IMPLEMENTATION OF INTERACTIVE COMPUTING SYSTEMS FOR HCI

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Abstract:

Human-computer interaction is a discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.
—Thomas T. Hewett et al., 1992

Human-computer interaction (HCI) as a field of inquiry necessarily evolves in response to changes in the technological landscape. During the past 15 years, the speed of change has been particularly dramatic, with the emergence of personal mobile devices, agent-based technologies, and pervasive and ubiquitous computing. Social networking has also profoundly changed the way people use technology for work and leisure. Who would have predicted a decade ago that (smart)phones would offer constant access to the Web, to social networks and broadcast platforms like Facebook and Twitter, and to hundreds of specialized apps? Who could have anticipated the power of our everyday devices to capture our every moment and movement? Cameras, GPS tracking, sensors—a phone is no longer just a phone; it is a powerful personal computing device loaded with access to interactive services that you carry with you everywhere you go.In response to these technological changes, user populations have diversified and grown. Once limited to workplaces and used only by experts, interactive computational devices and applications are now widely available for everyday use, anywhere, anytime by any and all of us. Though complex institutional infrastructures and communications networks still provide the backbone of our digital communications world, HCI research has strongly affected the marketability of these new technologies and networked systems.

INTRODUCTION

Importance of HCI in education:HCI is primarily about solving problems and innovation. HCI students learn how to identify areas of improvement and then create better services and products. And if you can demonstrate these skills to a potential employer, then you'll significantly raise your chances of standing out in highly competitive job markets.

HCI courses (especially at postgraduate level) often have close ties with established or emerging tech companies. As such, they'll be plenty of opportunities for networking, including internships and placements at prestigious companies. Many HCI students end up working at some of the most successful and influential tech giants, such as Google, Microsoft, and Samsung. Specific career paths include software engineer, UX designer, computer programs, system engineer, and project manager, while others go on to build their own tech startups or work freelance.

Social media is a perfect example of how HCI can drive human behaviour. But it can also give birth to some less desirable forms of communication, such as internet trolling. So it's important to remember that HCI isn't just about making things work well; it also has a strong ethical dimension that relates to our mental health, our online interactions, and even the quality of our political discourse. HCI will continue to shape our experiences long into the future, and those working within the field have a responsibility to make sure it brings out the best in us, rather than the worst.

HCI students and scholars learn about basic human characteristics and develop the necessary skills to study people's activities with and around technologies. They need to develop investigative, analytical, technical, communication, and advocacy skills to help them shape interactive technologies that augment people's abilities, enhance their creativity, connect them to others, and protect their interests. Preparing today's students of Human-ComputerInteraction (HCI) for tomorrow's work practices ischallenging. The technologies, interaction modes andinterfaces all change fast. In addition, there are rises andfalls of techniques in use, design processes, work practices,software and platforms in use.Students, on one hand, need to learn appropriate theoriesand research methods, understand the state-of-the-artresearch, importance of scientific rigor and relevance.However, being a profoundly inter-disciplinary field, HCIdoes not offer any unifying core theories, so this goal is hardto achieve once and for all (in other words, new application.domains require acquisition of new theoretical knowledge,what the state-of-the-art research is, etc.).On the other hand, students need to be able to design new technologies and interfaces, using design processes andmethods. This is also hard to achieve without any formaltraining in design, which is, in part, why design processes inHCI often depend heavily on engaging users and otherstakeholders, thus sharing the responsibility with them forsuccess or failure of a designed prototype. The latter is notseen as problematic, as prototypes are often not intended tobecome artifacts, but are tied to the research objectives.

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DISCIPLINES CONTRIBUTING TO HCI

The field of HCI covers a wide range of topics, and its development has relied on contributions from many disciplines. Some of the main disciplines which have contributed to HCI are:

Computer Science

- technology
- software design, development & maintenance
- User Interface Management Systems (UIMS) & User Interface Development Environments (UIDE)
- prototyping tools
- graphics

Cognitive Psychology

- information processing
- capabilities
- limitations
- cooperative working
- performance prediction

Social Psychology

- social & organizational structures

Ergonomics/Human Factors

- hardware design
- display readability

Linguistics

- natural language interfaces

Artificial Intelligence

- intelligent software

Philosophy, Sociology & Anthropology

- Computer supported cooperative work (CSCW)

Engineering & Design

- graphic design
- engineering principles

HCI TECHNIQUES FOR E-LEARNING

The application of perceptive interfaces to e-learning systems, as a way to improve the quality of the interaction through more natural forms of communication have been considered. Of course, it is practically impossible to achieve the levels of real human-human communication, but thanks to constant developments in the fields of computer vision and speech recognition, we will get closer and closer to such goal.

Exploring Input Devices

1. Time stamping: This technique can be applied extensively to determine the time delays between the subsequent user responses and accordingly, judge the difficulty level of the question or the interest level of the user while answering the question or solving the problems.

2. Hand writing recognition: This type of interface can be helpful to reduce the use of keyboard, and hence minimizing the keystrokes, which often becomes tedious. This interface may facilitate an interaction through natural handwriting, which could be helpful in solving mathematical or logical or algorithmic type of problems. It could be of great use to the users not very efficient in typing skills.

