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SmartGeometry workshop helps architects generate solid design ideas

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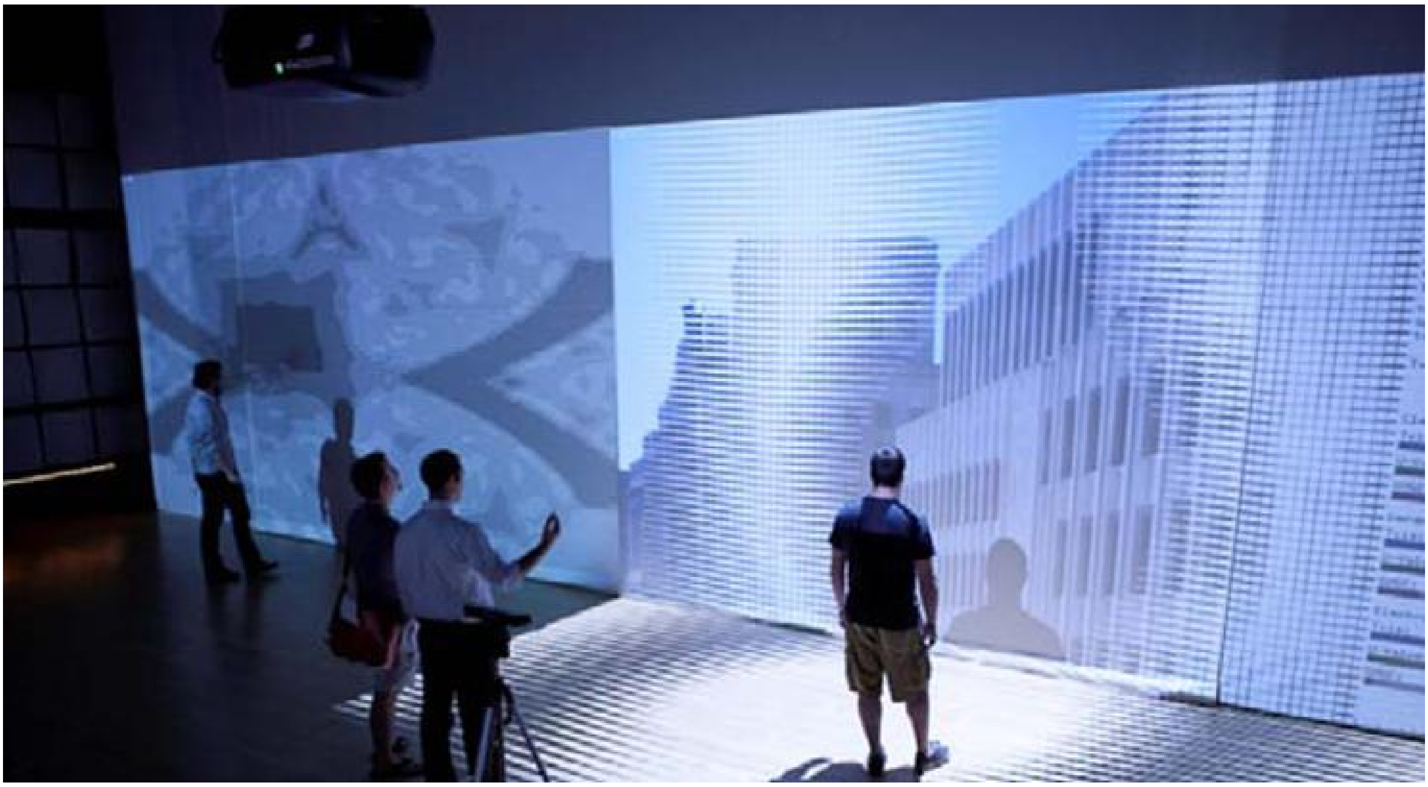


