

Marielba Zacarias and José Valente de Oliveira (Eds.)

Human-Computer Interaction: The Agency Perspective

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Preface

Human-Computer Interaction (or HCI for short) is a fast-growing area of computer science. Even a very quick scan of the ongoing research reveals how dynamic the area of HCI really is. For instance, a simple query for human computer interaction using Google Books yields near 200 results encompassing text books, conference proceedings and journals. On Science Direct human computer interaction returns more than 200.000 hits. A similar search on ISI Web of Knowledge returns more than 7.000 hits. In IEEE Xplore, more than 2.500 hits. More than half of these entries have been published after 2005. These figures give us an impression about the rapid progress of the area and highlight a genuine wealth of the applications of HCI.

The discipline of HCI emerges from bringing together two different but complementary disciplines; cognitive psychology and computer science. The integrated study of these two disciplines led HCI to adopt the information-processing paradigm to model human cognition, which was key in understanding how people used computers and related devices. HCI developments encompass theoretical frameworks, models, interaction methods and devices. Nonetheless, despite the number of methods, techniques and other solutions provided for critical problems in user interface design, the information-processing approach was challenged due to its limitations demonstrated by well-known HCI researchers such as Winograd and Flores (1986) and Suchman (1987). Limitations of the information-processing paradigm included its algorithmic approach to human problem-solving and neglecting social, organizational or cultural factors of user behaviour. As a result, the scope of HCI was enlarged. The discipline now encompasses a broad collection of research topics in usability, ergonomics and human factors. This enlargement is the key in supporting novel interaction paradigms created by mobile, wearable and ubiquitous computing, tangible bits, face and gesture recognition among others.

At the same time, organizational and social paradigms have evolved and now regard organizations as complex adapting systems where the notion of agency plays a central role. Agency is a key theme that crosses several disciplines and is commonly referred to as the capability and condition of being in action or exerting power. Agents are by nature self-aware, autonomous and purposeful entities. Agent-centric

perspectives dominate contemporary models of social and organizational science. Structuration theory explains the role of agency in the (re) production of societies. Agency implies the execution of actions which includes reflexive capabilities. Reflexiveness involves continuously monitoring agents environment. Activity theory analyzes particularly the formation and evolution of activities. The organizing unit is the activity, and agents are individuals and groups with motives and needs that are achieved through the usage of tools. Actor-Network Theory is a framework and systematic way to consider the infrastructure surrounding technological achievements. Its most well known feature is its assignment of agency to both human and non-human entities.

Agent-centric theories such as the aforementioned ones are being increasingly used within HCI research and are contributing to extend the scope of analysis of interactions between users and computers to the larger and more meaningful context of human activities. System usage can only be understood through the analysis of needs, motives and goals of people and their activities. Hence, rather than regarding the user at one end of the interaction and the interface at the other, users are regarded as agents interacting with objects and other agents through the interface.

Furthermore, the agency perspective on HCI research is not only driven by theoretical approaches, but also through the usage of agent-based technology. Several applications are being enhanced by developing intelligent software agents for usability or accessibility ends. Our aim is to highlight the broad influence, - theoretically or technologically driven- of the agency perspective in current HCI research.

Book Organization

This book includes a selection of papers addressing HCI research problems through approaches centered on human, non-human, individual or collective agency notions. The book contains 19 chapters organized in 5 parts as follows:

Part I: Users as Agents

Regarding users as human agents entails focusing on their needs and goals. It also means focusing user experience (emotions, attitudes, thoughts, behaviours and perceptions of users) rather than interface qualities. Within this topic we present the work of *Pieter Desmet* and *Marc Hassenzahl* who develop the notion of designing for the pleasurable life and the good life through a number of exemplary design cases. In this chapter the authors aim at laying the ground for an approach to design, which draws upon happiness to motivate the design of future technologies. *Claudia Nass*, *Sebastian Adam*, *Joerg Doerr*, and *Marcus Trapp* propose an approach to balance user and business goals in software development in order to create positive user experiences. These authors discuss the definition and structure of business and user goals and their mutual relationships in the work environment, and presents an integrated software development approach that allows engineers to align business and users goals. *Ofer Bergman* takes into account specific agent needs by proposing

an “user-subjective approach” for Personal Information Management applications that make systematic use of subjective, user-dependent attributes such as disposition, time or cognitive state rather than objective attributes such as author, form, topic, or title in the organization of personal files.

