SURFACE

{...overview...}

At the core of any representation method is the physical relationship between the data and the user. We have to sense the data in some way, sight, touch, sound, to begin to process and interact with it. And how we approach that data and how it is represented determines to a large extent how we think about it, and how we use it. Analog representation systems, hand drafted paper maps and measured chipboard models, have given way to projections and digital models. With the massive digitization of data over the past fifty years the issue of how we physically relate to digital data has become increasingly important. It is particularly important in the design profession because of the spatial nature of data and the use of drawing and seeing as procedural tools to explore design ideas. The method of data representation in the design process is the first tool a designer uses to understand a site and define the parameters of a design study. These tools determine how designs can be manipulated, how problems will be formulated and give structure to the range of outcomes from the designer's intervention.

This project explores the limitations and opportunities of mixing digital and analog representations of data. A 1:1000 scale plaster topography model of New Orleans was constructed and a matching digital projection was created on the surface. Issues of scale and resolution were reintroduced into the process of representation through this intermixing of digital and analog methodologies. The physical presence of the model rendered the digital data in a new tangible relationship with the designers and created a feedback between abstract data and design explorations.

The model and accompanying projections considered issues of collaborative design methodology and its relationship to data representation. Group size, accessibility to the model, height from the ground, and the fluidity of exchanging digital data on the model were all considered and examined during the course of design and construction. This model was thought of as a critical tool the students used to understand the nature of data and its physical presence in the design process.

{...model...}

The model was introduced in the 2006 Spring first year graduate design studio at the Louisiana State University School of Landscape Architecture. The students were asked to explore issues relating to the representation of data and the process of model making through a three week project. The students collected and analyzed topography, census, boundary, hydrology, flood, infrastructure, and aerial imaging data. Drawing from this formal analysis, issues of data representation and image interpretation were introduced to the student. Through a series of digital and analog studies, the students explored how different representation techniques affected the way the data was understood. These preliminary studies were then converted into digital and analog models and various methods were used, including plotting, projections, and laser cut models, to examine the specific relationship between digital and analog output methods. From this experiment, several study models were created to test different technologies for the larger model. These study models were created using a range of materials and explored the discreet relationship between texture, scale, and representation. The students worked back and forth to develop a symbiotic relationship between the digital representations and the analog model. After this series of experiments, the students designed and constructed the 1:1000 scale plaster model that served as a projection surface for digital data.

{...construction...}

The model surface was developed at a 4:3 ratio, with the surface at 80” x 72” with 14” of additional projection space in the width for future interface development. The model was sliced into sixteen 20” x 18” quads that would be assembled in a grid to create the entire model surface. The sixteen quads would allow for the model to be constructed and transported as modules. The students used a contour model they created from LIDAR data to create the CAD data they would use to cut a chipboard mold for each of the sixteen panels.

The plaster panels were created using 20” x 18” inverse chipboard molds. Each layer of elevation was cut using the laser cutter, assembling the negative portions, then glued together and held with clamps to dry. The resulting chipboard inverse was then available to be used as a mold for the plaster. The plaster casting process was accomplished using a series of adjustable coddle boards. The coddle boards were created using four 4” x 24” plywood sections with a 2” x 2” post affixed to the end of each board. The boards were arranged around the chipboard model and clamped into place, each of the vertical and horizontal seems was then sealed with clay. A releasing agent, vaseline, was added to the surface of the chipboard to prepare it for the plaster.

The plaster was mixed in a 3:2 plaster to water weight ratio using approximately twelve pounds of plaster per panel. The water was added to the bucket and the plaster was sifted in over the course of one minute. The plaster was mixed using using a plaster/paint paddle on high for one minute and then slowly for 30 seconds to work out air bubbles. The plaster mixture was poured slowly over the model taking care not to generate air bubbles. Once the mold was full, the table was agitated in order to allow for the air bubbles to rise to the surface. The plaster would set when it was cool to the touch, this took approximately one hour. Each panel would be placed in a dry area under a fan to remove retained water. The resulting plaster panels were then assembled to create the 80" x 72" grid that would serve as the projection surface. The plaster grid served to represent the topography, copper strips for the roadways, and acrylic sheets for the lake and river. The students created a table and frame for the grid that supported the model at 18" above the ground.

The projection system was developed to accommodate two types of projections, parallel to the surface and perpendicular to the surface. The parallel method used a mirror angled at 45 degrees to redirect the projection downwards to the model surface. This method allowed the projector to have flexibility and used the mirror for fine tuning and adjustment. The perpendicular projection used a straightforward ceiling mount that faced the projector towards the model surface but provided less flexibility. The dual projection types allowed for flexibility in the design space using multiple ceiling configurations.

