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**Subtraction Model with Four Rooms**

4.023 Architectural Design Studio I, Fall 2015

Given a solid that the form of a Triple Rabbeted Oblique Scarf Spice Joint, I created through only subtraction four rooms with different prescribed rooms. Upon arranging the rooms into a sequence of experiential views, I aimed to intertwine my ideas of circulation and room. The rooms themselves became a vehicle for movement with inlines, terracing, and directionality. The question of the boundaries between a room and stair opened ideas of what spatial qualities of light, relaxed space, and framing views designated these carved spaces to be rooms. The circulation begins as a bifurcation that unites for the climb up to the open top room, in which a loop then can bring the viewer back through the circulation. The material here is a powder 3D ZCorp print to truly envision the spaces, the apertures, and the carving required for the rooms, done in 1/8th scale.
Ohm Bus Shelter

4.500 Intro to Geometric Modeling, Fall 2015

The bus shelter design provides shelter while still containing natural daylighting and evokes the environment around it. The ribs of the bus shelter were meant to be reflective and the space in between the ribs would be glass in order to frame the view that the inhabitants of the bus shelter would see. The ability to sit safely in the bus shelter with one’s back to the glass would nestle its inhabitants in any rain, snow, or sun. The bus shelter involved geometric modeling in Rhino before importing to 3DS Max in order to make the render. This image represents my first experiences with rendering my own models and taught me the importance of lighting and staging in visualization an architectural space. Finally, the physical model was a powder 3D print from ZCorp and demonstrated my intent with the apertures and framing in the bus station.
This design was carved with a 5-axis robotic arm and the machine code was written with the aid of Grasshopper code in Rhino. The entire drawing of the curves was done through mathematical operations and Grasshopper code, as one of the constraints in this project. I learned how to carve non-planar surfaces and use Grasshopper in fluid conjunction with Rhino. Learning to use the robotic arm was one of the ongoing challenges of this project due to the robotic arm’s mechanical limitations and the difficulty in paring theoretical operations in code with the physical process.
This wooden puzzle cube began as an exercise in abstracted movement. By rendering body movement of the basic salsa step into lines, I created the cuts that would determine the cube faces. By building small foam models, I iterated from 3” to 6” scale to create an interlocking and expanding pattern. The idea was that the cube would unfold and expand in a series of controlled movements that could be representative of the body motion it encapsulated. My cube consisted of three interlocking pieces that expanded linearly in two axes like an L-shaped motion to reveal hidden loops and steps in the cube. While being constrained by the face cuts and the regular nature of the material, I found solutions that created positive and negative spaces mirroring each other. I was also challenged on the materiality and craft of the project. Having to transition between foam and wood and between scales both pushed the design and created a number of challenges to overcome.
The Army Remains.
Fall 2014

Done in Photoshop. A speed painting exploring color ranges, light, water, and narrative. Characters reference from Steven Universe.
Illustration Value Keys.

Spring 2015

Done in Photoshop under the guidance of Leelah Wagner. Intended to be integrated lessons in storyboarding and narrative compositional techniques with the exploration of light and shadow. Each value key is a rough in the painting process but stands as creative studies by themselves.
Self-Healing Hydrogels Simulation System

4.022 Architectural Design Foundations, Spring 2015

By investigating and abstracting a natural system within a material, I coded a system that would represent the equilibrium that hydrogen chains would need to ‘self-heal’ hydrogels. The principal was that the particles or mutables each contain a charge and as the limbs of the chain, would bond from a parent grounding immutable in series. The formed chain of mutables needed to maintain a certain balance of charge else the bond would dissolve and send the reaction back into motion, breaking the chain and leaving mutables to form new, different arrangements with different immutables. Because not all bonds would dissolve simultaneously, dynamic chain reactions could be seen and the distance of neighboring chains had a direct effect on a chains’ performance. The system was written and visualized in Processing and is controllable between the threshold of equilibrium, number of mutables and immutables, velocity of the dissolving bond, etc. The series of images below are sequential frames of the program running and oscillating between equilibrium and reaction.
Broadened Drawing-Scape

UROP with the Design and Computation Group, Fall 2015

The Broadened Drawing-Scape project seeks to intermarr the intuitive and ‘painterly’ method of hand drawing with the high-precision and ‘designerly’ method of algorithmic drawing. The system intends to create a new process that preserves the richness and tactility of hand drawing and utilizes the powerful replication and editing tools of coding.

Under the guidance and in collaboration with Onur Yuce Gun, I scripted in Processing code that would use camera capture and be able to extract primitives from hand drawing. These primitives could then be manipulated in the code environment with commands I scripted such as arrays, rotations, and scaling. Then the design gets passed back to the hand drawing and the process continues. The entire process of manipulating code and doing drawings led us to new understandings of pattern usage, shape grammar, and new ways of creating drawings. The watercolor samples are examples of works produced through a singular primitive and run through this drawing process in the Broadened Drawing-Scape several times.
We investigated the building technique known as tensegrity where compressive elements are held in place only through tensile force. The precedent was the Skylon tower that was held up only through wires during the Festival of Britain and gave the impression of it floating in midair. Our project aimed to demonstrate the arraying power of tensile structures and thus support a tower upon tensile elements that are already being supported by tensile elements, creating a double layer. The installation was built with aluminum rods held in suspension with steel wire. Ratchets allowed us to control the tensile force in the installation and thus created an almost flexible installation. In construction of the installation, we learned about building with tensile forces and the geometric necessities to suspend a tower up to a height of 18’. In collaboration with George Varnavides, Nynika Jhaveri, and Brian Huang.
Ascensores of Valparaiso
Internship with Plan Cerro, Summer 2015

The city of Valparaíso in Chile is a port city that grew out from its flat plan into the surrounding mountains. The rapid growth of the city and the decaying infrastructure over created a number of problems for the city, including fractured connectivity of the communities in the mountains aggravated further by the complexity of the geography and terrain. The funiculars or ascensores remain cultural patrimony for the city, as a way to move people between extreme elevations and were for most of the 20th century and early 21st century a favored mode of public transport.

The mission was to renovate the two decommissioned funiculars, Las Cañas and El Litre, and also building a new modern funicular for the city, Los Cipreses, that would reach the new limits of the city. My work focused mostly on the architectural work of the stations themselves as nodes of connectivity for the community and their significance in the larger urban plan. The drawing of the trajectory of the funicular was illustrated for the presentations to Metro Valparaíso. The 3D model was done in Sketchup and Rhino, as collaboration between myself and Andrés Zurita of Plan Cerro.
The challenge of this project was designing a roof based off a certain primary structural element and through using the structures learned in the class, to justify out design decision with engineering choices. For this, I designed Grasshopper code that would create graphic statics solutions for different loading conditions on the fan-like structure and thus give us a method at optimizing the form of the basic dendriform structure to uniform and uneven loads. We ran load calculations and discovered how the primary, secondary, and tertiary structure all interacted to each other in order to lend stability and resist all different sorts of uneven loading cases. For example, the secondary structure with its lateral trusses and window glass both allow for natural daylighting through the natural cascade of the structure and creates lateral stability on the flatter dendriform structures. The tertiary structure of the I beams that ran between the window lateral trussing also allowed for the roof membrane and, thanks to cross-bracing, resisted the torque that the membrane would enact on the unevenly loaded window trusses. The addition of structural integrity as a driving design force created unique and interesting solutions for our final Alluvial pavilion roof. All work displayed here was in collaboration with Maria Roldan.