VITALIZED GEOMETRY

Kristine Mun University of Southern California

Vitalized Geometry understands geometry as forces and explores three areas of engagement to produce and engineer empathic systems. Empathy in form raises the question on how we can build motifs in design where aesthetics moves beyond representation and are actuated by experience of the users to their environment. Interactive spaces/forms begin to address how architecture can be redefined in this domain. These empathic forms—forms that sense, feel and respond to the environment—produce haptic textures that, as Gary Flake describes, create “very subtle agreements between the beholder’s internal state and the change in context introduced by an object.” The idea of the vital, or enlivened, is based on technologies of matter that are able to self-stimulate form.

Integrating new responsive technologies, the studio looked at ways in which we can put life into geometry/material to create new orders of beauty. William Hogarth published The Analysis of Beauty (1753) to show beauty as a system of variation. Stressing the (serpentine) line and variation as key components with principles of order, change was deemed necessary to beauty. Reinterpreting Hogarth’s system of variation, his

1 Reflexive Elastegrity: Hogarth’s principle of fitness and simplicity activates the vital geometry as aesthetics of force. The fitness capacity of Latex is developed by pinning it against itself in multiple distinct elastic states, and testing the capacities of each to resist the other. Simplicity is reflected upon the minimal alteration of geometric figures used on the wood veneer to create an organic system of lines and voids which under compression yield varying results.
principles such as variety, uniformity, intricacy, and distinctness were interlocked within contemporary practices. The students created, fabricated, and coded dynamic responsive territories using advanced computational processes and machining technologies actuated with force feedback devices. Vitalized Geometry is a tightly woven relationship between logic of paths, geometry, sensations and material performance that set up the milieux for an empathic architecture.

Reflexive Elastegrity (Figure 1–3), by Chris Chiou and Daniel Kim, negotiates geometry of tension through a material performativity initiated by sensors detecting touch, exciting the form and expressing its attraction by morphing towards the viewer. Sound of Silence (Figure 4–6), by Jordan LaRue and Chao Wei, is an interactive soundscape, initiated by the sound of environment that interacts with the visitors and learns from their response to generate a rhythmic series of geometry presented by visualizing the invisible sound. Driven by the study of Electro-active Polymer (EAP), a responsive material, the shape of leaf units follows the rule of symmetry. Responsive Apertures (Figure 11–13), by Shaun Skoog and Andrew Wang, is a self-regulating ‘rose window’ utilizing two layers of geometries overlaid on one another that interacts with light and heat collected from the environment. In two layers, the back geometry is in-filled with thermo-chromatic resin that shifts from black to white based on heat/light. The front layer of hexagonal shutters opens and closes based on a certain percentage difference of black/white ratio that is detected by a photo-sensor in each cell. Automated Weaver (Figure 7–10), by Shahab Rahimi, is a 3D knitting machine that is programmed to feed a continuous line to form variety of 3D shapes. The robot is programmed with an algorithm that produces regular and irregular patterns with different materials (from yard, rope, wire, to carbon fiber/resin) associated with automated patterns that naturally produce differentiated aesthetic.
The petal is formed with a single wire, where both ends meet at the same fixed point.

The petal rotates around its midpoint in a complete circle, duplicating itself every 72 degrees to create a 5-point radial component.

Each petal duplicates itself and rotates along its fixed point to create a new 3, 4, 5, or 6-point component, where the petals are scaled accordingly so that two of each component's fixed points meet another component's fixed point.

A second radial component is layered into the framework in places where space us in excess abundance. Circles that have radius larger than 3.5" and contain the original radial component will be layered with the second radial component, where the number of nodes matches that of the original radial component. Empty circles that have a radius larger than 3" will be layered with the second radial component, where the number of nodes varies between 4, 5, and 6.

Growth pattern of the radial geometries.

Imposition of circle packing logic creates a new order and new grid, making each component tangent to its neighboring component. Where there is an error in this relationship, an empty circle is formed to fill the gaps and allow the pattern to continue.

Selected portion of the pattern to model physically, where the construction lines become the structural framework for the radial components.

Exploded Axonometric:

Responsive Apertures: Utilizing principles of distinctness and intricacy, the aim was to create a geometry that changes without losing its essence, thus actuated radial geometry produced variety without losing its essential radial form.

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Students: Chris Chiou, Daniel Kim, Jordan LaRue, Shahab Rahimi, Shaun Skoog, Andrew Wang, Chao Wei

REFERENCES


KRISTINE MUN

Approaching design by analog and digital modes of production, Dr. Mun researches on how machines and bodies can form a synthesis in our environment, informing our spatial environment as well as building it. Towards the idea of Empathic Architecture, projects involve designing interactive environments, creating fabrication machines and bio-sensing wearables. Her architecture practice ranges in scale from small scale pavilions to large scale works including a 1st prize award for a 600,000sf general hospital in Italy that engages the latest trends in renewable energy resources. She has taught and exhibited internationally and was the curator for several international architectural exhibitions including AAFAB in London 2009 and Architecture Beijing Biennale 2004, 2006.


IMAGE CREDITS

Figure 1, 8. Chris Chiou, Daniel Kim.
Figure 2, 3. Jordan LaRue, Chao Wei.
Figure 5, 6, 9, 10. Shahab Rahimi.
Figure 4, 7, 11. Shaun Skoog, Andrew Wang.