Second International Workshop on Organic User Interfaces

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Abstract
Advances in display, sensor and actuator technology are changing the field of TEI, and opening new research areas. While modern interfaces have been designed for traditional planar and static display devices, next-generation UI allow digital objects to change their shape and embed displays anywhere. Fitting into the paradigm of Organic User Interfaces, these developments require us to re-examine and reevaluate some of the basic design principles and interaction styles currently used. This Second International Workshop on Organic User Interfaces will bring together experts to discuss, brainstorm and prototype next generation of user interfaces.

Keywords
Organic User Interfaces, Tangibles, Flexible displays

ACM Classification Keywords
H.5.2 User Interfaces: Input devices and strategies; B.4.2 Input/Output Devices: Channels and controllers;

General Terms
Design, Experimentation.

Motivation for the Workshop
In the last decade, tangible and embedded user interfaces have taken the computing power out of the standard desktop environment and into the real world [6], allowing interactions with the digital world to be done with everyday objects. However, until recently, these interactions were still limited to planar displays,

Fig 1. Rollable organic light-emitting diode (OLED) display [9].

Fig 2. Sprout, a texturally rich surface for communication [2].

to objects with static shapes. We believe that the physical shape of displays and computing devices play key role in designing its user interface.

New advances in display, sensor and actuating technologies are changing the field of TEI. With e-ink electrochemical pixels and organic thin-film circuit boards, developments in manufacturing technology have produced displays so thin and flexible that they are beginning to resemble paper. Flexible organic light-emitting diode technology will let us to embed displays in any object, providing a rich environment to share information [9] (Fig 1). New actuating technologies allow for "claytronic"-type devices that can actively re-shape themselves on multiple scales, from hand-held gadgets to entire buildings (Fig 2). Combined with the advances in sensor technologies allowing us to track the position of multiple fingers, twists and pressure on surfaces of any shape, and the ability for flexible display to become the input device, any object will display information and allow user input, no matter how complex, dynamic or flexible its structure [10]. These developments are not only opening up new opportunities for user interface innovation, but also require us to re-examine some of the basic design principles of modern user interfaces, designed for traditional, planar and static display devices.

Organic User Interfaces

These advances fit into the new Human Computer Interaction (HCI) paradigm of Organic User Interfaces (OUI). *Organic User Interfaces* is an emerging vision for future user interfaces that attempts to map out a future where these technologies are a common place. It is based on an understanding *physical shape* of the displays and computing devices will become an important design variable for future interfaces. Indeed, not only will future displays be able to take any arbitrary shape, but the shape itself will by dynamic, either modified by the user, or self-actuated.

OUIs are flexible non-planar displays that act both as output and input devices. "When flexible, OUIs have the ability to become the data on display through deformation, either via manipulation or actuation. Their fluid physics-based graphics are shaped through multi-touch and bi-manual gestures." [5] OUI design principles include that they should be created so the function of the device equals its form, for an intuitive interaction. They should be made from transitive, shape shifting materials that allows the form of the display to follow its changing function and flow [11].

Following the significant interest resulted from the publication of the special issue of Communication of ACM on organic user interfaces [11] and the first workshop on OUIs and transitive materials at CHI 2009 [3], this workshop seeks to debate and develop further the concepts behind OUI vision and further stimulate research in related areas, such as in tangible, embedded and embodied interfaces.

Workshop themes and topics

The proposed topics for the workshop are centered on the main directions of OUI, and will include:

When displays can take on any form

What would happen when any object, from a credit card to a building, no matter how complex, dynamic or flexible will be wrapped with high resolution, full-color, interactive graphics?

- *Interaction with free-form displays devices*

  The emerging technologies will allow us to create display devices that can take any shape or form, i.e. a

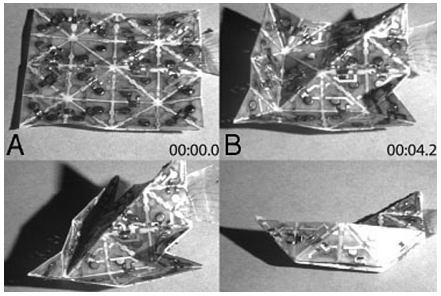

Fig 3. Programmable matter by folding [4].

Fig 4. A spherical display surface [1].

circle, triangle, sphere. How we might develop user interfaces for such displays? What kind of new applications and interaction styles would be possible?

- *Emerging display technologies: flexible, textile, paper and printed displays for OUI*

  Recent advances in materials have resulted in thin flexible paper-like displays, textile-based, printable displays and others non-planar displays such as a sphere [1, 9] (Fig 1 & 4). We invite overviews and reports on emerging display technologies as well as their comparison. How will we interact with displays that come in any shape imaginable? What new interaction principles and visual designs become possible when curved computers are a reality?

When displays can change their shape

We no longer require the physical shape of computing to be static. We will be able to bend, twist, pull and fold digital devices just like origami [4] (Fig 3). We can also augment future computing devices with new actuating devices and materials, to dynamically alter their shape, as with the Sprout interface [2] (Fig 2).

