

## Preface

The computer is becoming a medium through which more and more people search for information, communicate, and have fun. The complexity of this collection of information has attracted the interest of the Human-Computer Interaction (HCI) research community. Researchers have focused their attention in developing new models and methodologies for describing user behavior, analyze their needs and expectations, and thus successfully design user friendly systems.

The application of HCI can have an effect of organizational and social dimensions. For example, the area of computer supported collaborative work (CSCW) explores the effect the introduction of technology can have an effect on the organizational structure and the way of work of companies and organizations. Similarly the study of how we use technology to communicate with each other is gaining strong interest in the HCI research community.

The expansion of the Internet has resulted in an increase in the usefulness of Computer Mediated Communication (CMC) and the popularity of online communities. It is estimated that 25% of internet users have participated in chat rooms or online discussions (Madden & Rainie, 2003).

December (1997) defines CMC as “the process by which people create, exchange, and perceive information using networked telecommunications systems (or non-networked computers) that facilitate encoding, transmitting, and decoding messages”. He emphasizes that studies of CMC view this process from different interdisciplinary theoretical perspectives (social, cognitive/psychological, linguistic, cultural, technical, political) and often draw from fields such diverse as human communication, rhetoric and composition, media studies, human-computer interaction, journalism, telecommunications, computer science, technical communication, and information studies.

The cyberspace is the new frontier in social relationships, and people are using the Internet to make friends, colleagues, lovers, as well as enemies (Suler, 2004). As Korzeny pointed out, even as early as 1978, online communities are formed around interests and not physical proximity (Korzeny, 1978). In general, what brings people together in an online community is common interests such as hobbies, ethnicity, education, and beliefs. As Wallace (1999) points out, meeting in online communities eliminates prejudging based on someone’s appearance, and thus people with similar attitudes and ideas are attracted to each other.

Another application area in which HCI plays an important role is the computer-augmented environments, or commonly known as augmented reality or mixed reality. It refers to the combination of real-world and computer-generated data visualization. In other words it is an environment which consists of both real world and virtual reality. For instance, a surgeon might be wearing goggles with computer generated medical data projected on it. The goggles are said to augment the information the surgeon can see in the real world through computer visualization. Therefore, it is not difficult to see the connection of augmented reality with ubiquitous computing and wearable computers.

Since its inception, augmented reality has had an impact on various application domains. The most common use is probably the support of complex tasks in which users need to perform a series of complicated actions while having access to large amount of information at the same time, such as surgery,

assembly and navigation. Apart from these, augmented reality is also used for learning and training, such as flight and driving simulations.

Augmented reality implementation usually requires additional devices for input and output in order to integrate computer generated data into real world:

- A Cave Automatic Virtual Environment multi-user, room-sized, high-resolution, 3D video and audio immersive environment in which the virtual reality environment is projected onto the walls. The user wearing a location sensor can move within the display boundaries, and the image will move with and surrounds the user.
- A head-up display (HUD) is transparent display that presents data without obstructing the user's view. It is usually implemented on vehicles in which important information is projected directly in the driver's viewing field. Thus the user does not need to shift attention between what is going on in the real world and the instrumental panel.
- A head-mounted display is a display device, worn on the head or as part of a helmet that has a small display optic in front of one or both eyes.

Some of these devices have become commercially available and increasingly affordable. The challenge of HCI lies in the design of information visualization which is not obtrusive to the users' tasks.

A lot of effort has been put in coupling learning and technology to design effective and enjoyable learning. Various areas, namely e-learning, computer-based learning, serious games, and so forth have emerged, hoping to utilize the interactive power of computers to enhance teaching and learning experience. A myriad of design strategies have been proposed, implemented and evaluated, these include the early use of computer in presentation, drill and practice (the behaviorist paradigm), tutorials (cognitivist paradigm), games, story telling, simulations (constructivist paradigm), and so forth. As we progress from behaviorist to constructivist, we notice an explosion of user interface complexity. For instance, drill and practice programs usually consist on a couple of buttons (next, previous buttons, buttons for multiple choice, etc.) while simulations could involve sophisticated visualization (outputs) and various user interface elements for manipulating parameters (input). Recently, computer-based learning has moved from single user offline environments to online network spaces in which a massive number of users can interact with each other and form a virtual learner community. This social constructivist learning paradigm requires not only traditional usability treatment, but also sociability design in which the system includes not only the learning tools, but other sociability elements such as rules and division of labors.

Information visualization is an area in HCI which can be related to many other areas such as augmented reality just described before. Most modern computer applications deal with visual outputs. Graphical user interface has almost entirely replaced command-based interaction in many domains. Information visualization can be defined as "the use of computer supported, interaction, visual representations of abstract data to amplify cognition" (Shneiderman, 1992). To amplify cognition means that visualization shifts cognitive loads to the perceptual system, thus expanding working memory and information storage.

Visualization provides a more perceptually intuitive way of viewing raw data, thus allowing users to identify relevant patterns which would not have been identified in raw data.

Therefore, it has a huge impact on many applications domains, ranging from engineering, education, various fields in science, and so forth.

In HCI, the most obvious application is the use of visualization in the design of graphical user interface that allows more intuitive interaction between human and computers. Various innovative interaction styles have been developed such as WIMP (window, icon, menu, pointing device) which is so familiar in today's software. Three-dimensional graphics are also emerging although currently they are mostly

used in computer games and computer-aided design. One recent example of 3D graphical interface is the new windows navigation and management known as Windows Flip 3D in Windows Vista which allows the user to easily identify and switch to another open window by displaying 3D snapshot thumbnail preview of all windows in stack.

Today, information visualization is not only about creating graphical displays of complex information structures. It contributes to a broader range of social and collaborative activities. Recently, visualization techniques have been applied on social data to support social interaction, particularly in CMC. This area is known as social visualization by (Donath, Karahalios, & Viégas, 1999). Other technique such as social network analysis has also become increasingly important in visualization social data.

Other areas where HCI plays an important role include: Intelligent and agent systems; Interaction design; Interaction through wireless communication networks; Interfaces for distributed environments; Multimedia design; Non-verbal interfaces; Speech and natural language interfaces; Support for creativity; Tangible user interfaces; User interface development environments and User support systems.

HCI issues like usability evaluation, presents an additional interesting complexity. Due to the variety in design of systems, and the variety of user-goals while interacting with them, the task of choosing and properly using the appropriate evaluation method becomes a challenge. New approaches and methodologies for analysis, design and evaluation of such systems have been developed, and this book presents some of those.

This book also points out that beyond the technical aspects, we need to systematically take into account human interaction and activity, and the completely renewed social and cultural environments that such digital environments and interfaces are calling for and technologies are now capable of delivering.

The book brings together 10 chapters that cover in depth some of the recent HCI issues of interest to academia and industry.

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