

Weaving Structure & Interactive Space

CAADRIA2017 Pre-Conference Workshop Proposal (April 2-3 2017)

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Aims and methods

- Weaving Structure

Influenced by architects such as Zaha Hadid and Frank Gehry, a lot of contemporary architectural designs employ great deal of digital technologies, and explore complex spatial expression and construction of organic curvilinear forms. Despite large amounts of effort that is dedicated into study and optimization of such design, its construction is still expensive.

Inspired by traditional handicrafts, we propose a new mesh-like weaving structure that is constructed by continuous elastic members such as bamboo or FRP rods, which can bear bending forces. The advantage of the weaving structure system lies in its formal representation, structural performance and construction method. Firstly, mesh model is a common way to represent complex topology, and can be easily transformed into a weaving structure. Thus, the system can adapt to a wide range of forms. Secondly, the final form is a balance of bending forces inside the continuous elastic rods, thus is “organic” in its mechanism, rather than only looks organic. Thirdly, the form finding process makes the structure an evenly stressed and integrated one. Fourthly, materials for the weaving structure are accessible and easy to process. Further the structure can be constructed without tedious 3D positioning works, which is far more convenient than previous construction methods for curved surfaces.

- Interactive Space

Interactive space is a dynamic space with kinetic structure with sensors and actuators that can react to the behaviors of habitants in the weaving structure created above. Similar approaches are dynamic façade and kinetic architecture that are in experiment as well as practice in field. Form of weaving structure and interactive spaces need to be considered together at the beginning and refined along the workshop to fit into the location given during conference.

Proposal of Installation

A large-scale weaving structure installation is proposed to be constructed in the XJTLU campus by the tutors and participants. The installation could be interior or exterior, with LED lighting controlled by interactive sensors and Arduino system that could redefine the space. Interactive mechanical system is also proposed to enhance the interaction of the

installation and people. Since the weaving structure system can be constructed without complex 3D fabrication and positioning work, the structure can be constructed within 2 days.

Technical requirements

The participants with some of the following ability are preferred.

- Rhino and Grasshopper
- Elementary construction experiences
- Basic knowledge of Arduino system
- Basics of electrical engineering

Material and Facilities Required

PC pipes and LED lighting strips.

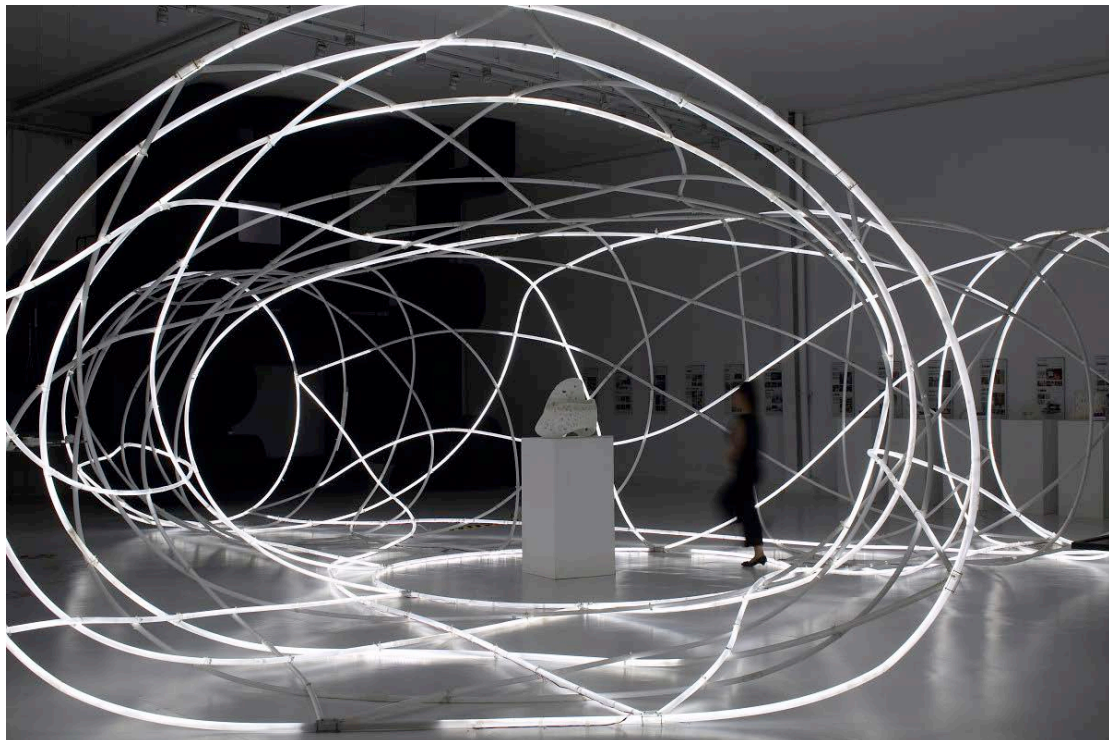
Arduino board, sensors, step motors, etc.

