Preface

Definitions of Human Computer Interaction (HCI) are quite easy to find. Most of those definitions state that HCI involves the manage, study, planning, design and uses of the interaction between humans (users) and computers, being often regarded as the intersection of computer science, behavioral sciences, design, media studies, and several other fields of study.

Given the above definition, it is quite easy to recognize that the boundaries of HCI are quite fuzzy. Historically, in a non-exhaustive overview, HCI evolved from a set of switches, to punched cards, keyboards, mouse pointers, etc., to the new platforms and most recent devices. Things are changing fast. The dialogs in the Stanley Kubrick (1968) "2001: A Space Odyssey" movie between the computer HAL 9000 and humans or the library host hologram in the Simon Wells (2002) "Time Machine" movie where the hologram communicates and interacts naturally with a time traveler, were once science fiction, but not anymore.

Currently most computers and mobile devices have the computational capacity and are equipped to mimic humans' skills like sight and hearing. With the appropriate sensors, those machines can even sense taste, smell, touch, balance, acceleration, temperature, etc. On the other hand, those "computer senses" (e.g., touch and gesture) can be used to control machines in a natural and intuitive way. There is an huge amount of sensors that can be used with that purpose, that range from the embedded cameras that exist in many of our devices, touch screens, mobile 3D sensors such as Structure Sensor, the Leap Motion, to the well-known and used Kinetic sensor from Microsoft.

The truth is that, as J. Jack from Microsoft states, HCI is a moving target. We expect the future of HCI to be supported on ubiquitous communication where computers communicate to give universal access to data and computational services, high functional systems where accessing those functionalities is natural, mass availability of computer graphics, high-bandwidth interaction, wide variety of displays (e.g., on large thin flexible/common surfaces), and embedded computation.

This book concentrates on Human Computer Interfaces, focusing mainly on the Interaction, and state of the art applications, research and trends, having in mind three major sub-areas: (a) Gesture interaction, (b) augmented reality, with special attention to applications in education, and (c) Assistive technologies, with a special emphasis in technologies related to navigation and wellness. Many of those sub-areas are crosswise, as the research and applications are being developed for recreation and for professional purposes. The themes will be spread between the different chapters showing that human computer interfaces and interaction is now and in the future one of the major subjects of study in the areas where humans are involved (bottom line: everywhere!). This book shows applications and research that goes

from rehabilitation systems, education to holography and gamming. These are very different fields of research but, at the same time, very similar due to the necessity to interface the machine with humans.

The objective of the book is to bring together a comprehensive collection of research trends on HCI and interfaces from a set of international experts on research, design, evaluation, implementation and use of innovative technologies on the field. It is a book for the generic public, from policy makers, academicians, researchers, advanced-level students, technology developers, which are interested in the new trends in HCI and interfaces. We expect that actors in this huge area will find this text useful in furthering their research exposure to pertinent topics in HCI and assisting in furthering their own research efforts in this field.

Chapter 1 presents an evaluation of 4 Machine Learning techniques by using the Microsoft Research Cambridge (MSRC-12) Kinect gesture dataset. Accuracy was evaluated with different techniques obtaining very high correct-recognition rates. The performed experiments are likely to provide new insights into the application of Machine Learning technique to facilitate the task of gesture recognition. In Chapter 2 it is proposed a new analysis method based on the dynamic model which focuses on human communication. The authors selected a dozen of characteristic "exaggerated gestures" that are effectively used in our everyday lives, such as in Japanese Kabuki and Disney animation, and tried to identify their common effects.

In Chapter 3 it is described how spatial freehand gesture based navigation methods were developed to be used in virtual walkthroughs meant to be experienced in large displays using a depth sensor for gesture tracking. Chapter 4 offers two prototype solutions supported by the Leap Motion 3D sensor, to manage appliances and other devices in a building and for the picking and loading of vehicles in a warehouse. The first case is contextualized in the area of the Internet-of-things (IoT) and load scheduling of appliances, as a decisive factor in reduction of the buildings' electrical costs. The second case is presented as a solution to integrate the distribution of fresh and frozen goods where workers use thick clothes/gloves to carry out their work. Chapter 5 describes the implementation of a remote bilateral gripping architecture that enables the operator to feel the remote teleoperation environment, by communicating vivid sensations from the server side to the master side, through sensorless sensing techniques of Disturbance Observer (DOB) and Reaction Torque Observer (RTOB).

