ACCUMULUS

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Massachusetts Institute of Technology

Jason Butz
Gould Evans

1 ACCUMULUS: completed installation.

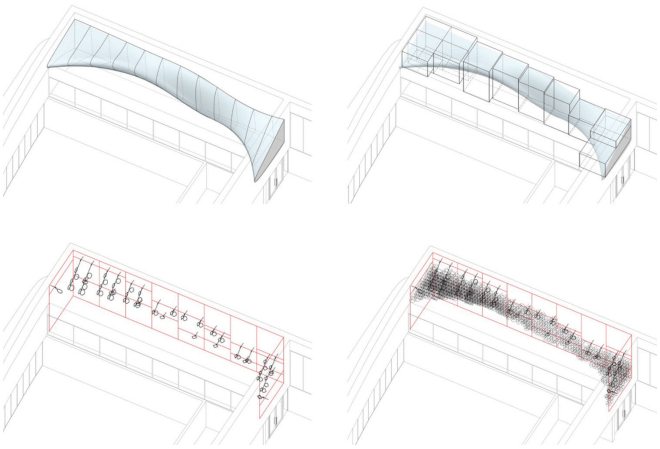
ACCUMULUS is hidden within the cantilevered void above the entryway of the Contemporary Art Museum St. Louis. Composed of over seventeen thousand wire and plastic parts, its variety of transparent and translucent materials reflect and scatter sunlight throughout the day, casting textured shadows on the surfaces below. ACCUMULUS is initially obscured by the walls of the cantilevered volume, but the active light and shadow it creates are visible from a distance. With its volumetric accumulation of many small shapes and textures, the installation deliberately contrasts the heavy and planar surfaces of the museum building.

As a result of the use of linear material (hand-cut wire) and the method by which it is manually joined to sheet material, ACCUMULUS has very large assembly tolerances and a great amount of overall variation, which contributes to the ease of assembly and takes advantage of the system's ability to self-correct. Though the modeled geometry is rigid and predetermined to fit within the site volume, the final configuration of elements contains unpredicted variety, as the material reacts to physical forces as well as the inexact process of making. Tolerance adds variation and complexity to the rigid geometry of the structural grid without compromising the spatial effects of the materials.

The installation's visual and structural integrity remain unaffected by large tolerances, as the digital model is not meant to provide the exact appearance of the finished object, but rather the approximate configuration of all of its parts. Though the project is

PRODUCTION NOTES

Client:	Contemporary Art Museum St. Louis
Status:	Temporary/Completed
Location:	St. Louis, MO
Date:	2015



