

AWE: AN INTELLIGENT ENVIRONMENT SUPPORTING DIGITAL AND TACTILE DESIGN MANIPULATION

KEITH EVAN GREEN

Clemson University, USA

Schools of Architecture and Materials Science & Engineering

Abstract. AWE is a physical, programmable work environment supporting design processes which are both physical and digital in character. For participants in the workshop “High Tech/High Touch: Digital and Analog Design Tools,” an introduction to AWE, a physical/digital hybrid itself, contributes to the larger workshop questions of Where, When and How physical and digital tools and a variety of media are employed and created in the process of designing.

1. AWE as a Contribution to the Conference Workshop, “High Tech/High Touch: Digital and Analog Design Tools”

The Information World demands of architects and allied designers a wider range of design activities and expanded collaboration with others. Our increasingly-digital design community is, however, not fully prepared or fully willing to abandon tactile manipulation of design tools and artifacts and sole authorship of their works. But as design practices transform, so must physical work environments transform, physically, to support more and different physical/digital design activities and social, collaborative interactions.

A response to this condition is "AWE," an Animated Work Environment. AWE is a user-programmable robotic work environment that dynamically shapes and supports the working life of architects, designers and their new and more traditional collaborators working with both new and old, digital and analog materials and tools. AWE is composed of eight hinged panels which change the spatial characteristics of the work environment, affording work and play activities such as collaborating, composing, presenting, viewing, lounging, and gaming.

Users of AWE select one of six configurations and fine-tune that selected configuration by hand-gesturing proximity sensors. Embedded with touch-

screens, touch-pads and virtual keyboards, AWE's three horizontal work-surfaces of different forms can be moved, rotated and re-joined to create a variety of "activity tables."

Shown in the figure are two architects working in their studio with our developing, fully-functional AWE prototype. AWE affords users the opportunity to collaborate on complex design tasks and to configure *for themselves*, in real-time, the mix of digital and physical engagement their design activities demand and AWE frames.

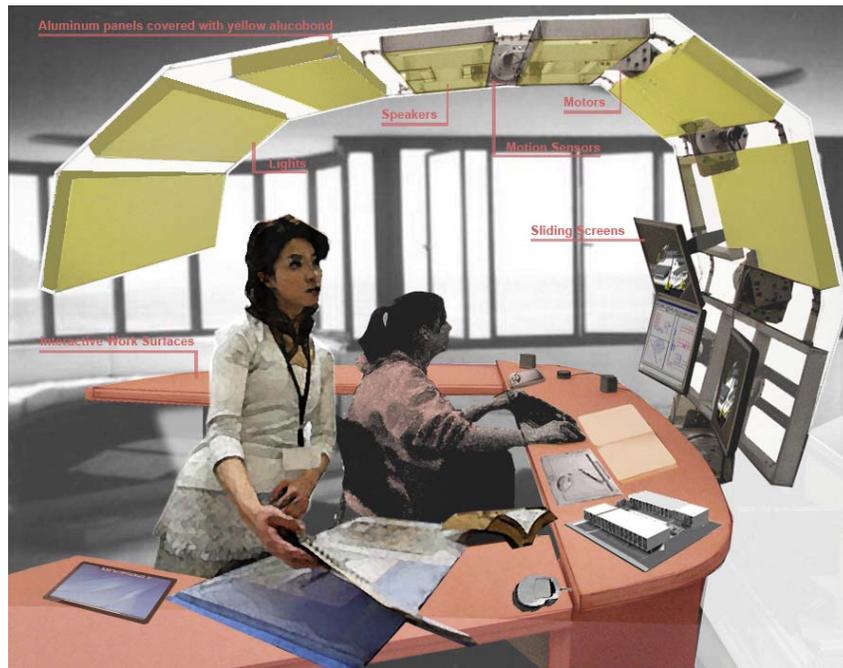


Figure 1. AWE shown with two collaborating architects employing physical and digital tools and materials in the process of designing. The image itself is a hybrid of a photograph of our developing, full-scale, operating, physical prototype and digital insertions to give a more complete sense of the project's scope and promise.

The author (AWE PI) wishes to share with participants in the workshop, "High Tech/High Touch: Digital and Analog Design Tools," the motivations for AWE, the iterative, transdisciplinary physical/digital process leading to its design, the digital simulation and near-complete physical AWE prototype, and metrics developed to evaluate the latter. This introduction to AWE, a physical/digital hybrid itself, contributes to the larger workshop questions concerning Where, When and How physical and digital tools and

media are employed and realized in the process of design. The author seeks responses to AWE from workshop participants, and looks forward to learning more about related research efforts as a means for inspiring future work and collaboration.

Acknowledgements

The authors acknowledge support for the AWE Project from the U.S. National Science Foundation under grant number IIS-0534423. The author would also like to acknowledge his collaborators on this project: L. J. Gugerty, J. C. Witte, I. D. Walker, H. Houayek, J. Rubinstein, R. Daniels, J. Turchi, M. Kwoka, I. Dunlop, and J. Johnson.

References

- Bernus, JS and Chase, MA: 2006, Decision making in a networked environment, in H Eschenauer, J Koski and A Osyczka (eds), *Technology and Communication*, Springer-Verlag, pp. 376–396.
- Baecker, R. (Ed.): 1993, *Readings in groupware and computer-supported cooperative work*. San Mateo: Morgan Kaufmann.
- Green, KE, Gugerty, L, Walker, ID, Witte, J: 2006, Three robot-rooms/the AWE project. Works in Progress *CHI 2006*, ACM Press.
- Johanson, B., Fox, A, and Winograd, T: 2002, The Interactive Workspaces Project: Experiences with Ubiquitous Computing Rooms, in: *IEEE Pervasive Computing* vol. 1, issue 2, April/June, 2002.
- Johnson, J, Kwoka, M, Houayek, H, Walker, ID, and Green, KE. Design, Construction, and Testing of a Novel Robotic Workstation: 2007, *Fourth International Conference on Computational Intelligence, Robotics, and Autonomous Systems (CIRAS)*, Palmerston North, New Zealand, November 2007.
- Luff, P, Heath, C, Kazuoka, H, Yamakazi, K, Yamashita, J: 2006, Handling documents and discriminating objects in hybrid spaces, in: Paper, *CHI 2006*, ACM Press.
- Mitchell, WJ: 2003, *e-topia*, MIT Press.
- Oosterhuis, K: 2003, *Hyperbodies: Towards an E-motive Architecture*, Birkhauser.
- Raskar, R, Welch, M, Cutts, A, Lake, L, Stesin, H and Fuchs, H: 1998, The office of the future: a unified approach to image-based modeling and spatially immersive displays, in: *Proc. SIGGRAPH 98*.
- Sellen, A and Harper, R: 2002, *The Myth of the Paperless Office*, MIT Press.
- Streitz, NA, Rexroth, A and Holmer, T: 1997, Does “roomware” matter? Investigating the role of personal and public information devices and their combination in meeting room collaboration, in: *Proc. E-CSCW 97*.
- Streitz, NA, Tandler, P, Müller-Tomfelde, C and Konomi, S. Roomware: Toward the Next Generation of Human-Computer Interaction Based on an Integrated Design of Real and Virtual Worlds, in: J. Carroll (ed.): 2001, *Human-Computer Interaction in the New Millennium*, Addison-Wesley.
- Wigdor, D, Shen, C, Forlines, C and Balakrishnan, R: 2006, Effects of display position and control space orientation on user preference and performance, in: Paper, *CHI 2006*, ACM Press.