

Advances in Intelligent and Soft Computing

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Man-Machine Interactions 2

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The secret of the machines

*For all our power and weight and size,
We are nothing more
than children of your brain!*

Rudyard Kipling

Preface

Whether we like it or not, machines have become an indispensable part of a man's life. Some say that humans are enslaved to modern technology and reject progress and new technological developments on principle, while, on the other hand, fanatics of new trends simply must have not only the latest tools, useful and long awaited for, but every gadget and gimmick, or a play toy as well.

Oftentimes we put our lives into the virtual or quite literal hands of machines when we accept that they make life-or-death decisions for us. They are considered with philosophical or ethical attitude when we ask questions if artificial intelligence is real, or talk about thinking machines. We see machines used in daily routines when we make coffee, wash up, drive a car, play a computer game. In research they enable travels to the outer space in search for extraterrestrial life forms, to study other planets, galaxies, the whole Universe. They also make possible to take a journey inside living organisms to observe and learn how they work at the cellular or molecular level, to uncover secrets of DNA. We employ them on both the macro and micro scale to live our lives and to gain knowledge about the past, present, and even future of ourselves and the world as we know it.

Man-machine interaction is the interdisciplinary field, focused on a human and a machine in conjunction. It is the intersection of computer science, behavioural sciences, social psychology, ergonomics, security. It encompasses study, design, implementation, and evaluation of small- and large-scale, interacting, computing, hardware and software systems dedicated for human use. Man-machine interaction builds on supportive knowledge from both sides, the machine side providing techniques, methods and technologies relevant for computer graphics, visualisation, programming environments, the human side bringing elements of communication theory, linguistics, social sciences, models of behaviour. The discipline aims to improve ways in which machines and their users interact, making hardware and software systems better adapted to user's needs, more usable, more receptive, and optimised for desired properties.

While early methodologies assumed the construction of the cognitive model, reflecting predictable and quantifiable actions undertaken by the human user interacting with machines, modern approaches advocate the need for constant exchange of

ideas and feedback among users, researches, designers and engineers, in order to arrive at such solutions that are best suited to user's requirements.

This monograph is the second edition in the Springer *Advances in Intelligent and Soft Computing* series, providing the reader with a selection of high-quality papers dedicated to current progress, new developments and research trends in man-machine interactions area. In particular, this volume points to a number of advances in man-machine communication, virtual and augmented reality, modelling of biological processes, data mining, pattern recognition, rough and fuzzy computing, mixed media processing, algorithmics, models and architectures of complex data storage, management and transfer systems.

The topical subdivisions of this volume include human-computer interfaces, robot control and navigation systems, bio-data analysis and mining, pattern recognition for medical applications, sound, text and image processing, design and decision support, rough and fuzzy systems, crisp and fuzzy clustering, prediction and regression, algorithms and optimisation, and data management systems.

This monograph presents 4 invited and 45 reviewed research papers, reflecting the work by 95 researchers from ten countries, namely Canada, Germany, Greece, Hungary, India, Malta, Poland, Portugal, Slovenia, and UK.

Compilation of this volume has been made possible thanks to the laudable efforts of the Institute of Informatics, Silesian University of Technology, and the Institute of Theoretical and Applied Informatics, Polish Academy of Sciences, Gliwice, Poland. We wish to express our thanks to Ioannis Pitas, Gerald Schaefer, and Kevin Warwick, the authors of invited papers, and all who helped us in review procedures of the rest of submitted manuscripts. In addition, the editors and authors of this volume extend an expression of gratitude to Janusz Kacprzyk, the editor of this series, Thomas Ditzinger, Dieter Merkle, Holger Schäpe, and other staff at Springer for their support in making this volume possible. Furthermore, the editors extend their thanks to Sebastian Deorowicz for extensive use of his typesetting skills.

The editors express their hopes that this volume will not be considered as merely reporting scientific and technological solutions which have already been achieved, but it will also become an inspiration for some new efforts dedicated to further research and improvements in man-machine interactions field, enhancing the quality of life, making the world a better place.

October 2011

Tadeusz Czachórski
Stanisław Kozielski
Urszula Stańczyk

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