2 Division of massing into assembly blocks.

3 Site location inside cantilevered exterior void.

4 View into cantilevered corner.

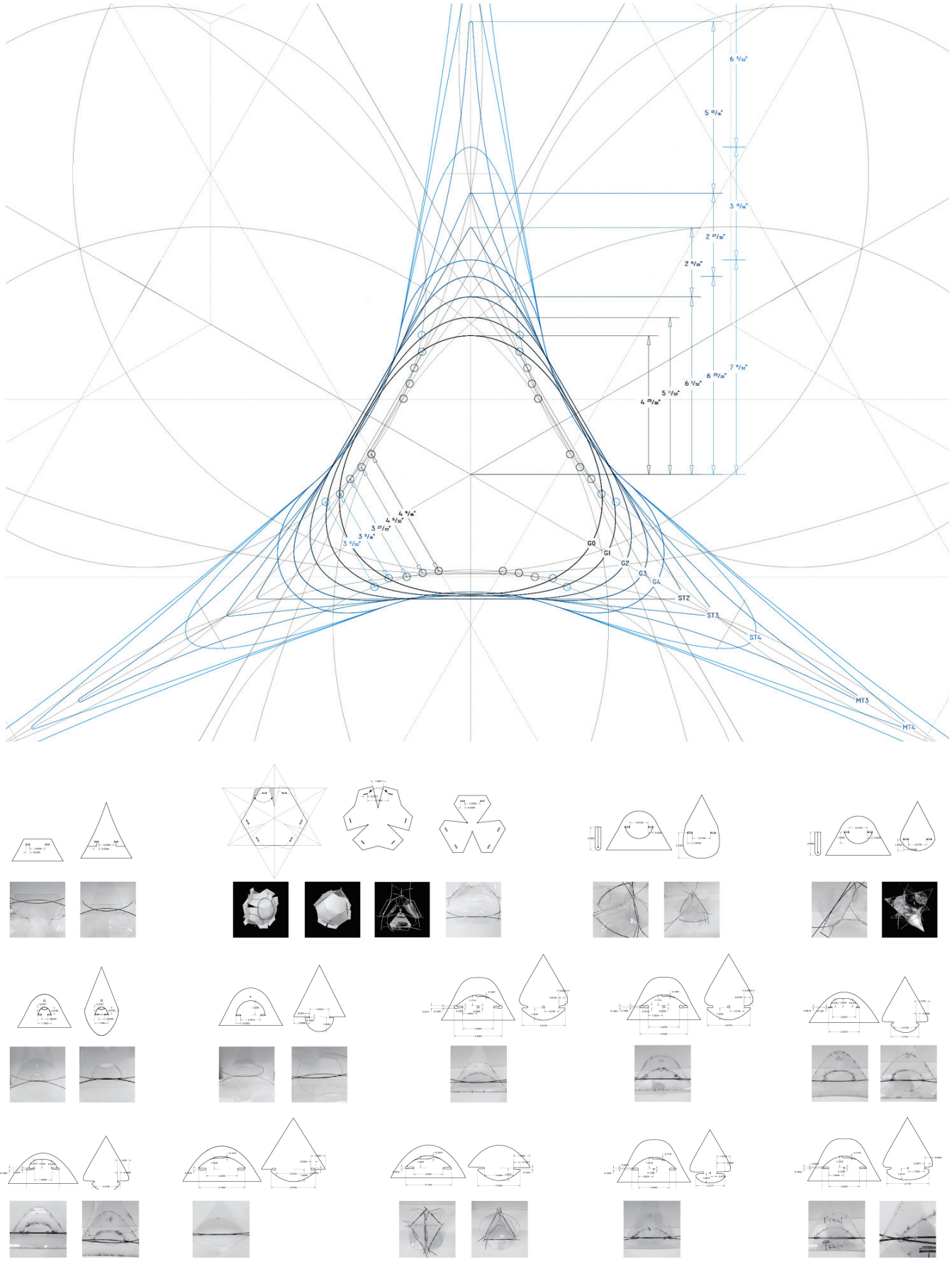
parametrically generated and a hybrid of manual and mechanical production methods, finished assembly has rich variation, as the enormous quantity of individual pieces conceals human error and improvisation.

The dimensions of the digital model are iteratively calibrated through measurements of physical prototypes by recording the locations of the interlocking points between the two materials. In the final configuration, the digital model is tuned closely enough to the physical outcome to predict the approximate size of the installation within the bounding box of the site. During installation, the assembly adjusts through its ability to stretch or compress to meet key anchor points, enabling dimensional adjustments to be made during the final installation process.

