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Analysis of Verbal and Nonverbal Communication and Enactment

The Processing Issues

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Preface

This book is dedicated to:

Luigi Maria Ricciardi

for his 360-degree open mind. We will miss his guidance now and forever

and to:

what has never been, what was possible, and what could have been

though we never know what it was.

This volume brings together the advanced research results obtained by the European COST Action 2102 "Cross Modal Analysis of Verbal and Nonverbal Communication," primarily discussed at the PINK SSPnet-COST 2102 International Conference on "*Analysis of Verbal and Nonverbal Communication and Enactment: The Processing Issues*" held in Budapest, Hungary, September 7–10, 2010 (http://berber.tmit.bme.hu/cost2102/).

The conference was jointly sponsored by COST (European Cooperation in Science and Technology, www.cost.eu) in the domain of Information and Communication Technologies (ICT) for disseminating the advances of the research activities developed within the COST Action 2102: "Cross-Modal Analysis of Verbal and Nonverbal Communication" (cost2102.cs.stir.ac.uk) and by the European Network of Excellence on Social Signal Processing, SSPnet (http://sspnet.eu/).

The main focus of the conference was on methods to combine and build up knowledge through verbal and nonverbal signals enacted in an environment and in a context. In previous meetings, COST 2102 focused on the importance of uncovering and exploiting the wealth of information conveyed by multimodal signals. The next steps have been to analyze actions performed in response to multimodal signals and to study how these actions are organized in a realistic and socially believable context. The focus was on processing issues, since the new approach is computationally complex and the amount of data to be treated may be considered algorithmically infeasible. Therefore, data processing for gainingenactive knowledge must account for natural and intuitive approaches, based more on heuristics and experiences rather than on symbols, as well as on the discovery of new processing possibilities that account for new approaches for data analysis, coordination of the data flow through synchronization and temporal organization and optimization of the extracted features.

The conference had a special session for COST 2102 students. The idea was to select original contributions from early-stage researchers. To this aim all the papers accepted in this volume were peer reviewed.

This conference also aimed at underlining the role that women have had in ICT and—to this end—the conference was named "First SSPnet-COST2102 PINK International Conference." The International Steering Committee was composed of only women.

The themes of the volume cover topics on verbal and nonverbal information in body-to-body communication, cross-modal analysis of speech, gestures, gaze and facial expressions, socio-cultural differences and personal traits, multimodal algorithms and procedures for the automatic recognition of emotions, faces, facial expressions, and gestures, audio and video features for implementing intelligent avatars and interactive dialogue systems, virtual communicative agents and interactive dialogue systems.

The book is arranged into two scientific sections according to a rough thematic classification, even though both sections are closely connected and both provide fundamental insights for cross-fertilization of different disciplines.

The first section, "Multimodal Signals: Analysis, Processing and Computational Issues," deals with conjectural and processing issues of defining models, algorithms, and heuristic strategies for data analysis, coordination of the data flow and optimal encoding of multi-channel verbal and nonverbal features.

The second section, "Verbal and Nonverbal Social Signals," presents original studies that provide theoretical and practical solutions to the modelling of timing synchronization between linguistic and paralinguistic expressions, actions, body movements, activities in human interaction and on their assistance for effective human–machine interactions.

The papers included in this book benefited from the live interactions among the many participants of the successful meeting in Budapest. Over 90 senior and junior researchers gathered for the event.

The editors would like to thank the Management Board of the SSPnet and the ESF COST- ICT Programme for the support in the realization of the conference and the publication of this volume. Acknowledgements go in particular to the COST Science Officers Matteo Razzanelli, Aranzazu Sanchez, Jamsheed Shorish, and the COST 2102 reporter Guntar Balodis for their constant help, guidance, and encouragement. The event owes its success to more individuals than can be named, but notably the members of the local Steering Committee Klára Vicsi, György Szaszák, and Dávid Sztahó, who actively operated for the success of the event. Special appreciation goes to the president of the International Institute for Advanced Scientific Studies (IIASS), Gaetano Scarpetta and to the Dean and the Director of the Faculty and the Department of Psychology at the Second University of Naples, Alida Labella and Giovanna Nigro, for

making available people and resources for the editing of this volume. The editors are deeply indebted to the contributors for making this book a scientifically stimulating compilation of new and original ideas and to the members of the COST 2102 International Scientific Committee for their rigorous and invaluable scientific revisions, dedication, and priceless selection process.

July 2011

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The funds provided by COST—less than 1% of the total value of the projects—support the COST cooperation networks (COST Actions) through which, with EUR 30 million per year, more than 30,000 European scientists are involved in research having a total value which exceeds EUR 2 billion per year. This is the financial worth of the European added value which COST achieves.

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- SSPnet: European Network on Social Signal Processing, http://sspnet.eu/

The ability to understand and manage the social signals of a person we are communicating with is the core of social intelligence. Social intelligence is a facet of human intelligence that has been argued to be indispensable and perhaps the most important for success in life. Although each one of us understands the importance of social signals in everyday life situations, and in spite of recent advances in machine analysis and synthesis of relevant behavioral cues like blinks, smiles, crossed arms, head nods, laughter, etc., the research efforts in machine analysis and synthesis of human social signals such as empathy, politeness, and (dis)agreement, are few and tentative. The main reasons for this are the absence of a research agenda and the lack of suitable resources for experimentation.

The mission of the SSPNet is to create a sufficient momentum by integrating an existing large amount of knowledge and available resources in social signal processing (SSP) research domains including cognitive modeling, machine understanding, and synthesizing social behavior, and thus:

- Enable the creation of the European and world research agenda in SSP
- Provide efficient and effective access to SSP-relevant tools and data repositories to the research community within and beyond the SSPNet
- Further develop complementary and multidisciplinary expertise necessary for pushing forward the cutting edge of the research in SSP

The collective SSPNet research effort is directed toward integration of existing SSP theories and technologies, and toward identification and exploration of potentials and limitations in SSP. More specifically, the framework of the SSPNet will revolve around two research foci selected for their primacy and significance: human–human interaction (HHI) and human–computer interaction (HCI). A particular scientific challenge that binds the SSPNet partners is the synergetic combination of human–human interaction models, and automated tools for human behavior sensing and synthesis, within socially adept multimodal interfaces.

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