aspect of people's lives: home, work, learning, social, public and infotainment environments, and on the move. This vision of a next wave in information and communication technology (ICT) with far-reaching societal implications is postulated to offer the possibility of a killer existence, signifying that it will alter people's perception of the physical and social world and thus their notions of action in it, as well as their sense of self and the sense of their relations to each other, things, and places. AmI is a field where a wide range of scientific and technological areas and human-directed disciplines converge on a common vision of the future and the fascinating possibilities and enormous opportunities such future will bring and open up (as to the numerous novel applications and services that are more intelligent and alluring as to interaction in both real and cyber spaces) that are created by the incorporation of computer intelligence and technology into people's everyday lives and environments. While the boundaries to what may become technologically feasible and what kind of impact this feasibility may have on humans are for the future to tell, some scientists foresee an era when the pace of technological change and its shaping influence (progress of computer intelligence and reliance of humans on computer technology) will be so fast, profound, and far-reaching that human existence will be irreversibly altered.

To facilitate your embarking on exploring the realm of AmI, I have designed the book around three related aims: to help you gain essential underpinning knowledge and reflect on the potentials, challenges, limitations, and implications pertaining to the realization of the AmI vision—with consideration of its revisited core notions and assumptions; to help you develop a deeper understanding of AmI, as you make connections between your understandings and experiences (e.g., of using computer

technology and your reliance on it in modern, high-tech society), relevant scientific and social theories, recent research findings, and the visions and views of computer scientists and technology creators; and, more importantly, to encourage you to take part in an ongoing debate about AmI in the twenty-first century, examining contrasting perspectives on AmI across a wide range of everyday life domains and practices.

In sum, this book offers a fresh, wide-ranging, and up-to-date approach to AmI, combining scientific, academic, and practical relevance with critical reflection. The latter is meant to question some underlying assumptions of AmI, to test the justification of taken-for-granted premises pertaining to AmI, or to cogitate intently about AmI as a form of scientific knowledge in light of the grounds that support it. The approach aims to provide fertile insights, new perspectives, and refreshing research alternatives, aiming to contribute to bringing the field of AmI closer to realization and delivery with concrete impact.

How Did the Book Come into Existence?

There are several factors that have stimulated my innate curiosity to jump into the ever-evolving or blossoming field of ICT and subsequently stirred my interest in embarking on writing this book, an intellectual journey into the modern, high-tech world. I have always been interested in and intrigued by science, technology, and society as fields of study. The world of science and technology (S&T) has gone through overwhelming and fast advances that have had significant intended and unintended effects within modern societies. My interest in exploring issues at the intersection of those fields, in particular, stems from a deep curiosity about the contemporary world we live in as to how it functions and the patterns of changing directions it pursues and also from a desire to meet people from different academic and cultural backgrounds for the purpose of social and lifelong learning as an ongoing, voluntary, and self-motivated pursuit of knowledge for good reasons. Having always been fascinated by the mutual process where science, technology, and society are shaped simultaneously, I have decided to pursue a special academic career by embarking on studying diverse subject areas, which has resulted, hitherto, in an educational background encompassing knowledge from diverse disciplines, ranging from computer science and engineering to social sciences and humanities. My passion for other human-directed sciences, which are of relevance to this book, sprouted in me around the age of fifteen when I read—first out of sheer curiosity—a mesmerizing book on cognitive and behavioral psychology in the summer of 1988. And this passion continues to flourish throughout my intellectual and academic journey. In recent years, I have developed a great interest in interdisciplinary and transdisciplinary scholarly research and academic writing. Having earned several Master's degrees and conducted several studies in the area of ICT, I have more specifically become interested in topical issues pertaining to AmI, including affective and aesthetic computing, cognitive and emotional context awareness,

natural human–computer interaction (HCI), computational sociolinguistics and pragmatics, and interaction design, among other things.