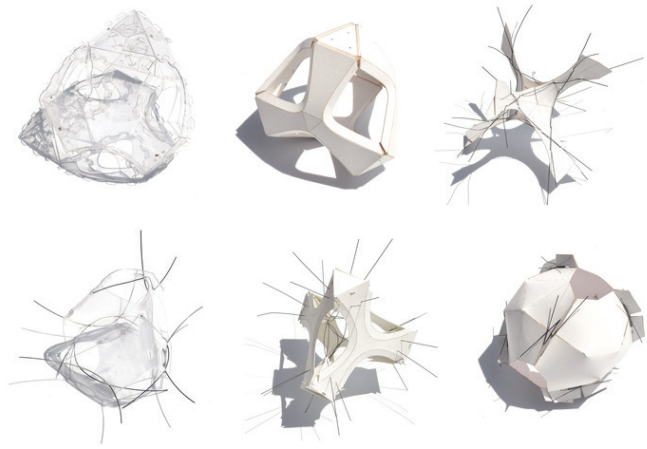
The initial number of possible geometries in the parametric model is unlimited; however, the selected design forgoes the idea that the source of complexity comes from gradually shifting shapes and chooses instead to limit the number of types to a finite set that is easy to visually differentiate. While the former method necessitates a vast system of labeling to describe the correct location of each of the parts, the latter requires a simple awareness of the differences between a small set of pieces and a basic set of instructions about how they are sequenced.

The parametric model contains the ability to control how many different variations exist in the project—extending either the size of the workforce or the timeframe of the assembly could create an opportunity to recalibrate the complexity by adding or subtracting from the set of variations.

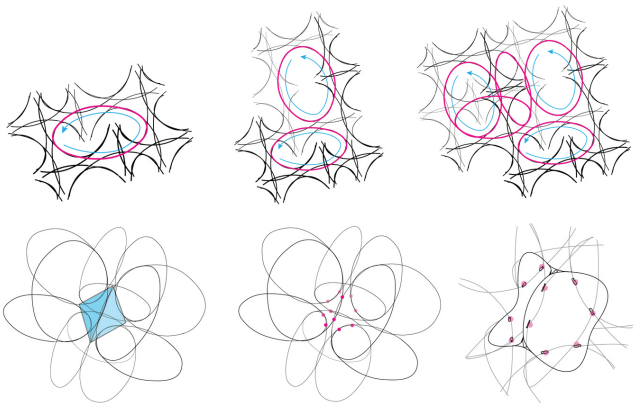
The role of technology throughout the project's design process is to temper and calibrate the intricacy of the digital model to match the resource of the mechanical and manual workforce, and the installation's production methods and material composition demonstrate the complementary roles of machined and manual labor.



5 Geometric detail of surface variation; dimensions are generated through an iterative process of measurement from physical models.



6 Study models of connections between linear and sheet materials.



7 Process of generating surface locations from the grid of circular loops.

8 Snapping surfaces onto wire during assembly.

9 Assembly detail showing interlocking wire loops.

ACKNOWLEDGMENTS

ACCUMULUS is designed and constructed by students in the Graduate School of Architecture and Urban Design at Washington University in St. Louis—Chun Liu, Lingfeng Zhang, Joseph Vizurraga, Jay Bassett, Qian Huang, Boxun Hu, John Patangan, Alex Melvin, Jeffrey Lee, Yue Zhang—under the direction of Lavender Tessmer and Jason Butz:

