Bayou-luminescence

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Bayou-luminescence is a full-scale installation that investigates the synthesis between digital and material processes in architectural production. Throughout the design process, computation-based techniques were integrated in order to impact three distinct aspects of the project: (1) the non-standard nature of the overall structure; (2) the custom cladding membrane modulated in relation to its behavior in tension; and (3) the long-distance collaboration between the team members. Although small is scale, the project entailed a precise integration of a complex workflow from modeling and simulation to fabrication and installation.

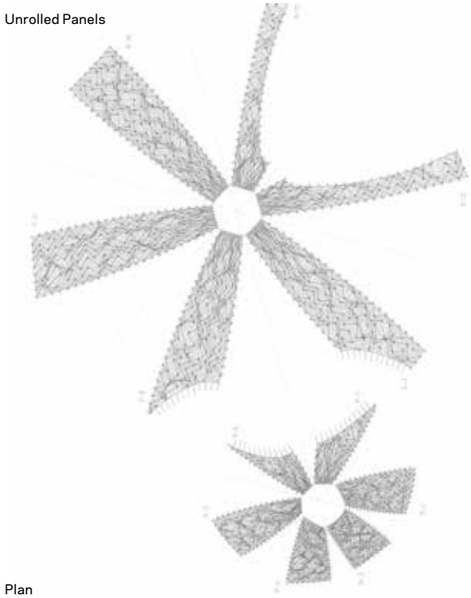
The non-standard form, that is the form in which no two constituent parts are geometrically identical, is a result of the oblique intersections between two interlocking volumes and their relationship to the ground plane. The volumes were parametrically scaled, dimensioned and positioned to respond to both anticipated material constraints and opportunities for occupation. The base model served as the source of the wireframe, which was extracted to generate the structural system. Top and bottom edges of the wireframe were thickened to produce templates for the CNC laser-cutting of steel plates, while the vertical curves were output as full-scale plots used for mechanical steel-tube bending. The digitally fabricated steel plates provided a means of self-jigging connections, which in turn streamlined manual tasks such as TIG welding and eliminated the need for additional dimensioning and setup.

The same digital model was used to produce the geometry of the twelve custom cladding panels stretched between the steel members. Through a series of digital operations – with the workflow that integrated Rhinoceros, Grasshopper, Weaverbird, and Kangaroo – we were able to simulate the behavior of the flexible skin in tension and as such transition from the form of the skin as one that is intrinsically double-curved to one that is flat when not in tension. In their flat state, the panel templates were further differentiated in order to synthesize the demands of fastening details, material properties, and sensory effects. Three interlacing layers of vectors are translated into three separate sets of paths used for the CNC-routing of shallow-relief formwork, from which final translucent rubber panels were cast. The intricate non-standard pattern that gives the liquid rubber its form is as much a result of tooling constraints and the materiality of the formwork as it is an outcome of digital data.

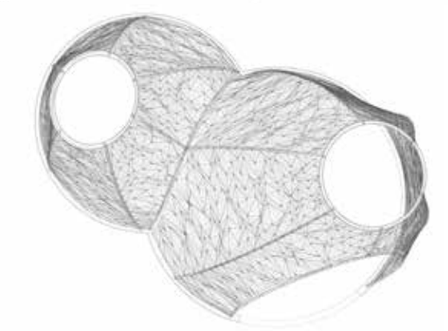
The two architects collaborated long-distance throughout the entire design and fabrication process. The steel structure was made in one city, the skin in another, and the installation took place in a third city inaccessible to both. Such a reality required a single digital model that integrated all design information in one location as well as a careful calibration of dimensional tolerances within and between the two material systems. The project serves as a model for a collaborative design practice in which material agency is capitalized upon through the strategic articulation of a digital workflow.

Bayou-luminescence was one of ten site-specific installations commissioned by the New Orleans chapter of the American Institute of Architects and was included as a part of DesCours, the annual architecture and art event on view at various locations in city from December 2 through 11, 2011.