3. Facial expression recognition: automatically identifying who is in front of the computer screen or distinguishing among different face expressions can help make the interface more "human like"

4. Voice: From voice it is possible to draw information about the emotional status of the user. Interfaces of this kind are useful to "humanize" the computer. Scientific findings suggest in fact an increasingly large number of important functions of emotions, which contribute not only to irrational behavior, but also play an important role in rational decision making. 5. Pointing and manipulation: A magnetic tracker can provide the three-dimensional analogue of the mouse. Other technologies, such as ultrasonic ranging or video tracking, can also be used in this way. Camera-based locator devices are being studied, but are still limited. A single-camera system is limited to its line of sight; more cameras can be added but full coverage of an area may require many cameras and a way to switch among them smoothly. This approach

requires some type of image processing to interpret the picture of the user and extract the desired hand or body position.

6. General gesture input: The three-dimensional mouse can be taken a step further. Rather than simply designating a location in three-space, it can allow a user to make natural, continuous gestures in space. Progress in this area requires not only a non-encumbering three-dimensional tracking technology but also a way to recognize human gestures occurring dynamically. Gesture based input is currently becoming a very active research area.

7. Speech: Speech input has been a long-standing area of research. While progress is being made, it is slower than optimists originally predicted, and further work remains in this field. Although the goal of continuous speech recognition remains elusive, unnatural, isolated-word speech recognition is appropriate for some tasks. Research is needed not only in the actual speech recognition technology but also in how to use speech in an interface.

8. Eye input technology: The eye movement input is, ideally a noncommand-based style technique. The problem with a simple implementation of an eye tracker interface is that people are not accustomed to operating devices simply by moving their eyes. They expect to be able to look at an item without having the look cause an action to occur. At first it is helpful to be able simply to look at what you want and have it occur without further action; soon, though, it becomes like the Midas Touch. Everywhere you look, another command is activated; you cannot look anywhere without issuing a command. To avoid this problem or some form of "clutch" to engage and disengage the monitoring.

9. Monitoring user attitude: A user-computer dialogue could be improved if the computer knew the answer to such simple questions as, Is the user still sitting in his chair? Is he facing toward the computer? Is he using the telephone? Is another person present in the room? Real-world objects can do useful things when they detect even simple events like user arrival and departure.

10. Finger print recognition: the technology can be utilized to authenticate a user, which could prove to be useful while examining or evaluating a user.

Exploring Output Devices

1. Better graphics resolution: While great strides have been made in graphical output resolution, the demands of high-performance user interaction are far from satisfied. People can routinely make effective use of densely packed documents such as a printed road map or navigational chart. Their high resolution is well matched to human perceptual abilities,

yet it is well beyond the current state of practice in display technology.

2. Touchable displays: A further improvement in the realism of a three-dimensional display would be to permit the user to reach out and feel the displayed object. Force and resistance feedback are discussed below; they derive particular power when combined with a convincing stereoscopic display.

3. Non-speech audio output for 'visualizing' data: It is not necessary to restrict the notion of "visualization" to visual displays. The basic idea of visualization is to put data into some representation perceptible to the user. This representation could be entirely visual or visual plus, for example, audio or not visual at all (tactile plus audio). For example, a useful means for encoding information is in sounds. Typical computer systems use only a few simple beeps for alerts, but humans can glean considerably more meaning from simple sounds, both natural sound effects and artificially conceived tones.

4. Speech: Natural, continuous speech output is difficult to achieve, but simple, isolated utterances may still be reasonable when talking with a computer. Much of the discussion under speech for input, above, applies here too, and, again, research in how to use speech and integrate it into a multimode interface is particularly important.

5. Ergonomic considerations: In a different direction, less tiring output media will become increasingly important as users spend more of their lives receiving computer output. CRT displays continue to elicit complaints of muscle fatigue, eye fatigue, and the like. While some of these seem to be caused by factors outside the display device, such as poor job design and poor seating posture, some may also be caused by the actual characteristics of the device. Better alternatives would be worthwhile.

6. Colour: Except where photographs are used or realistic pictures are required, screens limited to three or four colours work best. A high contrast colour between background and text facilitates reading and can improve performance on tasks such as recall and retention of information. However, colour is important for motivation, particularly where younger children are concerned, so the use of black and white screens is not generally advised. Be careful when choosing colours, as users with visual impairments such as colour blindness will have difficulties with certain colour combinations.

7. Video: Screens containing video need control buttons for the learner. They need to be able to rewind, repeat the video from the beginning and stop at any particular point. Make sure the buttons and their functionality are obvious by convention or design.

8. Text: Pay attention to the size and type of font and the area of the screen used for text. Make sure the level of difficulty of the language used is appropriate for your target learner and sentence lengths are kept short for improved readability.

9. Images: Select appropriate photographs, graphics and animations with the learning task and age of the audience in mind. These will influence the ambience of the learning material and will affect the appeal of the program, helping to give it its 'character'.

10. Balance: The screen should be pleasing to the eye, which often means some sort of symmetry in the layout and an appropriate balance between text and graphics. If clarity and simplicity are required, the text should only occupy a reasonably small portion of the page and screens should not be too busy or 'loud'. For learning purposes grouping or chunking together of material for specific learning points is desirable.

CONCLUSION:

Exploring new input/output devices and interaction styles for interactive systems can lead to two kinds of benefits. The first is progress in our scientific understanding of human computer communication: it can improve our understanding of new modes by which people can communicate with machines and lead to understanding of the characteristics of the devices, interaction techniques, and dialogue styles that allow us to exploit these modes. The second is in application of these results: it can lead to faster and more natural communication with interactive systems, enable better quality and efficiency in the operation of such systems, and improve the working conditions of their users by providing them with richer and more natural means of communication.User involvement and iterations of user testing are strongly recommended to get the layout correct. The input of sample learners at an early stage is well worth investing in so that you have information on how others see and operate your screens. In this way, you can eliminate any assumptions you may have about how the interface works, which may not be apparent to the user.

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