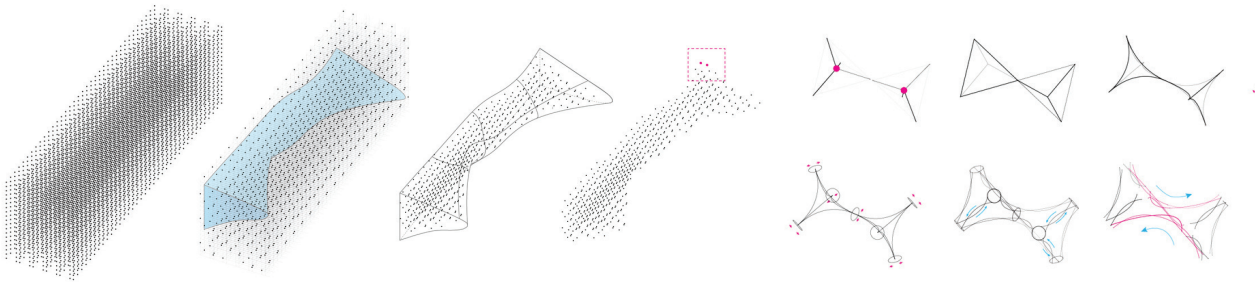
IMAGE CREDITS

Figures 1 and 4: © Stan Strembicki, 2015

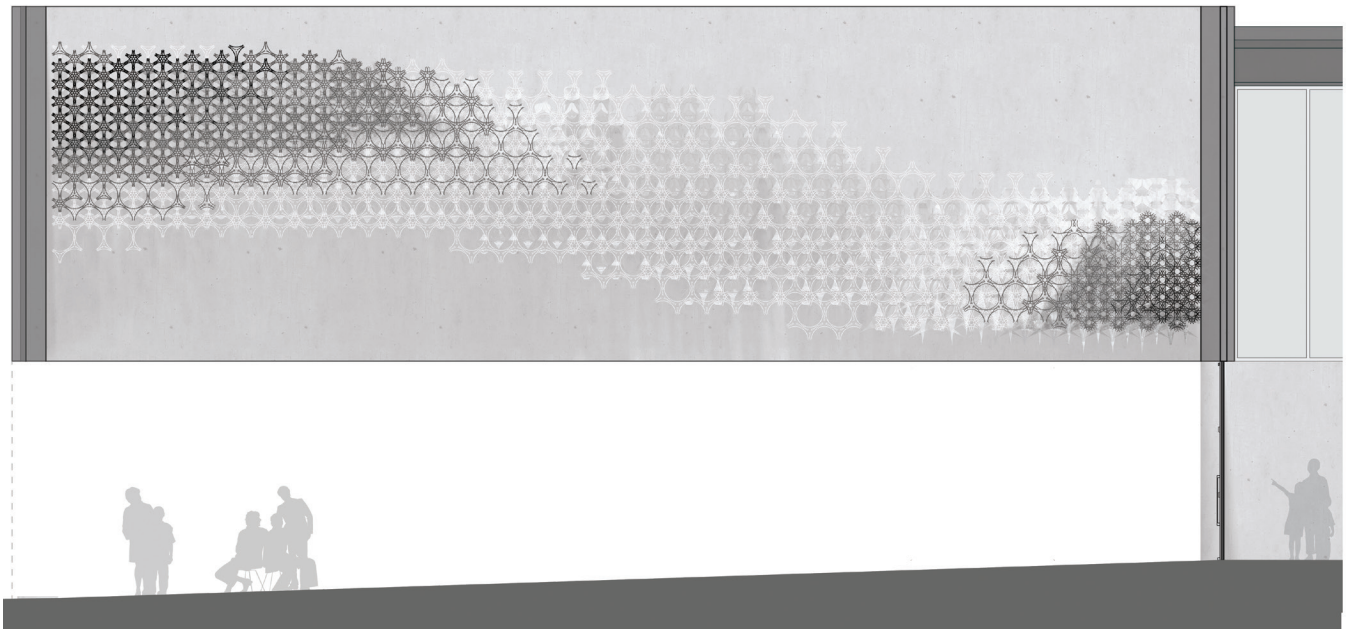
All other drawings and images by the authors.

Lavender Tessmer is currently a student in Design and Computation (SMArchS) at the Massachusetts Institute of Technology and a research assistant in the Self-Assembly Lab. Her work explores the disciplinary boundary between art and architecture, as well as the relevance of craft in digital modes of design. She received her Master of Architecture from Washington University in St. Louis in 2011, where she taught as a lecturer from 2012 to 2017. Her most recent work includes Spectroplexus, an installation at the St. Louis Lambert International Airport, designed with her spring 2017 graduate architecture studio; and Hedge, a site-specific installation (with Jason Butz and Nathaniel Elberfeld) exhibited at the Contemporary Art Museum St. Louis from August through December 2017.

