THE NUIT BLANCHE PAVILION

USING THE ELASTIC BEHAVIOR OF ELASTOMERS FOR A LIGHTWEIGHT STRUCTURE

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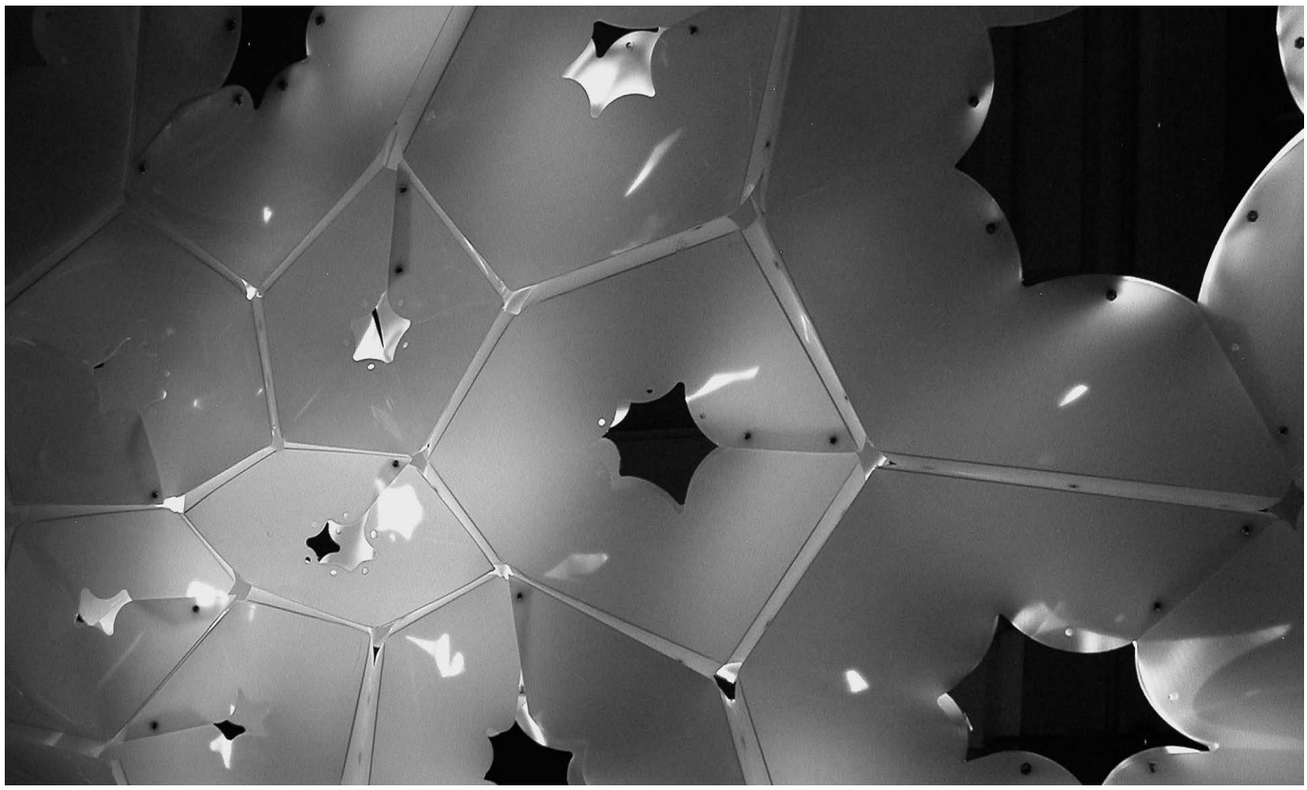