- *Shape-shifting, actuator technologies, claytronics*

  How can we make objects that can dynamically change their shape? What novel actuators will allow creating such interfaces? How can properties of new materials, such as flexibility or shape, be used to create new interfaces and applications? For example, if devices become foldable or stretchable, how can that lead to new interaction paradigms?

- *Kinetic interactions*

  With the physical shape itself being a form of display, its physical kinetic motion will become an important design variable in future interfaces. How do we use physical motion for communicating information?

When the display is the input device

Current point-and-click interfaces designed for fixed planar coordinate systems, and controlled via separate input device will not be sufficient. Rather, multi-touch, full gesture, multimodal interactions will be required.

- *Input techniques for organic user interfaces and new sensor technologies*

  What kind of interaction techniques and modalities are possible? What are new sensor technologies that can be used for OUIs? What are the most important sensory modalities for OUIs: vision, haptic or other?

Other organic user interfaces topics of interest

- *Future applications and themes of OUI*

  What kind of new applications would be made possible by OUIs? Are specific themes more appropriate for OUIs, such as building interfaces for creativity, learning, or well-being? By embedding computation in objects that change form with function, can we promote the reuse of objects?

- *Tools for developing physical interfaces*

  OUI and TEI interfaces present an interesting design, engineering and reusability problem. Advances in such tools include software environments for rapid prototyping of hardware devices, e.g. Frizting [7], or hardware toolkits that allow flexibility and power [8], but they may not always be basic enough to allow non-programming expert to use them. How can we create better, reconfigurable and dynamic tools, while providing expressiveness and details? How can we combine computation and physical materials? How can we program all these devices and materials? Are

we programming computers or programming these materials and devices directly?

Workshop Goals

This workshop will bring together interface designers, architects, engineers and scientists interested in the OUI vision; to stimulate exchange and debate between them; and to promote collaboration and brainstorming through prototyping sessions, with the following aims:

(1) To survey and discuss the current state of the field of user interface research in general and to survey trends that lead toward the organic user interface concept, identifying current and new directions of research as well as unsolved problems.
(2) To debate the scope and mission of Organic User Interface research and its connection to other fields, such as tangibles and embedded interfaces.
(3) To imagine where the underlying technological changes will take us in the next 10-20 years.
(4) To put together the collective knowledge and creativity of participants in a tangible form, through prototyping session that will illustrate key concepts of organic user interfaces.
(5) To create and maintain a broad community of researchers developing around this topic.

Workshop Supporting Web Documents

We will provide a website before the workshop at http://www.humanmedialab.org/. It will contain detailed information about the call for papers, and the list of accepted participants and proceedings with their workshop papers. The website will be maintained after the workshop.

References

[1] Benko, H. and Wilson, A.D., Design Challenges of Interactive Spherical User Interfaces. in ACM CHI 2009 Workshop on Programming Reality, (2009), 4p.

[2] Coelho, M. and Maes, P. Sprout I/O: a texturally rich interface. Proc. TEI'08, 2008.

[3] Coelho, M., Poupyrev, I., Sadi, S., Vertegaal, R., Berzowska, J., Buechley, L., Maes, P. and Oxman, N. Programming reality: from transitive materials to organic user interfaces. Proc. CHI'09 Extended Abstracts, 2009.

[4] Hawkes, E., An, B., Benbernou, N.M., Tanaka, H., Kim, S., Demaine, E.D., Rus, D. and Wood, R.J. Programmable matter by folding. Proceedings of the National Academy of Sciences. 2010, -.

[5] Holman, D. and Vertegaal, R. Organic user interfaces: designing computers in any way, shape, or form. Commun. ACM, 51 (6). 2008, 48-55.

[6] Jacob, R.J.K., Girouard, A., Hirshfield, L.M., Horn, M.S., Shaer, O., Solovey, E.T. and Zigelbaum, J., Reality-Based Interaction: A Framework for Post-WIMP Interfaces. in Proc. CHI'08, (2008), 201-210.

[7] Knörig, A., Wettach, R. and Cohen, J. Fritzing: a tool for advancing electronic prototyping for designers. Proc. TEI'09, ACM, 2009.

[8] Ngai, G., Chan, S.C.F., Ng, V.T.Y., Cheung, J.C.Y., Choy, S.S.S., Lau, W.W.Y. and Tse, J.T.P. i*CATch: a scalable plug-n-play wearable computing framework for novices and children. Proc. CHI'10, 2010.

[9] Ricker, T. Sony's rollable OLED display can wrap around a pencil, our hearts. Engadget, May 26, 2010.

[10] Schwesig, C., Poupyrev, I. and Mori, E. Gummi: a bendable computer. Proc. CHI'04, 2004.

[11] Vertegaal, R. and Poupyrev, I. Introduction. Commun. ACM, 51 (6). 2008, 26-30.