

# Human-Computer Interaction

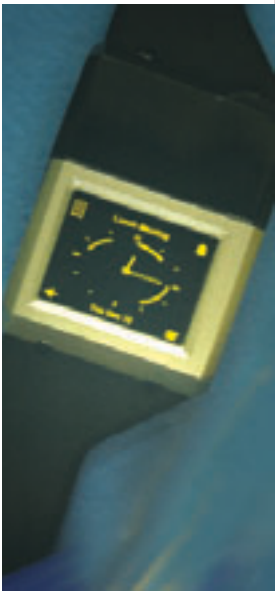
In parallel with its research on computer hardware and software, IBM is a leading center for human-computer interaction (HCI). From the development of enabling technologies, such as speech recognition, to cutting-edge interaction design, IBM's HCI research spans more than a quarter of a century. Drawing on such disciplines as anthropology, computer science, psychology, and sociology, as well as visual and industrial design, HCI work is carried out in contexts ranging from laboratories to on-site collaborations with customers. Current research includes three entwined areas: computer perception and output, context awareness, and social computing.

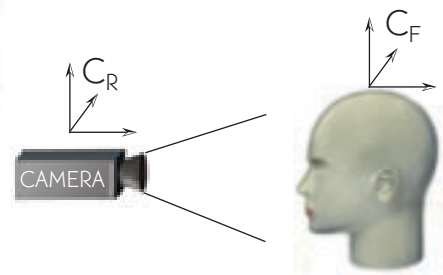
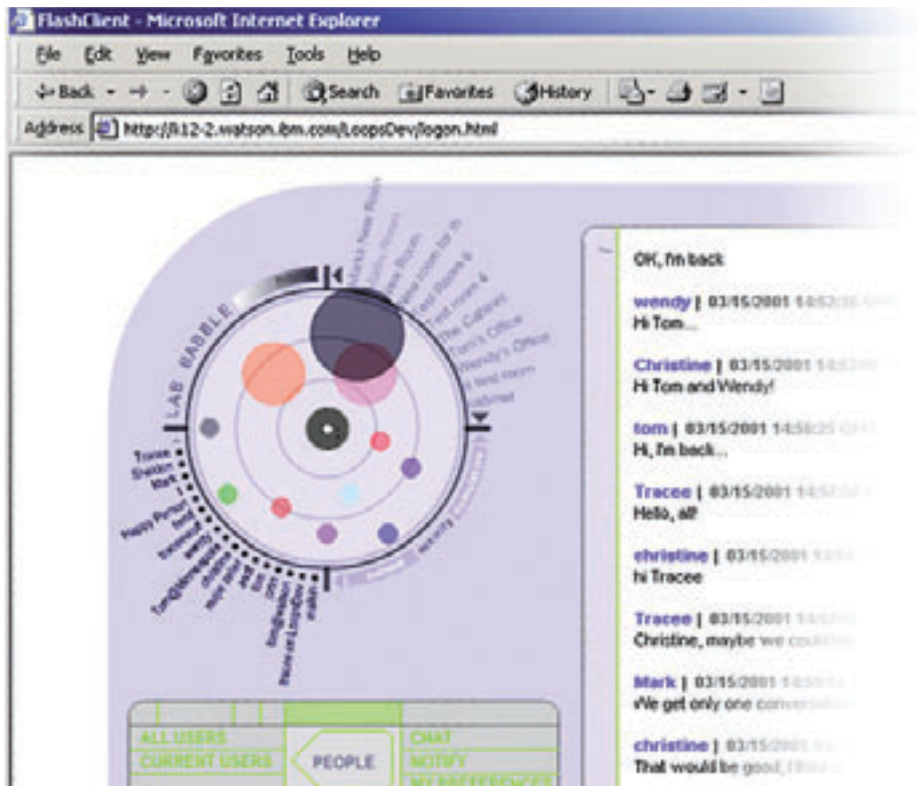
## Computer Perception and Output

Humans perceive the world through the senses of hearing, vision, touch, taste, and smell, and one of the important areas of HCI research is the design of computer systems that perceive the world in similar ways. Emulating the modality of hearing, the speech recognition group, which set the pace for dictation systems in the early 1990s with ViaVoice, continues to focus its efforts on enabling spoken language input.

Image processing also provides crucial information to the computer about its environment, and the audio-visual speech technologies group is pursuing research into augmenting audio techniques with visual cues to improve the robustness of both speech recognition and speaker identification. This technology is widely applicable in areas ranging from large-vocabulary broadcast news transcriptions to speech recognition for automated information kiosks in noisy public areas such as airports.

Natural interaction, of course, is not just about getting information into the computer. In addition to computer perception, HCI research also has a strong emphasis on delivering information and functionality to users in innovative and appropriate ways. For example, researchers in wearable computing have developed the first wristwatch that runs Linux. Designed to communicate wirelessly with PCs, cell phones, and other devices, this "smart watch" has e-mail, calendar, address-book, and messaging functionality, and uses a touch screen and roller wheel for input. The Everywhere Displays project uses an LCD display to project images anywhere in a room and lets users interact with the images via a video camera that detects the user's gestures. In this paradigm, the display comes to the user rather than the user going to the display.





### Context Awareness

Another focus of HCI research is context awareness. What counts as “natural” interaction changes depending on the situation and becomes increasingly varied as computational devices become more pervasive. The cell phone ringing in a quiet restaurant has become a symbol for the many infelicitous ways in which technology impacts our daily lives. Increasing the abilities of our devices to sense their surroundings and act appropriately has a vast number of applications.

The BlueEyes project, for example, is integrating information from video cameras, microphones, and other sensors to determine where users are, what they are saying, and how they are gesturing. There are a number of projects exploring how to gather and apply information, ranging from identifying who people are (using techniques such as voice ID or retinal scanning) to where they are (motion or IR sensing), and what they are doing (identifying whether slide presentation software is being used). A key issue here is to better understand appropriate applications of such technologies. One example is the Rapid Access project that aims to make it easier for users who have difficulty – whether through lack of knowledge or physical disability – configuring their user interfaces. Rapid Access seeks to alleviate these problems by detecting when the current interface is difficult for a user to control and automatically adapts to the user’s capabilities.

### Social Computing

HCI research is not just about human interaction with computers; it also includes work on facilitating human-human interactions through computers. From small working groups to large e-commerce sites, designing infrastructure, middleware, and user interfaces to support collaboration and group interaction is increasingly critical.

In a joint project with Boeing, researchers have developed a framework called TeamSpace that provides the infrastructure for virtual teams. TeamSpace is a web-based system for conducting distributed meetings, managing shared work processes, and maintaining shared artifacts in a project that typically spans months or years. Another research project is Babble, an online conversation-oriented space that uses social proxies – abstract minimalist visualizations of participants’ presence and activities – to support new forms of group interaction. Social proxies provide a rich texture of cues that allow people to draw upon their social knowledge (for example, if there’s a crowd, it must be interesting) and that support everyday social processes (for example, imitation and peer pressure) that are important in facilitating coherent group interaction.