Chapter 6 applies a user-centered approach to investigating feedback modalities for robot teleoperation by naive users. In Chapter 7 are presented three virtual public relations installations, including a holographic installation, combining technology with a human like public relations ability, capable of interacting with potential clients located in front of the installations. Following, in Chapter 8 the authors discuss the Sixth Sense Technology, highlighting the future opportunities and challenges in implemented such technology in integrating the digital world with the real world.

Chapter 9 presents current setups for the construction of Augmented Reality Mirrors (ARMs) – a kind of specular interfaces that use of Augmented Reality technology. It also presents a study on their potential for inferring behaviours and emotions in human perception and shows their use in different areas of knowledge, namely entertainment, edutainment, clothing, arts and medical therapy. Chapter 10 presents a religious tourism experience model and methodology for religious and spiritual ways and itineraries development, in a way to get additional knowledge about the cultural, spiritual and religious heritage, in a technological itinerary, through a personal mobile device.

Chapter 11 focus on context aware systems which strive to facilitate better usability through advanced devices, interfaces and systems in day to day activities. These systems offer smart service discovery, de-

livery and adaptation, all based on the current context. In this sense, the chapter proposes and implements different contextual data organizations, identifying the tactics of contextual data organizations as evident in the literature. A qualitative comparison of these structures is also carried out to provide reference to future research. Following, Chapter 12 outlines how a design science (DSR) research approach is used to develop a Human-Computer Interaction artifact (semiotic framework) for design and evaluation of user-intuitive web interface signs. The chapter describes how the principles and guidelines of DSR approach are adopted, while performing the activities of the DSR process model to construct the artifact.

Chapter 13 examines the theories behind the user interface design, the learner interface design and the instructional design. It also shows guidelines that can be garnered from these designs theories to develop a user-friendly online module and to explore the plausible reasons for the high attrition rate in Massive Open Online Courses (MOOC). Chapter 14 presents the development a framework for evaluating e-learning for use in Human Computer Interaction (HCI). This framework can be used to evaluate different e-learning modules along common lines making it easy to compare evaluations. Making a contribution that over the next few years, a consistency in evaluations of e-learning would be achieved for use in HCI.

Chapter 15 describes the exploration and testing of new possible designs and ways of control of human-computer interfaces for remote control of complex distributed manufacturing systems. I tis shown a remote system with Wall interface, video beam presentation mode and using group work to enable producers in manufacturing sector to offer a product, through outsourcing manufacturing process and system in a global chain, utilizing ubiquitous computing systems and virtual and networked enterprises concepts, for anywhere-anytime control. Chapter 16 explores Serious Games as a method of stimulating users to learn, by playing and competing against themselves, against other users or against a computer application. After presenting some developments they present two real world projects, that help the understanding of the applicability of this technology. In Chapter 17, the authors discuss the requirements that assistive environments have to address, when designed for older users. The theoretical discussion is complemented with experimental results gained from an Ambient Assisted Living project carried out by the authors, discussed as a use case.

In Chapter 18, the authors discuss the establishment of a robotic assistive system that can be used in post-stroke rehabilitation. In particular, they present the mathematical models based on artificial intelligent techniques that map the surface electromyography (sEMG) signals to estimate the joint torque of elbow. Using that information the resulting robotic assistive system recognizes the intended movement and assists the patient to perform and make the training exercises more effective. Chapter 19 describes how VR can be used as a non-pharmacological adjuvant for chronic pain. It is also presented two paradigms for virtual environments built for addressing chronic pain that have emerged – Pain Distraction and what we term Pain Self-modulation. Finally, this chapter discusses VR's validation for mitigating pain in patients who have acute pain, for those with chronic pain, and for addressing "breakthrough" periods of higher pain in patients with chronic pain. Following, in Chapter 20 focus its study on advergaming which serves as a new and valuable form of online advertising. The chapter examines the impacts of cognitive overload with placement prominence on respondents' brand recall, recognition and brand attitudes. The investigation both investigated the context of advergames and as well in-game advertising situations, with practical and theoretical implications.

In Chapter 21, the author addresses the design and development of an inclusive customer service facility, capable of supporting users with physical or sensory disabilities, in rendering a wide range of services, by means of several gadgets such as self-service kiosks, tablets, and interactive panels and

tables. In Chapter 22, the authors address the challenge of identity assurance, using brain electric signals obtained from electroencephalographic sensors. They propose a first solution, based on the reconstruction of patterns of connectivity between three electroencephalographic sensors (or motifs) and on the assessment of their stability across different trials for a single subject. Chapter 23 presents a fully automated and an interactive semi-automated counting systems using computer vision to count the number of colonies in a Petri dish culture to reduce the time and avoiding inconsistencies that occur in manual counting of bacterial colonies.

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