Human-Computer Interaction Research at Maryland

In an age when technology permeates every part of our lives, intuitive computer interfaces are essential. Awkward hardware and frustrating software can complicate simple tasks, decrease productivity, and render even the most powerful programs ineffective. Researchers studying human-computer interaction (HCI) apply a range of methods to design user-focused interfaces that are both functional and appealing.
Established in 1983, the University of Maryland's Human-Computer Interaction Lab (HCIL) was the country's first HCI lab; it continues to lead and innovate. HCIL develops advanced user interfaces and design methodologies that have social impact. Health care, public safety, literacy, cultural awareness—these are just a few of the social concerns improved and addressed by HCIL's innovative designs.

Ben Shneiderman and Catherine Plaisant develop computer visualization technology to reveal hidden patterns in electronic health records. Their applications offer medical professionals powerful new tools for disease research and patient diagnosis.

Paul Jaeger and Jennifer Preece work with Shneiderman and other researchers to develop community response grids. These interactive portals provide real-time emergency information to citizens across a range of interfaces, including Web sites and mobile phones.

Allison Druin develops innovative software for kids by involving them as partners in the design process. She uses this practice to improve the International Children's Digital Library.

François Guimbretière develops technologies that combine the best attributes of paper interfaces—such as notepads and books—with the power and flexibility of digital devices.

Human-Computer Interaction Lab www.cs.umd.edu/hcil

Visualizing Health Records

Ben Shneiderman and Catherine Plaisant have been changing the way doctors see medical information for more than a decade, and their latest work continues to innovate.

Their LifeLines program turns the text of a personal medical history into an instantly accessible color-coded visualization. At a glance, doctors can see timelines of office visits and hospitalizations, track the development of a condition, or observe changes in medications or dosages. By visualizing medical events, LifeLines reduces doctors' chances of overlooking important information, and it can help them instantly identify trends and anomalies in the health of individual patients.

Most recently, Shneiderman and Plaisant have been developing PatternFinder, the next generation of medical-record visualization technology. PatternFinder allows physicians and researchers to create visualizations from custom queries, both within and between patient records. This cross-record functionality is the real innovation of PatternFinder. Visual queries of large medical databases can reveal visual patterns that are difficult or impossible to express in other media. PatternFinder visualizations will guide new research projects, aid the analysis of clinical trial data, and help identify invisible risks to public health.

PatternFinder www.cs.umd.edu/hcil/patternfinder/
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911.gov: Community Response Grids, E-government, and Emergencies

As recent national crises have shown, traditional information channels, such as television and radio broadcasts, can be ineffective when disaster strikes. During crises, traditional emergency response systems can become overwhelmed, leaving vulnerable citizens uninformed or stranded.

Ben Shneiderman, Jennifer Preece, Paul Jaeger, and other HCIL-affiliated researchers are creating technological solutions to improve emergency information management and response at the community level. They are developing multi-

channel interactive systems that citizens and governments can use to share information and to help each other. These community response grids (CRGs) are geographically based socio-technical networks of citizens supported by Internet-based and mobile technologies. Citizens can connect with officials and with each other through Web portals designed for both computers and cell phones. Through these portals, people can share local information, receive important updates, ask for help, or offer to assist neighbors.

HCIL's proposed 911.gov system is an emergency CRG that would allow citizens to receive and submit information about significant homeland security problems, such as floods, wildfires, hurricanes, or terrorist attacks. More than just an informational site, 911.gov would aid communities before, during, and after an emergency by providing channels for contacting authorities, uploading information, distributing information, coordinating the responses of social networks, and facilitating resident-to-resident assistance.

911.gov www.cs.umd.edu/hcil/911gov/
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Technology Resources for Children, Designed by Children

Allison Druin, Director of HCIL, has a novel approach for designing accessible interfaces for children—she has real children help with the design. This approach is an example of what HCI researchers call "cooperative inquiry." Druin's design partners are part of the College Park Kidsteam, a group of six children, ages 7 to 11, who work with the adults at HCIL. Children and adults learn from each other as they develop and evaluate interfaces. Through this collaboration, Druin and the Kidsteam have co-developed new features for searching, browsing, reading, and sharing the electronic books of the International Children's Digital Library.

The International Children's Digital Library (ICDL) is the world's largest online repository of digitized children's books. Created at HCIL but now run by an independent foundation, the library's mission is to inspire the world's children to respect diverse cultures, languages, and ideas by making the best in children's literature available online. When children got involved with the library's design, they proposed desirable features that adults would have never imagined. For example, children often search for a paper book based on how it will make them feel. This feature is now a search option on the site. Similarly, children do not always read illustrated books linearly. The library now includes a spiral interface that facilitates nonlinear reading.

Ben Bederson and Ann Weeks also contribute to the ICDL project.

International Children's Digital Library www.childrenslibrary.org
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Bridging the Paper-Computer Gap

François Guimbretière designs hardware systems that combine the functionality of paper-based interfaces with the robust features and flexibility of digital technology. His Paper Augmented Digital Documents (PADD) system and next-generation e-book readers help to bridge the gap between paper and computer formats.

It may seem strange to call paper documents "interfaces," but these traditional forms offer distinct advantages for interacting with information. They allow users to read across more than one document at once, and they can be marked easily with pencils and pens. However, paper documents are difficult to modify, and they are expensive to archive and distribute. Guimbretière's PADD system allows users to write on printed documents with a pen that tracks changes and archives them through digital databases. The PADD system connects the power of digital storage and sharing to the more natural activity of writing on paper.

Guimbretière's next-generation e-book readers also bridge the paper-computer gap. These twin-panel hinged displays mimic the twin-panel "displays" of paper books. They offer a more natural reading experience than reading an e-book on a computer or PDA, and the dual-displays enable new ways of interacting with content. For example, a reader can simultaneously view two pages from different parts of a book.

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