Preface

Human-Computer Interaction (HCI) can be understood as two potent information processors (a human and a computer) trying to communicate with each other using a highly restricted interface. Thus, it is important to study how to design the interface to overcome its limitations when interacting with the users.

Only using command-line interfaces could be adequate for expert users who are able to memorize the commands that they use every day. However, the rest of the users who are not experts, and they only need to interact with the computer from time to time, will not be able to memorize all the commands, and thus they are limited to the use of menus.

Any option that is not represented in the list of choices provided by the menus is ignored by those non-expert users, even being a valid option for the application. Moreover, any time that they want to use one of the options of the menus, they have to remember which tab is, and to click on it.

Natural Language (NL) Interaction, that is, to let the users express themselves, could be the solution to improve the communication between human and computers. By using NL interfaces, expert users can overcome the limits imposed by the use of keywords, and non-expert users can naturally interact with the application as they are used to interact with other humans, in their own language. The main difficulty to move from the current interfaces with command line or menus to NL interfaces is the lack of NL techniques to correctly and immediately process the language. NL is highly ambiguous, and to discover the exact meaning of a sentence uttered by a human is complex, even for another human being.

Therefore, the goal is not usually to perform a complete NL interaction, but to guide the interaction with a certain goal. That way, NL interfaces to databases have already proved their worth. Moreover, conversational agents have been developed to combine agent capabilities with computational linguistics.

Conversational agents exploit NL technologies to engage users in text-based information seeking and task-oriented dialogs for a broad range of applications such as:

- E-commerce: agents can answer the questions of the users about products and services, and finally guide the sell of the article and even order it from the company webpage.
- Help desk: agents can help with the doubts of users about certain technical problems with a product or device.
- Website navigation: agents can guide the users to navigate and find information in complex websites with a high number of links.
- Personalized service: agents can leverage internal and external databases to personalize interactions and provide specific data to each user. For instance, and as reported by Dr. Victoria Rubin, intelligent agents can be used libraries.
• Training or education: agents can teach or be taught by the students about a certain domain, and even to serve a leaner companions to avoid the so-called “isolation problem” of computer-based education.

Conversational agents have features which are quite similar to human intelligence such as the ability to learn, or adapt to new information. In fact, according to the Media Equation theory, people process technology-mediated experiences in the same way as they would do non-mediated experiences, because as Reeves and Nass claimed, “individual’s interactions with computers, television, and new media are fundamentally social and natural, just like interaction in real life.” Human users even tend to regard conversational agents as assistants to whom they can delegate work or be helped by them, instead of regarding conversational agents as computer programs to which they simply give orders. This feeling has become deeper in the last decades with the introduction of embodied agents.

Embodied conversational agents differ from traditional conversational agents in the introduction of virtual characters with animated faces (sometimes even a complete body), which allows the agents to produce and respond not only to verbal communication, but also to non-verbal communication. The benefits of agent expressiveness have been highlighted both for verbal expressiveness and for non-verbal expressiveness. On the other hand, there are also studies indicating that when using conversational agents, mixed results can appear. These studies reveal the need to review the research in the field to identify the most effective practices when using conversational agents for different applications.

Some secondary objectives to fulfill the main goal are:

• To gather a comprehensive number of experiences in which conversational agents have been used for different applications.
• To review the current techniques used to design conversational agents.
• To encourage authors to publish not only successful results, but also non-successful results and a discussion of the reasons that may have caused them.

This book is intended to serve as a reference guide for people who want to start their research in the promising field of conversational agents. It will not be necessary that readers have previous knowledge on the topic, as the first part of the book will be devoted to the fundamental concepts. Similarly, readers are not expected to have technical knowledge as authors will be requested to write the chapters so that they can be understood by experts in non-technical domains, given the multidisciplinary nature of the field covered by the proposed book.

38 chapter proposals were received from 13 different countries (Argentina, Australia, Austria, Canada, France, Germany, Greece, Italy, Japan, Spain, The Netherlands, United Kingdom and United States of America). A double-blind review process was enforced with the help of 16 experts from the Editorial Advisory Boards, all of them with a PhD in topics related to the book and from 8 different countries (Australia, Bulgaria, Canada, Romania, Spain, Switzerland, The Netherlands and United States of America).

After reviewing the chapter proposals, 18 were accepted to be published (47% acceptance ratio). They have been distributed into four main sections. The first section comprises the chapters devoted to the fundamental concepts of conversational agents and Natural Language Interaction. The second section comprises the chapters devoted to the design of conversational agents. The third section comprises the chapters devoted to the experiences of use of conversational agents. Finally, the fourth section presents some insight about what the future of the field may be.
The first chapter entitled ‘From ChatBots to Dialog Systems’ provides an introduction to the notion of dialog systems in contrast to chatbots, and the importance of applying Natural Language Processing (Computational Linguistics) methods to make more flexible human-agent dialogues possible.

