

## About Me

I am Associate Professor of Architecture and Director of *Intelligent Materials and Systems (IMSA) Research* at Clemson University [USA]. IMSA is a partnership between the Departments of *Architecture, Materials Science & Engineering*, and *Electrical & Computing Engineering*. I hold a BA, MS and PhD from the University of Pennsylvania and an MArch from the University of Illinois-Chicago.

## Contact

Keith Evan Green, AIA, PhD  
[kegreen@clemson.edu](mailto:kegreen@clemson.edu)  
ph: 001.864.650.4879  
fax: 001.864.656.1810

School of Architecture  
165 Lee Hall, Box 340503  
Clemson University  
Clemson SC 29634-0503 USA

## Research Interest

Within IMSA Research, my own “Animated Architecture Lab” [AAL] is devoted to “interactive and adaptive” robotic architecture at various scales. This research is accomplished in close collaboration with Ian Walker, Professor of Electrical and Computing Engineering (Robotics), and engages investigators in Human Factors Psychology, Sociology, Childhood Education and Gerontology.

AAL research on intelligent furniture and interior environments is actively supported by the US National Science Foundation [NSF]. To my knowledge, I am the only Architect within the US funded by NSF to develop interior and adaptive furniture, and I might be the only investigator in any discipline with such funding. I was also the only Architect invited to participate in a recent NSF workshop in Human-Robot Interaction, and I served as paper reviewer for the last two HRI conferences. I have published numerous scholarly articles and a forthcoming book chapter on this topic.

My current research includes a “Creativity Support Environment” of embedded IT and robotics for children [below]; an intelligent robot-table supporting the elderly; and the “Animated Work Environment” [presented in the next two pages].



## The Animated Work Environment [AWE]

An Intelligent and Reconfigurable Physical Work Environment for Home and Office

### *Research Team:*

Keith Evan Green (PI, Architecture)

Ian Walker (ECE/Robotics)

Leo Gugerty (Human-Factors Psychology)

James Witte (Sociology)

### *Funding:*

U.S. NSF / CISE IIS-0534423, \$400k/3yrs

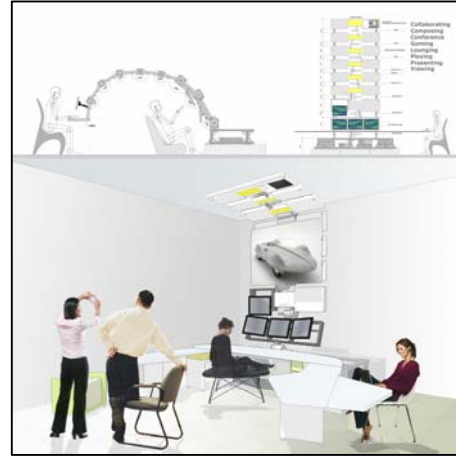
### *Description:*

The dramatic shift in the nature, place and organization of working life, as well as the sophistication of information technologies employed, motivate the development of an intelligent work environment for the Information Age.

A recent trend in the nature, place and organization of working life is the growing complexity of work, the emergence of new working populations (older workers, under-skilled workers, telecommuters and flexible shift workers), and the increasing likelihood that workers are working with information technologies both across and between work sites. Workplaces have meanwhile become increasingly dynamic, mobile and flexible, with “hot desks,” portable and hand-held devices, WI-FI and internal networks replacing hard-wired, isolated workstations. Such dramatic transformations in the nature of the workplace, combined with unprecedented new technologies associated with working life, suggest a re-evaluation of the relations between workers, their technologies and their work environments, and a redesign of the work environment itself as a socially and technologically responsive system.

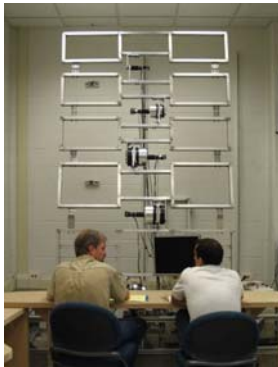
Towards undertaking this challenge, our transdisciplinary research team is developing the “Animated work Environment [AWE],” an advanced work environment funded by the U.S. National Science Foundation. In concept, AWE is envisioned as an information-rich environment featuring the ability to continuously “morph” to accommodate a wide range of user needs. At the core of this environment (though not exclusively comprising it) are user-reconfigurable “smart” surfaces. In addition to this novel aspect, AWE embodies a range of “off-the-shelf” Information Technology (IT) components: embedded commercially-available sensors (that, when suitably exploited, make AWE user-friendly and intelligent); barcode readers (that allow AWE to associate printed and digital materials); and integrated display screens, scanners, projectors, keyboards and audio speakers (that make AWE useful as a total work environment programmable to suit a range of work needs and situations).

Under my direction, this established research team is extending the AWE Project to multi-modal work environments as well as to ageing-at-home applications. For these next phases, the research team draws upon AWE’s successes in defining and developing the “intelligent” work environment: its IT components (tablets, screens,



projectors, robots, sensors, actuators, and other digital devices) working together with a wholly compatible physical, intelligent environment.

The need to “program the room” both stimulates and is enabled by existing and ongoing efforts in Information Technology and “intelligent environments.” More broadly, AWE challenges present understanding in both Architecture and Computer and Information Science and Engineering by recognizing computer software, networks and devices not as isolated aspects of a digital society but as constituents of an integral environmental system, far more productive and more accessible than any of its parts. In this way, the AWE concept expands the vision of both the IT community and architectural and allied designers to recognize both IT *and* the physical environment as integral and necessary parts of the dynamic interaction between people and things. *I hope to be invited to the Workshop to voice this position and share my experiences with projects like AWE, while also learning from other participants working in the same research arena.*



The developing AWE prototype with 5 of 8 panels yet uncovered but operating.

### Selected Publications on AWE

M. Kwoka, J. Johnson, H. Houayek, I. D. Walker and K. E. Green. “*The AWE Wall: A Smart Reconfigurable Robot Surface.*” In the Proceedings of *ICRA 2008*, Pasadena, in press.

J. Johnson, M. Kwoka, H. Houayek, I.D. Walker, and K.E. Green, “Design, Construction and Testing of a Novel Robotic Workstation.” In the Proceedings of the *Fourth International Conference on Computational Intelligence, Robotics and Autonomous Systems [CIRAS]*, 2007, in press.

R. Daniels and L. Gugerty. “Task Analysis of Information Flow for Teachers, Accountants, and Architects.” Poster presented at the *American Psychological Association 115th Annual Convention*, San Francisco, CA, August 2007, in press.

J. Witte, K. E. Green, L. Gugerty, I Walker, et. al. “CREATING AWE....” In the Proceedings of the *International Symposium on Intelligent Environments* hosted by Microsoft Research, Cambridge, UK, 2006.

K. E. Green, L. Gugerty, I. Walker, and J. Witte. “Three Robot-Rooms / The AWE Project.” In the Proceedings of 2006 CHI [Computer Human Interaction], Montreal, Canada.

K. E. Green. “Architecture Plus: The Collaborative Animated Work Environment.” In the Proceedings for the 2006 *ACSA National Conference*, Salt Lake City.

K. E. Green, L. Gugerty, I. Walker, and J. Witte. “AWE (Animated Work Environment): Ambient Intelligence in Working Life.” In the Proceedings of *Ambience 2005*, a Conference on Intelligent Ambience and Well-Being, Tampere, Finland, pp. 1-7.