Trading Design Spaces: Exchanging Ideas on Physical Design Environments

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ABSTRACT
Physical design environments are places that support people engaged in the spatial, physical, tangible act of creation. It is now possible to augment workspaces with an amazing array of technologies to assist users in their creative endeavors. However, the integration of computing technologies into physical environments involves a new set of tools, technologies, principles and practices.

In this panel, researchers working on the challenges of physical design support present their work through a walkthrough of their prototype work environments. Each environment will then be "remodeled" by a fellow researcher using his or her own approach, tools, and design philosophy. The goal of this session will be to explore the large variety of potential applications, tools, technologies, interfaces, and processes used by those working to augment the creative physical world.

Author Keywords
Physical; design; workspaces; tangible; augmented reality; work practice; usability

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI), General:

OVERVIEW
Physical design environments are places where people are working with tangible tools and corporeal materials to produce end products. As electronics grow smaller, faster and cheaper, it becomes possible to augment these workspaces with an amazing array of technologies to assist users in their creative endeavors. The spaces, tools and materials of designers, architects, cooks, and engineers could be augmented with displays and speakers to inform and guide their work, networked sensors and actuators to help detect their actions and changes in the environment, and computers to help coordinate all these elements into a cohesive whole.

The augmentation of physical design environments requires feats of engineering, yes, but also sound understandings of human needs and work processes, and a willingness to think of current technologies in new ways meet those needs.

This panel of researchers in the realm of physical, tangible and augmented computing seeks to explore the large variety of potential applications, tools, technologies, interfaces, and processes used by those working to augment the creative physical world.

FORMAT
Our panel format is based on the television show "Trading Spaces," wherein two sets of neighbors get to rennovate a room in each other's homes. In our panel, "Trading Design Spaces," each panelist will be paired with another. Each panelist will present a large, annotated image of a design environment that they have augmented, and will make a 10-minute presentation about the features, characteristics, and use of space, and explain how their tools and technologies enrich that design space. Then, their panel partner will have 10 minutes to conceptually "redesign" the space with his or her own technology and tools, sketching into the picture how the design space would be remodelled. We could take five minutes of questions, comments and suggestions from the audience at the end of each pair of redesigns.

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The goal of this format is to encourage constructive critique of existing research but also to show how different approaches, technologies and perspectives might lead to result in startlingly different visions of what a creative environment should be.

AUDIENCE

The audience for this panel includes designers interested in applications to support their needs, practitioners interested in creating environments to support physical creative work, and researchers interested in the applications of tangible interfaces, projected displays, augmented reality, gestural input, actuated robotics, or ubiquitous computing technologies. This panel would also appeal to anyone with an interest in novel applications of computer technology.

PANELIST POSITON STATEMENTS

Margot Brereton

How should we design instrumented physical environments to support design knowledge capture and reuse? Design knowledge comes in many forms - sketches, catalogues, physical prototypes. Design is an example of an activity that can benefit from augmenting the physical world with computational devices rather than necessarily completely replacing the physical world with immersive computational environments.

About the panelist:

Margot Brereton is a Senior Lecturer at the University of Queensland, Australia. She holds a PhD from Stanford Engineering in Mechanical Engineering.

Michael Haller

How can people make sense of complicated handbooks, reference manuals or instructions when working in a physical space? Designers often feel that they do not have time to bother with instructions. By using embedded sensors and applying an augmented reality toolkit, we have aided the people in the task of assembling furniture. Extension of such technologies could enable people to tackle larger-scale projects, like assembling machines, and enrich user's interactions with their physical surroundings.

About the panelist:

Michael Haller is a professor at Upper Austria University of Applied Sciences, in the Media Technology and Design Department. He is the Project Manager of AMIRE, an Augmented Reality Authoring Framework.

Amanda Parkes

Tangible Bits seeks to realize seamless interfaces between humans, digital information, and the physical environment by giving physical form to digital information and computation, making bits directly manipulable and perceptible. The goal is to blur the boundary between our bodies and cyberspace and to turn the architectural space into an interface.

About the panelist:

Amanda Parkes is a second year master's student in the Tangible Media Group at the MIT Media Lab. She holds a B.S.E. in Mechanical Engineering Design and a B.A. in Art History from Stanford University.

Scott Klemmer

Currently, building tangible interfaces requires "getting down and dirty" with input technologies such as computer vision. Consequently, only a small cadre of technology experts can currently build these UIs. Based on a literature review and structured interviews, we created Papier-Mâché, a toolkit for building tangible interfaces using computer vision, electronic tags, and barcodes. Papier-Mâché introduces a high-level event model for working with these technologies that facilitates technology portability.

About the panelist:

Scott Klemmer is a doctoral candidate in the Group for User Interface Research at UC Berkeley. He has an MS in computer science from Berkeley, and a dual BA from Brown University in computer science and art-semiotics.

Brian Lee

The Stanford Interactive Workspaces project researches HCI and systems in the context of physical shared workspaces and group activity. Using the iRoom as a testbed for development of reusable, robust, extensible systems, we integrate laptops, large displays, PDAs, cameras, and other computing appliances to investigate multi-device, multi-user applications, multimodal interfaces, and cognitive factors within augmented spaces. The goal of the project is to understand how users can interact with future crossroads of virtual and physical environments in a fluid and natural fashion.

About the panelist:

Brian Lee is a senior PhD student in the Human Computer Interactions Lab at Stanford University. He received his undergraduate degree in EECS from UC Berkeley.

Dan Rosenfeld

Wide availability of human-centric, computer-mediated active manipulation of objects has the potential to lead to fundamental improvements in the ways people use computers for problem solving and cooperative planning. The Planar Manipulator Display is a novel device that enables simultaneous planar movement and sensing of multiple physical objects. Interaction mediated by computer-controlled objects will improve understanding and collaboration in many types of simulations for which screen-based interaction is not optimal.

About the panelist:

Dan Rosenfeld is a Program Manager in the New Consumer Products group at Microsoft, and was formerly a research scientist at New York University.