Part II: Agents and Accessibility

The agency perspective in research addressing accessibility issues for people with special needs is present in two ways; (1) by taking into consideration specific agent needs and disabilities and (2) by employing agent technology in helping disabled users. Accessible interfaces aim at improving the individual autonomy and social inclusion of impaired users. Moreover, some applications seek the gradual development of their interaction capabilities. Nonetheless, disabled users pose important challenges since the nature and degree of disability varies among individuals, hindering efforts to build generic user profiles. Hence, approaches enabling qualitative analysis and evaluations, centered on specific needs of individuals and monitoring their development are essential in achieving these ends. *Marco de Sá* addresses the technological requirements in supporting Cognitive Behavioral Therapeutics for children and teenagers with disorders like depression, anxiety, social withdrawal, and somatic or physical problems. A cognitive behavioral perspective is centered on users emotions. More specifically, it assumes that anxiety is a normal and expected emotion comprised of biological, behavioral and psychological components. The chapter provides an overview of existing approaches and systems and describes in detail systems that aim at offering therapists, and their patients, tailored tools for the support of individual and group approaches for these disorders. *Abdullah Al Mahmud, Suleman Shahid, Omar Mubin* share their experience from designing social games for the elderly, using tangible and tabletop technology. The games designed aim at alleviating the social isolation of older adults and to engage them with peers. The authors show experience evaluation results, and present guidelines to design games with and for older adults.

Two chapters illustrate how non-human agents can be used in helping elderly and disabled people. *Miguel A. Sanz-Bobi, David Contreras, Álvaro Sánchez* describe the objectives and elements of a multi-agent system and in particular, the state-of-the-art of the multi-agents systems orientated to helping elderly and disabled people carry out their daily activities at home. It also describes the typical agent models and roles of these multi-agents systems, their requirements, their physical devices such as robots or programmes and their communication methods. The chapter includes an example of a particular case of a multi-agent system. *Azizi Ab Aziz, and Michel C.A Klein* present the design of an intelligent agent application aimed at supporting people with a cognitive vulnerability to prevent the onset of a depression. The agent application uses the principles of Rational Emotive Behavioral Therapy (REBT). The effect of the application is studied using software simulation. The simulation shows that a person that responds to REBT therapy develops less cognitive vulnerability than people that are not supported.

Part III: Agents and Interactions

The topic of agents and interactions encompasses agent-to-human interaction; models for human-agent interaction; socially intelligent agents; human-robot interaction; gesture, emotion, and personality-based interactions. *Leila Takayama* presents an analytical approach that allows understanding how autonomous and interactive personal robots allow us to explore how people come to perceive agency of non-human agents. Her chapter explains two types of perceptions of agency: in-the-moment vs. reflective perceptions, and discusses what these perspectives on agency mean for the research and design of personal robots. *Nicole Krämer*, *Astrid von der Pütten*, and *Sabrina Eimler* discuss whether a theory specific for human-robot and human-agent interaction is needed or whether theories from human-human interactions can be adapted. Krämer and her colleagues argue that since there is research suggesting that interaction with an artificial entity is similar to interaction with fellow humans, the author discusses whether theories from human-human-interaction will be a helpful framework also for human-agent/robot interaction, whether amendments will be beneficial or whether, alternatively, a totally new approach is needed. *Mei Yui Lim* reviews the current state-of-the-art of memory models for social companions, particularly on memory aspects that have been explored and proved useful and other potential memory aspects that would be beneficial if included. *Ary Fagundes Bressane Neto* and *Flavio Soares Correa da Silva* introduce a computer architecture to build believable agents by incorporating modules to handle personality and emotion into agent architecture, allowing to reflect the role that personality and emotion play in their capabilities of perception, attention, planning, reasoning, creativity, learning, memory and decision making. *Stefan Kopp* and *Kirsten Bergmann* discuss the state of gesture research on real humans and modeling approaches with virtual agents, and present results from an extensive empirical study on human iconic gestures in direction giving dialogues. It is described how machine learning methods can be employed to extract different speakers gesturing style and to generate individualized language and gestures in embodied conversational agents. The authors show that human observers rate virtual agents better in terms of competence, human-likeness, or likability when a consistent individual gesture style is produced. *Abey Campbell*, *Mauro Dragone*, *Levent Görgü*, *Thomas Holz*, *Michael J. O'Grady*, *G.M.P. O'Hare*, and *Antonella Sassu* discuss and illustrate how intelligent agents may be harnessed for integrating a range of diverse interface and interaction modalities such that the ubiquitous user interface concept may be validated.