In particular, what draws me to AmI as a distinguished example of a field that lies at the intersection of technology, science, and society arose from an intrigue into its postulating a paradigmatic shift not only in computing but also in society. This renders AmI a sphere of boundless knowledge, extending far beyond the ambit of computer science and artificial intelligence to include a wide range of other academic disciplines, ranging from human-directed scientific areas (e.g., cognitive psychology, cognitive science, cognitive neuroscience) to social sciences (e.g., sociology, anthropology) and humanities (e.g., linguistics, communication studies, philosophy). Indeed, AmI can only be fully developed by a holistic approach, encompassing scientific, technical, and social research. Further, my interest in AmI continues to flourish and I enjoy exploring this field. I yearn to discover further the complexity, intricacy, and expansion of AmI, and have a greater understanding of what may in the longer run determine its success as to its transformational effects on society by fully technologizing it. That is, how the AmI vision in its evolution will balance between its futuristic and innovative claims and realistic assumptions.

In all, the scope of my academic and intellectual interests and the nature of the field of AmI have had a seminal influence on my choice to undertake the challenging endeavor of exploring AmI as a new computing paradigm—with a particular emphasis on humanlike cognitive and behavioral aspects, namely context awareness, natural interaction, conversational acts, emotional and social intelligence, and affective and aesthetic interaction. Furthermore, over the past few years, I have tremendously enjoyed the challenge of merging technological, scientific, and social perspectives in the studies I have carried out as part of my Master studies. But of all these were two main studies that actually inspired me to write this book: (1) *A Transdisciplinary Study on Context Awareness, Natural Interaction, and Intelligent Behavior in Ambient Intelligence: Towards Emotionally and Cognitively Human-inspired Computer Systems* and (2) *A Critical Reading of the Scholarly and ICT Industry's Construction of Ambient Intelligence for Societal Transformation*. I started writing this book in the fall/winter of 2012/2013, about 2 years after I finished my fourth (research-based) Master's degree in Computer Science with a focus on AmI at Blekinge Institute of Technology, Sweden. The writing process continued ever since alongside my full-time Master studies till June 2014. That is to say, I have been able to work on the book only during study breaks and vacations. I can only hope the result proves worth the efforts.

How Can the Book Be Read?

Providing guidelines for the reading of this book is an attempt to domesticate the unruly readers—who learn, interpret, and respond in different ways. The intention of this book is to explore the technological, human, and social dimensions of the large interdisciplinary field of AmI. In the book, I demonstrate the scope and

complexity of the field by presenting and discussing different aspects of AmI as both a computing paradigm in and new vision of ICT. This book focuses on humanlike cognitive, emotional, social, and conversational understanding and intelligent behavior of AmI systems in smart environments—in other words, on the enabling technologies, processes, and capabilities that underlie the functioning of AmI systems as a class of intelligent entities exhibiting cognitive and behavioral patterns in the different systems and roles that they form part of within their operating environments, where their supposedly situated forms of intelligence are supposed to enable them to achieve a close coupling with their human and social environment. The range of applications that relate to the scope of AmI in this book is potentially huge in domains such as workspaces, living spaces, learning, health care, assisted living in smart homes, and so forth. AmI applications are postulated to be widened and deepened.

Why Does the Book Stand Out with What It Covers?

In response to the growing need for a more holistic view of AmI and a clear collaborative approach to ICT innovation and the development of successful and meaningful human-inspired applications, this book addresses interdisciplinary, if not transdisciplinary, aspects of a rapidly evolving area of AmI, as a crossover approach related to lots of computer science and artificial intelligence topics as well as various human-directed sciences (namely cognitive psychology, cognitive science, social sciences, humanities). Up to now, most of the books about AmI focus their analysis on the advancement of enabling technologies and processes and their potential only. A key feature of this book is the integration of technological, human, social, and philosophical dimensions of AmI. In other words, its main strength lies in the inclusiveness pertaining to the features of the humanlike understanding and intelligent behavior of AmI systems based on the latest developments and prospects in research and emerging computing trends and the relevant knowledge from human and social disciplines and sub-disciplines.

No comprehensive book has, to the best of one's knowledge, been produced elsewhere with respect to covering the characteristics of the intelligent behavior of AmI systems and environments—i.e., the cornerstones of AmI in terms of being sensitive to users, taking care of needs, reacting and preacting intelligently to spoken and gestured indications of desires, responding to explicit speech and gestures as commands of control, supporting social processes and being social agents in group interactions, engaging in intelligent dialog and mingling socially with human users, and eliciting pleasant experiences and positive emotions in users through the affective quality of aesthetic artifacts and environments as well as the intuitiveness and smoothness of interaction as to computational processes and the richness of interaction as to content information and visual tools.