The second chapter entitled ‘Designing and Evaluating Interactive Agents as Social Skills Tutors for Children with Autism Spectrum Disorder’ ends the first block of fundamental concepts by introducing the notion of ‘Embodied Conversational Agent’, that is, agents with a body able to make gestures, and in some cases, agents that can be designed for non verbal social interaction to attend the diversity.

The second section on the design of conversational agents starts with the chapter entitled ‘Designing ECAs to Improve Robustness of Human-Machine Dialogue’ giving a special attention to the possibility of spoken conversational agents. That is, the design of interaction no limited just to typing but for oral interaction.

The fourth chapter entitled ‘Dialogue Act Classification Exploiting Lexical Semantics’ presents the use of automatic dialogue act recognition in human-ECA interactions as a preliminary step in conversational analysis for modelling the users’ attitudes in several domains.

The fifth chapter entitled ‘A Cognitive Dialogue Manager for Education Purposes’ focuses on the possibilities of applying dialogue management techniques to improve pedagogic conversational agents, that is, agents designed with educational purposes.

The sixth chapter, entitled ‘Building a Social Conversational Pedagogical Agent: Design Challenges and Methodological Approaches,’ discusses the design challenges when developing a pedagogic conversational agent.

The seventh chapter, entitled ‘Design and Implementation Issues for Convincing Conversational Agents,’ describes a selection of design experiences for multimodal dialogue systems.

The eight chapter, entitled ‘Extending Conversational Agents for Task-Oriented Human-Computer Dialogue,’ presents the role of conversational agents for Interactive Question Answering and Persuasive Dialogue.

The ninth chapter, entitled ‘Affective Conversational Agents: The Role of Personality and Emotion in Spoken Interactions,’ revisits the main theories of human emotion and personality and their implications for the development of affective conversational agents, which are conversational agents that take into account emotions and try to respond empathetically.

The tenth chapter, entitled ‘Enhancement of Conversational Agents by Means of Multimodal Interaction,’ ends the second block of the book by providing a global overview of the design of multimodal interaction for conversational agents, that is, not only to interact by one channel (e.g. oral interaction), but also to provide alternative communication channels (e.g. typing / haptic interaction, etc.).

The eleventh chapter starts the third section of the book devoted to practical experiences of using conversational agents in several domains. In particular, this chapter, entitled ‘Embodied Conversational Virtual Patients,’ is focused on the application of conversational agents as virtual patients in the medical domain.

The twelfth chapter, entitled ‘A Conversational Personal Assistant for Senior Users,’ presents the experiences carried out with the conversational agent called Cassandra, which provides a way for senior users to perform tasks like managing reminders or appointments, medication schedules, shopping lists, and phone calls.

The thirteenth chapter, entitled ‘A Companionable Agent,’ describes the ‘Companion’ system which is being developed and tested as part of an EU project, so that the agent can build a long-term relationship with the user.
The fourteenth chapter, entitled ‘Humanizing Conversational Agents: Indisys Practical Case Study in eHealth,’ describes the eHealth human-like conversational agent called Maria and its use as embedded in the Web page of the Health Department of the Junta de Andalucía in Spain.

The fifteenth chapter, entitled ‘Design and Development of an Automated Voice Agent: Theory and Practice Brought Together,’ presents the experiences in spoken dialogue systems and focuses on the AVA agent able to perform call routing and customer service tasks.

The sixteenth chapter, entitled ‘Conversational Agents in Language and Culture Training,’ ends the practical experiences block by describing the work done on the domain of culture training.

The seventeenth chapter, entitled ‘The Future of Companiable Agents,’ starts the fourth and last section of the book devoted on the future of conversational agents. In particular, this chapter provides the expectations for the Companiable Agents described in chapter 13.

Finally, the eighteenth chapter, entitled ‘Future Trends for Conversational Agents,’ ends the book with a summary of the lines of future work that remain open for the next decades in which it is expected that Conversational Agents become pervasive and natural in our daily lives.

Building this book required the dedicated effort of many people. Firstly, we would like to thank the authors for their valuable contributions to the book. Secondly, we would like to thank the members of the Editorial Advisory Board for their diligence and expert reviewing. We would also wish to include here a word of appreciation for the excellent organization provided by IGI Global, who have smoothly and efficiently prepared the most appropriate environment for the book.

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