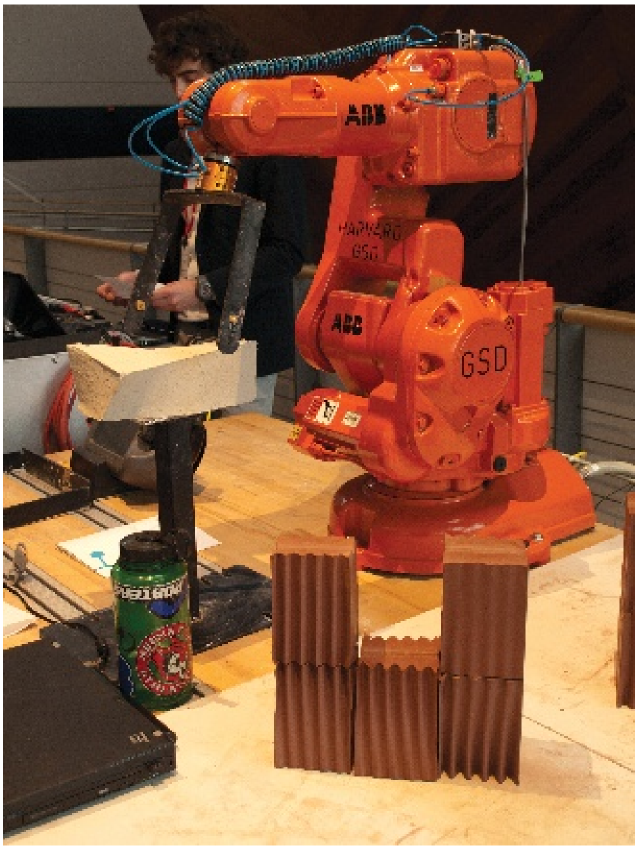
The 2012 workshop suggests clay and computers could be the future

Originally founded to explore architectural geometry via computation, the SmartGeometry group has expanded its horizons to encompass wider explorations of computing and its possibilities in architecture. Its annual workshop and conference are intense, almost round-the-clock, events that oscillate across the Atlantic.

This year's venue was Grimshaw's Experimental Media & Performing Arts Centre (Empac) building at Rensselaer Polytechnic Institute in Troy, New York. The host institution always contributes a considerable amount of time and resources, and this year the SmartGeometry group had access to chemistry labs, wind tunnels and other equipment.

SmartGeometry launched this year's challenge in May 2011. Ten Cluster proposals were selected from 40 applications by academic peer review. The invitation to participate in the Workshop drew in global applicants, 100 of whom were selected to join their preferred Clusters. After extensive pre-planning and ordering of materials, they worked in these groups for four days, and most of the four nights.

Source: Marc Thomas



Ceramics 2.0's industrial robot uses taut wire to cut clay.

The Bioresponsive Building Envelopes Cluster took over one of Empac's studios, filling a wall with projected simulations of interactive fritting. Driven by OpenFrameworks software, Kinect sensors captured the movements of people next to the simulated facade fritted with 100mm pixels. This can be programmed to respond in various ways and is about to move into development.

In the studio next door Reactive Acoustic Environments constructed a transformable acoustic canopy that changed shape in response to a variety of inputs. These included manual control via an iPad app, response to sound levels, response to Kinect-detected gestures or social situations such as group size and even via an EEG detecting headset.

The canopy was fabricated from HDPE, supported by a standard theatre lighting truss and the array of theatre winches available in the studio. The self weight of the material resulted in elegant surface forms.

In the virtual realm, the Material Conflicts Cluster explored solar ingress using Bentley's Generative Components and Cloud-based analysis tools. The significant innovation was the aim to be multi-objective — a step forward from the single-variable analysis tools used on most projects.

Most prominently displayed was the structure built by the Gridshell Digital Tectonics Cluster. Modelled in Rhino, Grasshopper, Kangaroo, and Karamba with surface relaxation (similar to soap-film techniques) to produce rule lines that can be used rationally with straight members of unequal length, this was convincing example of mass customisation.

The most unexpected substance in use was clay, a material not usually associated with digital events. Both the Ceramics 2.0 and Transgranular Perspiration Clusters experimented with making clay smarter. Ceramics 2.0 used a robot arm equipped with a simple cutting wire to mass customise ceramic tiles or clay bricks.

Meanwhile, Transgranular Perspiration explored the possibilities of ceramics, embedding sensors in tile samples to measure their performance. The aim is to develop ceramic units that may have varying layers with different performances to act as passive building conditioners.

The work with clay may prove to be most significant in the long term. At the moment, most smart-building systems have a shorter lifespan than building materials.

If clay and other bulk materials can be made smarter, there could be significant benefits.

Postscript: The next Smart Geometry event will be held in London in 2013. See smartgeometry.org for details.

Marc Thomas is director of Isisst Project Technology. www.isisst.co.uk

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