Jason Butz received a a Bachelor of Arts in Architecture from Clemson University in 2010, and a Master of Architecture from Washington University in St. Louis in 2012. During his academic career, he participated and placed in a number of design competitions, was awarded the St. Petersburg prize for best undergraduate work, the AIA Certificate, and was nominated for the Widmann Award for best graduate work. Upon graduating, he worked at Cannon Design on a variety of typologies, including higher education, corporate commercial, and healthcare for projects all over the world, including Miami, Rio de Janeiro, and locally in St. Louis. His projects went on to receive several local and regional AIA awards. While working full time, he also taught in the

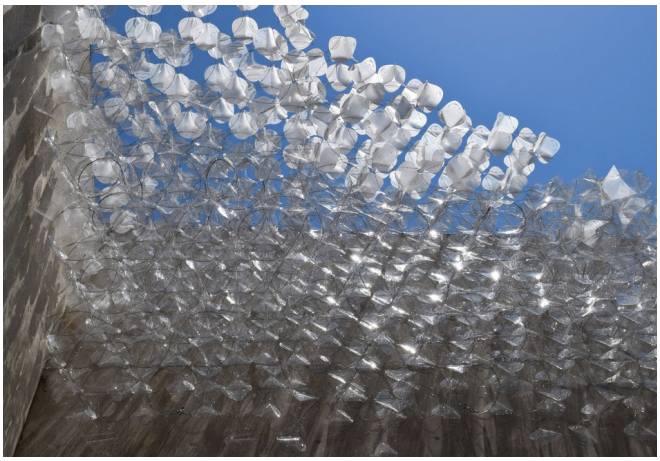


10 Digital process of arriving at the volumetric form from a 3D array of points and the generation of interlocking circular loops

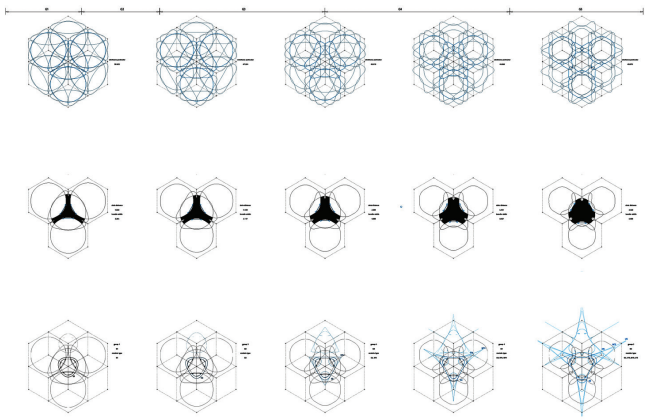


11 Longitudinal section.

Sam Fox School of Design and Visual Arts at Washington University in St. Louis. His classes included seminars on parametric design and three digital fabrication studios co-taught with Lavender Tessmer. In 2017, Jason moved to New Orleans and began working for Gould Evans Architects, exploring new project types, including multi-family residential and adaptive reuse, and developed projects that went on to win local AIA awards. In the Fall of 2018 he will begin teaching a seminar at Tulane University.

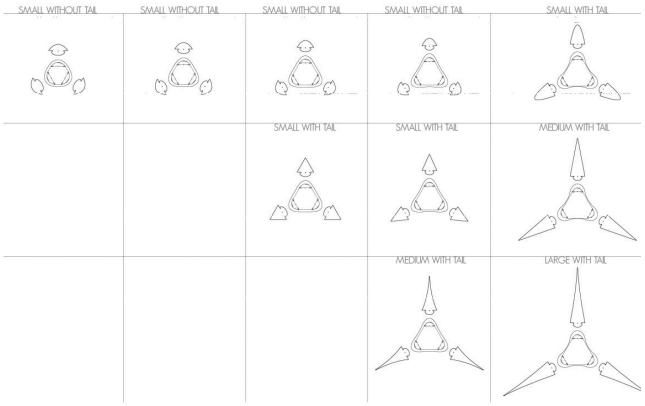


12 Module variation: "compact".



13 Set of five geometric variations between wire and plastic components.

14 Module variation: "leafy".



15 Final matrix of 2D-part shapes.