1 Lighting effect of interactive envelope

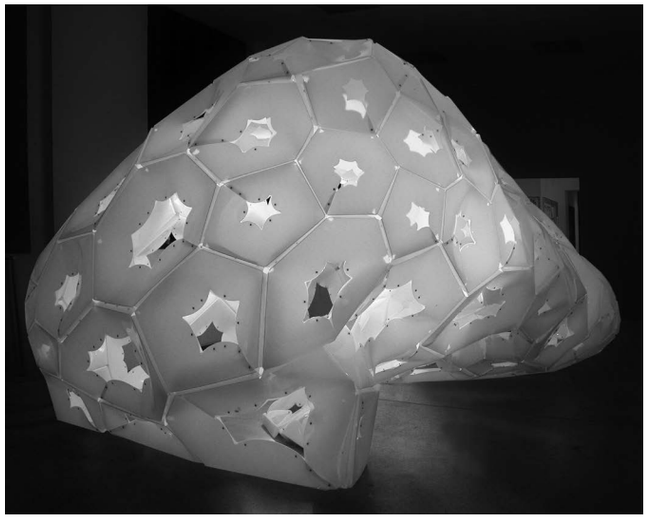
The Nuit Blanche Pavilion investigated the elasticity of elastomers to develop a structural envelope for an interactive spatial video and sound installation by artist Damien Valero (http://atelierdamienvalero.com/). The project was part of the annual Nuit Blanche Art Festival (http://www.paris.fr/pratique/culture-patrimoine/nuits-blanches/p6806) in Paris, France. The design of the pavilion responded to Valero's investigations in human skin as an organic interface. The video installation required a space that allowed specific cones of vision that informed the pavilion's overall form. The double-skin system formed the pavilion's structure and housed the hardware necessary for the interactive video and sound installation.

The envelope was subdivided into modules to make the pavilion deployable. Each module functioned as container for sensors, small video projectors and other devices needed for the installation. To provide access to the hidden infrastructure each module could be opened and closed at any time after the pavilion was assembled. On the other hand the connection detail of the modules provided a continuous space between the two layers of the skin created by the module halves was necessary to run an infrastructure of cables between them.

The elasticity of elastomers was used in two ways: to develop rigidity in the module itself and to create stiffness in the edges between the modules. The flattened module halves were bent into a cone shape to introduce tension in the module. Each module therefore acted as a rigid plate that could be connected into a shell structure. This was achieved by modeling the cone digitally, unfolding it, routing it and bending the physical piece in place. Removing material eliminated an unusable stress increase in the center of the module. To control the remaining stress of the plate we changed the size of the opening and the depth of the individual cones.

The flanges of the module were bent to create stiffness between the cells. Changing the length and depth of the individual edges allowed varying the relationship between the different modules. The flanges of both parts were first bent and then connected to the neighboring cells. To use the elasticity of the material, it had to be bent in such a way as to keep its original physical properties intact. Over time, the material would try to reach its original flat stage, causing tension between the modules. Different bending methods were investigated to achieve this effect.

Each module was simulated as a plate element that once connected to others formed the larger structure. Because plate behavior is predicated on the continuity of material, removing material from the plate's center suggests that the structure is capable of gradually changing its behavior from a shell structure to a wireframe structure consisting of linear frame elements. The two domains of wireframe and shell structure are therefore used as guidelines to perform different analytical methods with an understanding that the actual behavior is in an ambiguous domain between the two.



2 Exterior view

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GERNOT RIETHER is an award winning architect, scholar and educator. His work utilizes information technology to activate urban spaces. Gernot Riether has taught Architecture at Universities in Europe and the US, including the Georgia Institute of Technology, the New York Institute of Technology (NYIT) and Barnard College at Columbia University. He currently holds a position as Visiting Professor at Ball State University.

KEYAN RAHIMZADEH is a graduate of the Georgia Institute of Technology. Having earned degrees in both structural engineering and architecture, his research efforts aim to synthesize the knowledge and methods of those disciplines, especially via computational tools. Recent work focuses on the intersection of design intent, geometric abstraction, and structural performance, and using feedback from one area to drive the optimization of another. Other work includes research on photovoltaics with particular emphasis on balance of systems design. He currently holds a position as a facade consultant.