LIVING KNITWORK PAVILION – ASYMPTOTIC TIMBER TOWER AND 3D-KNITTED FABRIC

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Keywords: *asymptotic structure, optimization, multi-criteria optimization, art installation, digital fabrication*

ABSTRACT

Textiles possess a distinct quality that can bring a sense of fluidity, softness, and dynamic character to both natural and constructed environments. Drawing from the craftsmanship and construction methods found in traditional textiles, as well as the concept of communal spaces like pavilions or pagodas, our goal is to offer a fresh viewpoint on technical textiles. This involves blending innovative materials, sensor technologies, and digital manufacturing techniques to create a sizeable interactive textile. Simultaneously, we seek to incorporate intricate elements and opportunities for self-expression.

Fig. 1. Sunset view of the Living Knitwork Pavilion at Burning Man. Photo: Gabriela Bila Advincula.

The Living Knitwork Pavilion (Fig.1) is a specialized and adaptable textile shade structure, shaped like a dodecagonal pyramid measuring 18 feet in height and 26 feet in width. It is constructed using 3D-knitted yarns that possess optical and electrical capabilities, enabling them to detect activities and undergo color changes that illuminate the structure throughout the day and night. On sunny days, it unveils hidden patterns inspired by human activity, nature, plant and animal life, as well as futuristic elements through photochromic processes. This pavilion serves a dual purpose, functioning as a shade structure during the day and transforming into a responsive lantern at night. It serves as a communal gathering place. Our presence, movements, and alterations in the environment all contribute to the overall glow, visual effects, and atmosphere of space. These elements are reflected onto the pavilion as living memories, enhancing moments of exploration, contemplation, and connection.

The innovative approach of employing 3D-knitting technology, now implemented in electronic and responsive textiles at an architectural level, represents an additive manufacturing process that commences with a selection of functional and standard yarns as fundamental design components. These yarns encompass conductive, photochromic, and luminous varieties. Each petal in the Knitwork design is thoughtfully crafted with mesh-like apertures to enable the passage of light and air, tactile patterns that provide textured relief to the textile, melting yarns that facilitate hardening or thermoforming processes, as well as custom channels and seam details to accommodate the insertion of sailing rope and electrical wiring (Fig.3). This comprehensive process allows for the creation of customized, multi-layer textiles that seamlessly combine aesthetics and technical functionality, resulting in distinctive forms and textures while minimizing material waste. We are particularly proud of our commitment to sustainability, as 60% of the yarns used are derived from recycled plastic bottles. Moreover, the Living Knitwork Pavilion is powered by the Solar Library, an initiative aimed at reducing the reliance on generators and noise pollution on the playa by harnessing renewable energy sources.

The core framework of the pavilion consists of a lattice network of timber elements, carefully designed to achieve structural strength while minimizing the use of materials. To create a cohesive and harmonious integration with the Knitwork, the lattice and joint designs have been

customized to give the central structure a curved appearance, enhancing the overall sense of fluidity and unity within the pavilion (Fig.2).

Fig. 2. The asymptotic timber tower – Living Knitwork Pavilion at Burning Man 2023. Credit: Judyta Cichocka.

Within the twelve Knitwork petals, there is an interconnected system of thereminic antennas, constructed using conductive yarns. These antennas communicate with each other and interact with the electrical field generated by the central structure. This enables them to detect non-contact gestures and drive an immersive experience by controlling the audio and lighting systems.
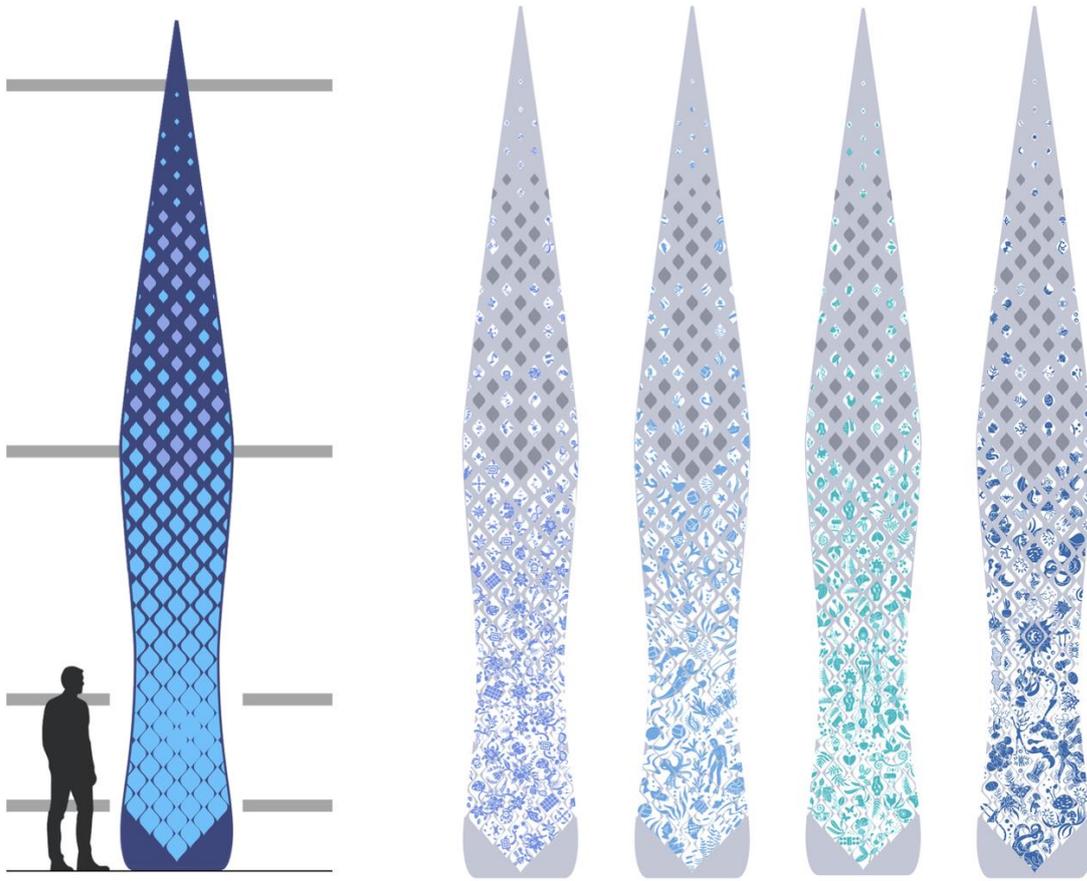
Fig. 3. The Knitwork: 4 out of 12 different designs. Credit: Irmandy Wicaksono/Gabriela Advincula.

The Living Knitwork Pavilion serves as a testament to the incredible opportunities that emerge when architecture, technology, and textile art unite to foster community connections. By harnessing innovative materials, digital manufacturing methods, and a profound respect for cultural symbolism, we extend an open invitation for everyone to find shelter, participate, interpret, and immerse themselves in a celestial tapestry of light, color, and textile marvels.

Living Knitwork Pavilion team
Project Lead and Artist Irmandy Wicaksono
Textile Design Irmandy Wicaksono and Gabriela Advincula
Textile Engineering and Fabrication Irmandy Wicaksono
Structural Design and Engineering Alfonso Parra Rubio and Judyta Cichocka
Hardware Design and Engineering Sam Chin and Irmandy Wicaksono
Musical Mapping Manaswi Mishra

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