In addition, this book explains AmI in a holistic approach—by which it can indeed be fully developed and advanced, encompassing technological and societal

research. This is accomplished by amalgamating and organizing various strands of scientific and social theories or concrete conceptual assumptions and their applicability to AmI in a multifaceted, coherent, unified analysis reinforced by a high-quality synthesis of knowledge from a large body of interdisciplinary research on and relating to AmI. Apropos, the intent of this book addressing interdisciplinary and multidisciplinary aspects of AmI (as a crossover approach linked to computer science and artificial intelligence topics) with human-directed disciplines such as cognitive psychology, cognitive science, social sciences, and humanities as defined by leading scholars is to encourage collaboration among people from these scientific and academic disciplines or working on cross-connections of AmI with these disciplines. Moreover, this book operates under the assumption that it is timely to look back at the visionary user scenarios (portraying the bright side of life and ideal type users in a perfect world) and the research outcomes pertaining to, and spanning a wide variety of topics within, the field of AmI, after 15 years of substantial research effort, and reflect on the overall achievements of this area. The underlying premise is that the originators of the AmI vision have gained a much more thorough understanding of the area of humanlike applications that needs to be examined to solve current problems and also pertinent and well-informed solutions to several of the specific issues involved in the realization and deployment of AmI spaces.

Who Am I Writing for?

The intended readership of the book is aimed at students, academics, computer and cognitive scientists, HCI designers and engineers, modelers in psychology and linguistics, techno-social scientists, industry experts, research professionals and leaders, and ICT professionals and entrepreneurs, whether they are new or already working within the area of AmI. Specifically, I have written this book with two kinds of readers in mind. First, I am writing to students taking advanced undergraduate and postgraduate courses in computer science, artificial intelligence, cognitive science, informatics, interaction design, software development, affective computing, and aesthetic computing, as well as those pursuing studies in such subject areas as ICT and society, social studies of new technologies, innovation and entrepreneurship, and media and communication studies. I have assumed that most of these students will already have some background in subjects related to computing, human-directed scientific areas, social sciences, or humanities. Those familiar with AmI will certainly get more out of it and find much that appeals to them in it than those without that grounding. However, those with more limited knowledge are supported with detailed explanations of key concepts and elaboration on theoretical perspectives and their applicability and convergence. This is meant to appease the uninitiated reader. Second, I hope that this book will be useful resource for people working on cross-connections of AmI with human-directed scientific areas, social sciences, and humanities, and for anyone who is looking for an accessible and essential reference of AmI in its various dimensions and from

different perspectives. In all, people in many disciplines will find the varied coverage of the main elements that comprise the emerging field of AmI as a socio-technological phenomenon to be of interest. My hope is that this book will be well suited to people living in modern, high-tech societies.

Who Did Contribute to the Book and What are Its Prospects?

The book obviously benefited—indirectly—from the work of many others. As an author, I know that I am not the exclusive originator; rather, the book is indebted to other writings in the field of AmI that have inspired me into finding an original approach to writing a book that differs from other books on and related to AmI in terms of the analytical approach, topicality of addressed issues, integration of major research strands, nature of inclusiveness, diversity and richness of content, and reflective thinking in terms of scrupulously analyzing and making judgments about what has happened. This pertains to the research results and the overall accomplishments of the area of AmI. While this book has an ambitious agenda, clearly it is not possible to deal with every aspect of AmI in a single book, nor can it cover all of my chosen topics in equal depth. Hence, this book makes no claims that it is an exhaustive study of the subject—but it will add a great value to AmI scholars, scientists, experts, advocates, and critics, as well as to those who are interested in AmI as a new computing paradigm or a vision of a next wave in ICT, including students, intellectuals, and academics from outside the field of AmI.

Lastly, I believe that I have achieved an important objective with this book—that is, creating a valuable resource for the AmI community. I also believe that there is a real need for a comprehensive book of AmI—a blossoming field that cuts across several academic and scientific disciplines. Therefore, I hope that this book will be enlightening, thought-provoking, and, more importantly, making good reading for the target audience, and eventually the first edition will be well received.

The Human Face of Ambient Intelligence
Cognitive, Emotional, Affective, Behavioral and
Conversational Aspects

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