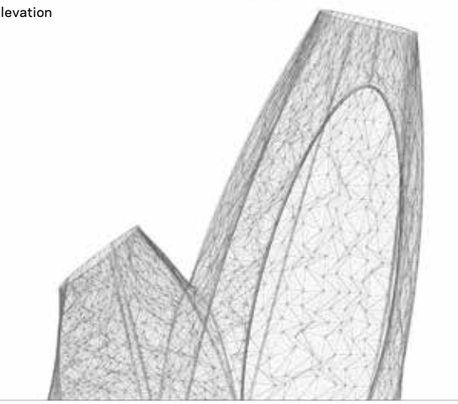
Unrolled Panels

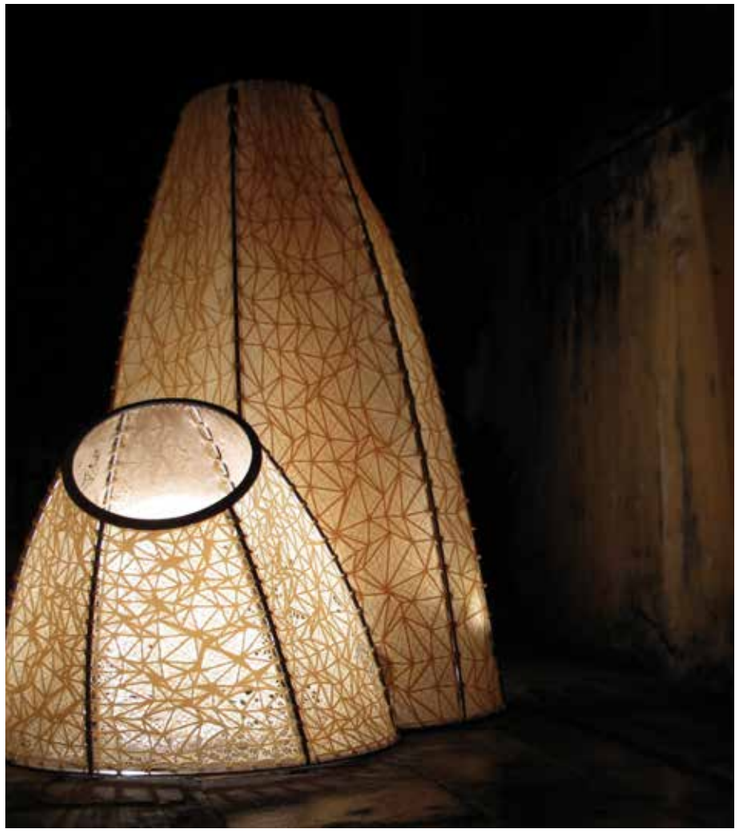


Plan

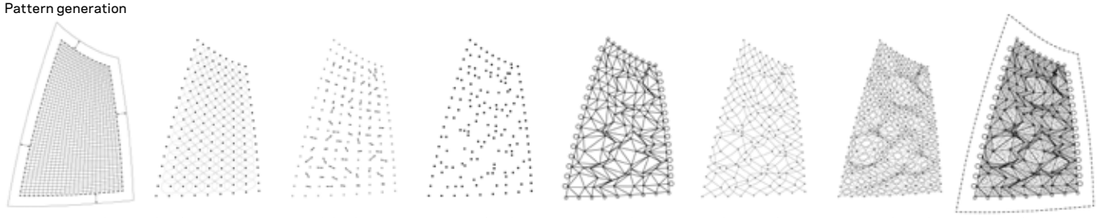


Elevation





Pattern generation



panel unrolled edges inset to optimize tension; rulled surface produced

point-grid extracted: magnitude of possible movement assigned by radius; perimeter point remain fixed

vectors of direction and distance of point movement under grid relaxation

resultant point-grid

large-scale triangulated mesh and termination detail at surface edges

medium-scale diamond mesh with geometric flexibility to produce curature

small-scale interlacing mesh with fine texture and aperatures to accommodate material distribution

composite mesh, fabrication-ready for formwork production