Ladders or movable scaffoldings

Installation Size

Depending on the campus site, the installation could be with a height of 3-4 meters and horizontal span of 4-8 meters. The design can be decided after discussion with XJTLU host.

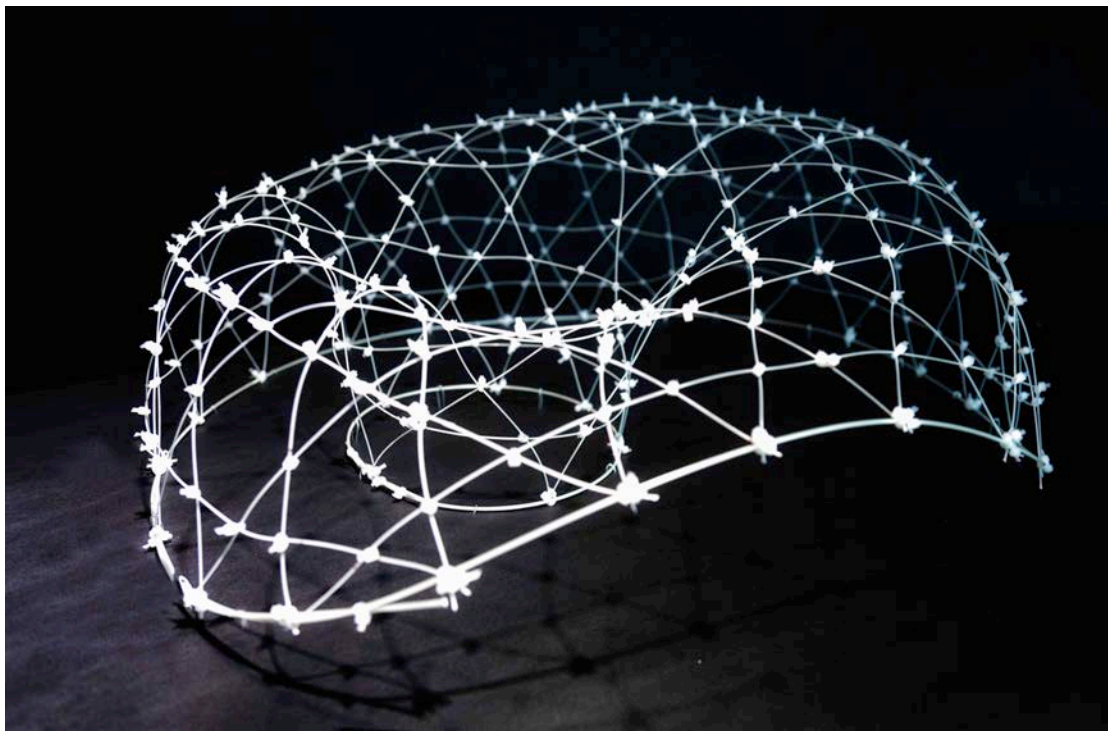
Reference images of Weaving Structure



Spacetime Weaving, 4*11*10m, Installation for 2016 Beijing Design Week, 2016.10



Moon, 1.5*3*3m, installation of CAAD practice, Tsinghua University, 2016.09



Doom, weaving structure model by FRP rods. CAAD practice, Tsinghua University, 2016.09

Tutors

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Reference

<https://www.youtube.com/watch?v=Bmw8Ms25Nps>

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