Connecting to the Real: Digital Fabrication

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With the advent of computer modeling and animation, architects today are able to develop new ways of thinking about how to conceive of and deliver buildings of ever-greater complexity, responding to the challenges of speed, flexibility, and cost in ways that seemed unimaginable a generation ago. One of the unintended side-effects of embracing the virtual has been the tendency among many students towards a lack of rigor in considering the actual materials from which their buildings are to be constructed. Yet these are the notes that, strung together, become the symphonic whole of any great architectural work.

From Fall 2011 to Fall 2013, the Design Build Studio created its first project, a vacation home to be located in the Mojave Desert near Las Vegas, Nevada. We explored how technology can assist in reconnecting with materiality, texture, light, and time, creating opportunities for memorable experiences. During the first semester, we began studying some of the critical parts of the house at full-scale; these components became loci for crystallizing essential design concepts. The most provocative of these was the design process for the perforated screen system. The following passage from the project narrative describes the conceptual intent for the screens:

The journey begins with a pathway where dappled light filters through perforated screens, seemingly dissolving the building in its pattern. The effect recalls light passing through the native mesquite tree. The movable screens respond to seasonal differences: in the summer, they can enclose the patio space and provide shading for the building. In the winter, the screens can be opened completely to allow the sun to penetrate the building, providing passive heating.

This describes, both poetically and pragmatically, the raison d'etre for the house's perforated screen system. The students responded to this by photographing Native Mesquite trees, and selecting images that best captured the desired qualities. While the finished product was striking, the process used to create the mock-up was extremely time intensive. Students spent many months developing a process that would make the screens affordable, efficient, and functional while still retaining the effect demonstrated by the mock-up.

For the final screens, students developed a script in Grasshopper, a plug-in for Rhinoceros that sampled a gray-scale image using grid coordinates that then created circles corresponding on the percentage of gray found in each area of the image. Lighter grays were drawn as larger circles and darker grays were drawn as smaller circles. This brought the files for each screen down to a much more manageable size that could be loaded into the CNC machine's computer.

The constantly shifting perception, between solidity and dematerialization, is particularly noteworthy. The premise underpinning the Design Build Studio's work – that architecture is the creation of memorable experiences, was powerfully demonstrated by this evocative installation. It was the synthesis of digital technology and thoughtful application of tectonic principles that made this project possible. Maintaining this balance was a key challenge as the project moved from concept to construction.