

Gradient Shadow: Digitally Knitted fabric for Light Large-scale Vault

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Abstract

The Light pavilion that will be built during the IASS congress 2019 in CIMNE explores the potential of using digital knitting for large structures and easy on-site deployment. The rationale for the construction is to apply the unique shaped and form-fitting capabilities of knitted fabric, and to integrate structural and color patterning into the fabric of the pavilion.

The proposed structure will be composed of a double shell where the outer digitally knitted textiles will have a rough finish whereas the inner created membrane will have a smooth and colorful finish.

The pluri-disciplinary team's work aims at using digital knitting to achieve highly differentiated elastic meshes densities provoking shadows gradients inside the shell. The densities of the shell are adjusted and created so that this light pavilion could serve future contexts and other projects where it will be used as fabric formwork for sprayed mortars so that the highest mesh densities will be created where the maximum stress is applied if the structure was to work fully in compression.

In addition, 6 colors of yarn will be used in the digital confection of the 4 shaped pieces forming the overall 4 m tall shell once assembled by thin inflatable arches which will give the authors the opportunity to highlight and translate subtly Barcelona colorful heritage and culture.

Change of materiality of the fabric forming sleeves for the arches to take form will give the team the opportunity to challenge the digital knitting machine and its preprogramming to achieve full manufacturing of the pieces including stitching in addition to the replicability of such large structures in any context and at larger scale.

Such technique could open a new page in the shotcrete industry by providing bespoke affordable light meshes.