

The Future of User Interface Design Tools

Dan R. Olsen, Jr.

Computer Science Department
Brigham Young University
Provo, UT 84602
olsen@cs.byu.edu

Scott R. Klemmer

Computer Science Department
Stanford University
Stanford CA 94305-9035
srk@cs.stanford.edu

ABSTRACT

This workshop aims to gather researchers in the field of user interface design tools to identify important themes for the next decade of research. These tools aid in the design and development of interactive systems: they include interface builders, development environments for writing code, and toolkits that provide software architectures and building blocks to aid development. These tools have provided tremendous benefit for the designers and developers of graphical user interfaces. The CHI community has shown that the next generation of user interfaces is moving off the desktop: these emerging interfaces employ novel input techniques such as tangible, haptic, and camera-based interaction, access to vast information repositories and sensor networks, and information presentation to a wide range of devices. In this workshop, we will discuss common themes, conflicting ideas, and future directions for the next generation of software tools that will support ubiquitous computing.

Development is driven by tools and technologies

History has shown that revolutions in the way people interact with computers are often driven by basic technology and by tools for developing solutions on top of that technology. Graphical interaction had been around for more than a decade before the Xerox Star showed how it could be effectively used in an office setting and the Macintosh provided a set of tools that put programming such interfaces within the grasp of the average programmer and provided an environment in which solutions could effectively interoperate. The Internet had existed for decades before the World Wide Web provided a set of interoperable tools that put network interaction within the range of average programmers rather than network specialists.

REASONS FOR THE WORKSHOP

In the early 1980's a series of workshops were held to outline the challenges of how to support people interacting with computers [1, 2]. These workshops were simultaneous with the advent of personal computing and in particular the digital desktops that are now pervasive in homes and businesses. Those workshops helped to establish the research communities and identify the challenges that shaped UI research over the next 15 years.

The nature of computing, however, has changed radically since 1980. Personal computers are 10,000 times faster with 10,000 times more memory and disk space. Virtually all computers are connected to the Internet. Over the next 10 to 20 years we face a similar growth in computational capacity along with an ever increasing amount of network connectivity. The personal workstation of 2015 will likely have a 300 GHz processor, 50 GB of RAM and 10 terabytes of disk. The direct-manipulation / document-processing model of interaction will be inadequate. Not only will personal workstations be tremendously powerful but other forms of computing will change also. Mobile phones will have tens of gigabytes of storage and gigahertz processors with no increase in cost. A processor that supports today's state of the art in speech recognition will be a \$5 part. Webcams will likely have at least a gigabyte of RAM and a gigahertz processor. The model for interactive computing created in the 1980's does not take advantage of the computational realities of the 21st century. New paradigms for interacting with computers are not only required but possible [3].

Limitations of today's interactive computing

Interaction on the desktop is physically and socially limited in many ways. Computing at the desktop is a solo activity that requires one to be seated. Laptops are not much better. U.S. labor statistics show that the majority of Americans do not work at a desk, but like health care and manufacturing workers spend most of their time interacting in the physical world where things are made and people are served.

The current direct manipulation model for interaction limits users to interaction with what they can see and touch. If a user must spend 20 seconds reading and 10 seconds clicking or typing to process a piece of information then they can handle at most 240,000 pieces of information per year (with no breaks or rest). If each piece of information was 1 MB

then the user can handle at most 240 GB per year. This pales in comparison with the capacity of future workstations. Such a user could not sift through their own RAM (much less their disk space) more than 5 times per year.

Future interaction

Interaction with computers must move beyond the desktop and beyond direct manipulation. New interactive techniques that empower users to filter, manage, sift, and organize massive amounts of information are required. If a university president has every class taken by every student in the past 20 years on his PDA, how will he use that information effectively to explore new university initiatives? If an oncologist has all of the medical data, test results and radiology images of every cancer patient in the hospital for the last 15 years on her PC, how will she be interactively empowered to discover new trends, treatments or problems?

The potential form factors for computing devices are changing radically and thus empowering new ways of interacting with computers. The future ranges from computers that fit in one's ear through palm-sized, lap-sized, and desk-sized devices to where an entire office becomes an interactive environment. This can further expand to where conferences, buildings and urban environments become vast interconnected interactive resources. When interaction is embedded in the world, how will that interaction occur and who will have the skills to create, design and adapt such interactions?

The Future of User Interface Software Tools

Currently, developing this next generation of interfaces is difficult, time-consuming, and requires a high level of technical expertise. Consequently, only a small cadre of technology experts can currently build these UIs. The difficulty of technology development and lack of appropriate interaction abstractions make designing different variations of an application and performing comparative evaluations unrealistic. These difficulties echo the experiences of developing GUIs twenty years ago. One of the earliest GUI toolkits, MacApp, reduced application development time by a factor of four or five [7]. Similar reductions in development time, with corresponding increases in software reliability and technology portability, will be achieved by the next generation of user interface software tools.

GOALS OF THE WORKSHOP

In the HCI research community, we have seen early examples of these future tools [4-6]. This workshop will serve as an organizing force for this emerging area of research, and will address questions including:

- What common “big goals” should the UI tools community have?
- Traditional UIs presume discrete, unambiguous, single-user input. How does input that is continuous, ambiguous, and/or multi-user impact tool design?
- What tools can be used to rapidly prototype novel physical devices? How do these tools bridge the physical and electronic worlds?
- How can interface tools not just lower the threshold for existing areas, but be catalysts for growth and experimentation?

Applicant Responsibilities

Each applicant for attendance will be requested to submit a two-page position paper outlining their vision of the future of UI tools and what they think the relevant research problems are. Applications must also commit to being actively involved in the writing of the resulting workshop report.

REFERENCES

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