Recent increases in computational processing power and expanding computational context suggest shifting paradigms in the role of computing. Computers have become mobile and embedded in our lives. They serve as media and as information channels. They have become loci of experience as well as work horses. They have become ambient and proactive as well as deskbound and reactive. They have become immersive and intrusive. We can wear them as well as sit in front of them. They can even sense.

So far our cohabitation with computers has been guided by the Human-Computer Systems Interaction discipline. However, there is a need for refocusing this field from a traditional discipline delivering truth into a discipline delivering value – collection of more subjectively oriented usability centered design heuristics, valued by a system stakeholders. Thus, the term Human-Computer System Interaction has been coined to grasp these postmodern facets of the cohabitation in question.

The University of Information Technology and Management (UITM) in Rzeszów, Poland, supports research devoted the above mentioned domain within the own, extended research program. Results gathered so far has entitled us to organize (with a technical co-sponsorship of IEEE) the International Human System Interaction Conference (held on May 25-28.2008 in Kraków, Poland), becoming now a cyclic international event. 44 out of 180 papers presented during this conference have been selected for this volume entitled Human-Computer Systems Interaction: Backgrounds and Applications.

But it is necessary to emphasize that this book is not a collection of post conference papers. All articles include new, so far unpublished research results, and even more they have been re-edited and distinctly extended by respective authors, to fulfill expectations of the envisioned readers. For this reason the book reflects on advances in human – computer system interaction, as well as complementary research efforts in related areas. It is impossible to summarise all the papers in brief but I hope readers will find them as a truly helpful guide and a valuable source of information about the state-of-the-art status of this extremely important domain of the computer science.
To sum it up, I wish to thank all the authors for their insights and excellent contributions to this book. I would also like to express my special thanks to the UITM faculty members for their excellent job in preparing this volume. I hope it will support the position of UITM in research and in education.

Tadeusz Pomianek
UITM President
Preface

For the last decades, as the computer technology has been developing, the importance of human-computer systems interaction problems was growing. This is not only because the computer systems performance characteristics have been improved but also due to the growing number of computer users and of their expectations about general computer systems capabilities as universal tools for human work and life facilitation. The early technological problems of man-computer information exchange – which led to a progress in computer programming languages and input/output devices construction – have been step by step dominated by the more general ones of human interaction with-and-through computer systems, shortly denoted as H-CSI problems. The interest of scientists and of any sort specialists to the H-CSI problems is very high as it follows from an increasing number of scientific conferences and publications devoted to these topics. The present book contains selected papers concerning various aspects of H-CSI. They have been grouped into five Parts:

I. General H-CSI problems (7 papers),
II. Disabled persons helping and medical H-CSI applications (9 papers),
III. Psychological and linguistic H-CSI aspects (9 papers),
IV. Robots and training systems (8 papers),
V. Various H-CSI applications (11 papers).

The papers included into Part I illustrate a variety of basic approaches met in H-CSI problems solving. To begin with cognitive methods used in decision making in ill-structured situations, through bionic models of information processing, ontological models of knowledge acquisition and representation, formal models of dialogue between man and computer system, consistency-based approach to the prediction of states of a system, up to annotation of images based on their semantic aspects. Of course, the above-mentioned papers are no more but several samples of possible approaches to H-CSI problems solution. However, they indicate the role of models and concepts concerning human thinking mechanisms in development of the advanced H-CSI tools.

Problems of helping disabled persons by substitution of their malfunctioning sense organs by suitable artificial tools, is one of the greatest social and economical importance. Since medical techniques of natural sense organs implanting are not suf-
ficiently effective, the role of auxiliary technical devices will be unquestionable. This area of investigations is represented in Part II by papers concerning the visually disabled persons mobility helping by teleassistance navigation systems, eye-driven computer mouse and eye-blink controlled human-computer interface. Computer-aided recognition of gestures also belongs to this group of presented works. Computer-assisted medical diagnostic systems are represented by papers devoted to image analysis applications in oncology, cardiology and radiology.

Part III can also be divided into two subgroups of papers. In the first one the problems of automatic emotions recognition are dominating. Such systems can also help visually disabled persons in acquiring additional information from the face observations of their interlocutors. A paper concerning the concept of a daydreaming machine shows that no limits for the attempts to fill the gaps between human and machine thinking can be a priori marked despite the fact that they are based on different backgrounds.

The second subgroup of papers in this Part concerns linguistic aspects of H-CSI systems design. One paper is also focused on the problem of virtual reality-based visualization framework perception and capture of information.

Problems of the design of robots, including their sensor subsystems, virtual reality modeling, biologically reasoned point-of-interest image compression, as well as kinetic analysis and training of surgical robots are considered in Part IV. A dominating idea consists here in functional capabilities of robots' extension on one hand, and human supervisory control of utilization of robots on the other one.

Miscellaneous H-CSI applications in enterprises management, technical diagnosis, molecular modeling, virtual museums organization, etc., are presented by the papers in Part V. They show that the H-CSI area of investigations and practical applications touches practically all possible domains of human activity.

To summarize, the book contains a collection of 44 papers written by an international team of contributors representing academia and research institutions from sixteen countries: Austria, China (also Hong Kong), Croatia, France, India, Iran, Israel, Italy, Japan, Poland, Romania, Russian Federation, South Korea, Spain, Taiwan, and the United States. We want to thank them warmly for supplying truly interesting and innovative papers.

Our special thanks go to Prof. Janusz Kacprzyk the editor of the Series for his invaluable support and help.

We are also indebted to DSc Teresa Mroczek, Ph.D. from the University of Information Technology and Management in Rzeszów (Poland) for her assistance in preparation of index, camera-ready copy of the book and conducting most of the correspondence with the authors.

Finally, we would like to express our sincere thanks to the publishing team at Springer-Verlag, in particular to Dr. Thomas Ditzinger for his permanent, versatile and very friendly help.

Zdzisław S. Hippe
Juliusz L. Kulikowski
Editors
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