{...reflections...}

Initial explorations between the analog model and the projection involved re-examining the original digital representations. Two overarching ideas came from this investigation. The first is the fluidity that contemporary digital representation methods offer the designer including the ability to zoom, pan and observe multiple scale representations simultaneously. The second is the ability the physical model allowed for multiple students to examine critical components of data in direct relationship to the three dimensional surface.

The constraints the analog model placed on the digital representation of data revealed to the students the power of the contemporary methods of digital representation. The most obvious constraint the model placed on the data representation is the loss of the ability to zoom through multiple scales instantaneously. In paper based representations, i.e. traditional maps, the issue of looking at data in multiple scales is handled by printing maps a series of maps of the desired scales. This type of representation requires the user to hold information from one scale in their head while reorienting themselves to look at the data at another scale. This process of reorienting to different scales of data interrupts the thought process and even graduates students with one semester of study completed often had a problem understanding exactly how the different scales fit together. In public meetings this type of disconnection between scales is even more pronounced. In a digital presentation the ability to zoom between scales, especially a fluid zoom where the data expands or contracts on the screen, requires much less reorientation. This fluidity between scales allows for more interaction with the data.

Other issues such as the ability to pan across a map or place multiple maps together on a display operate on the same principle. One issue that is related to the digital manipulation of scales is ability for a digital representation system to dynamically change the data displayed at different scales. As you zoom into an area, the data that is displayed can change to present data that is relevant to the new scale. This type of context sensitive relationship between the data and the representation is unique to a digital representation methodology.

The analog surface of the model offered new and important methods of interacting with the digital projections. One of the first things the students discovered was how the topography data of the plaster model could coexist with many other data sets without interference. The plaster model acted as a datum that influenced the data projected onto it. In comparison to a digital overlay method where the topography data might be color coded and placed under another data set for comparison and analysis and then removed as other data sets are compared, the topographical data was ubiquitous and ever present. In a digital methodology the number of data sets that can be displayed at once is limited by the interface and the rendering techniques employed. The model allowed for other data to be mixed on the surface and the topography data became more intuitive because of its physical presence. The physical model and the digital projections were processed differently by the user and allowed for more data to be incorporated on the model. This created a more dynamic analysis of the data by the students and a more comprehensive view of the design issues related to the project.

Although the model's scale remained static the students discovered that the data itself could also come to life by animating temporal representations. Students explored landscape phenomenon and historical progressions through sequences, that had a direct relationship to the topographic surface of the model. To have animations occupy the three dimensional, physical space of the model allowed the students to create a visceral connection between topography and landscape process. The abstraction between location, space, and time became more concrete and filtered directly back into the design and planning process.

Another discovery from the use of the model was the increased collaboration and interaction among the students. The ability to walk around the model and readjust the viewer position was intuitive to the students. In a similar way to the advantages of zoom and pan in digital representation methods, the ability to rotate around the model and see the data from different views was easier with a physical model. The model and the design space it occupied served to ground the students in a localized view of the model. Spinning around a 3D digital model can be disorienting and suffers from some of the same limitations as paper maps. Students could interact in 3D space with the physical model in a way they couldn't with a digital model. Students could look at the model from different views and discuss the significance of the projected data. This tangible interface also acted as a meeting space which functioned differently from a wall or screen projection.

{...conclusion...}

This project was a critical exploration of issues dealing with design and representation, not a search for a new solution to representation. However, many new ideas came from the experiment that can be incorporated into representation methodologies. Some modifications were incorporated to the model to see how some of the barriers particular to digital and analog representation systems could be overcome. The addition of graphic tablets to allow digital mark-ups on the model increased the collaborative design process. This allowed students to draw and annotate in physical space while engaging in a critical discussion about design proposals. A second digital projection on the wall above the model was also explored which allowed quick access to the power of a digital methodology. Later in the semester, design projects were projected on the model with collateral design drawings on the digital wall projection allowing for magnified views of the site and accompanying photography or rendered images. The second projection system became a complimentary piece that overcame the static nature of the plaster model and its single scaled projections.

For the data intensive, city-scale project that this model addressed, this hybrid methodology proved useful. In these types of projects, the surface of the model could represent topography, as it did in this study, or any critical, ubiquitous set of data that needs constant attention. In the case of New Orleans, the issue of topography and flood potential is ever present. The model allowed that data to be an ever present and intuitive part of the design process.