Part IV: Agent-Centric Paradigms and Approaches

The topic of agent-centric paradigms and approaches puts together research addressing the issues of self-awareness, identity and ego. Within this topic, *Vaiva Kalnikaitė* and *Steve Whittaker* explore psychology research for effective memory cuing such as the use of associations with other people, and discuss the synergies between

organic and synthetic recall, driven by the self-aware process of remembering, also known as meta-memory. Finally, the authors conclude the chapter by discussing the impact of meta-memory on personal remembering and reflect on principles for the design of future lifelogging tools. *Dipak Surie, Thomas Pederson, and Lars-Erik Janlert* present an “egocentric interaction paradigm” (EIP) centered on human agents rather than on the notion of user. More specifically, this paradigm is based on perception, action, intention and attention capabilities and limitations of human agents. The novelty of the proposed approach stems from aiming at developing a comprehensive and integrated theoretical approach, centered on individual human agent. *Francisco Iacobelli, Nathan Nichols, Larry Birnbaum and Kristian Hammond* present an information finding approach based on robust entity detection. The authors present a brief overview of Tell Me More, a detailed description and evaluation of its named entity recognition (NER) algorithms and an overall evaluation of the algorithms that determine what constitutes new information. Tell Me More is a system that, given a seed story, augments it by finding new names, numbers and quotes reported by other sources. *Derek Lackaff* presents the results of an online computer-assisted self-interview survey tool to collect data to uncover and characterize ego-centric or personal networks, based on the opportunities for data collection efforts offered by web applications relying on social graphs. The author discusses the implications of his method for social-network research.

Part V: Collective Agents

The topic of collective agents groups research adopting an agency perspective that acknowledges social, organizational and cultural factors in HCI. *Matthias Rehm, Yukiko Nakano, Tomoko Koda, and Heike Winschiers-Theophilus* focus on culture as a parameter for successful agent interactions and start with an attempt of grasping what is meant by this multiply defined notion. In the remainder of the chapter, they analyze in detail how culture influences the expression of multimodal behavior in agents. *Wajeeha Khalil and Erich Schikuta* describe the concepts about building a Virtual Organization from scratch in general and explains how it serves the Computational Intelligence community specifically. A use case of a virtual organization for computational intelligence as an e-learning platform is presented for justification. The chapter also presents an alternative notion for user, subject, defining the human interaction from different perspectives in the context of a virtual community.

Acknowledgements

We hope that the contributions compiled in this volume will bring the reader a fully updated and highly comprehensive view of the recent developments in Human Computer Interaction when the agency perspective is adopted.

Our gratitude goes to all authors for sharing their expertise and recent research outcomes. We also would like to thank the collaborators that helped in assuring independent reviews. Finally, sincere thanks to the dedicated and knowledgeable staff at Springer who were highly instrumental in all phases of this editorial project.

October 2011

Marielba Zacarias
Jose Valente de Oliveira

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