Grid Shell Sphere by the Active Bending Waving Structure

Weixin Huang*, Ziniu Luo[a], Xinchang Xiong[a], Yueqi Sun[a]

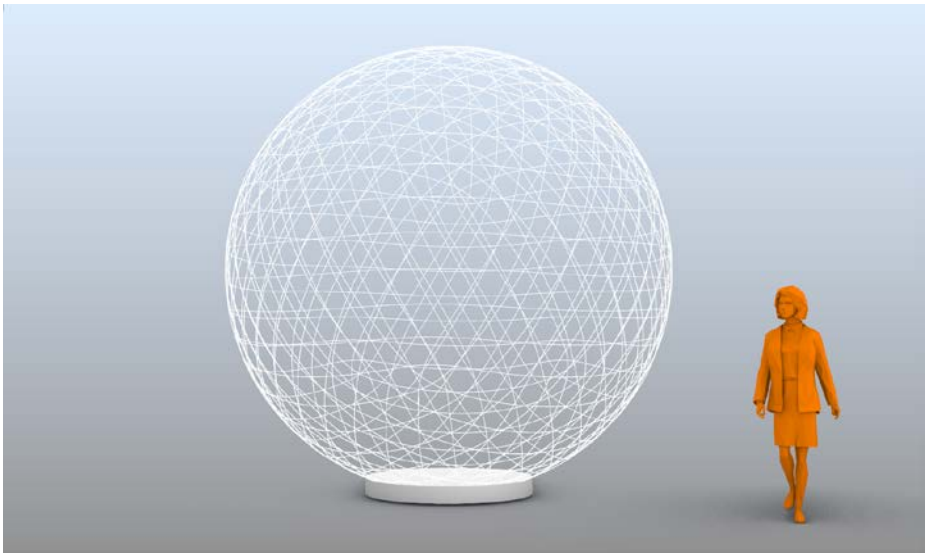
*School of Architecture, Tsinghua University
S400C, School of Architecture, Tsinghua University, Beijing, China, 100084
huangwx@tsinghua.educn

[a] School of Architecture, Tsinghua University

Abstract

The weaving structure is an active bending structural system for construction of free form shells. Through the form finding process of the interwoven rods, the system can be used for construction of a wide range of free form geometries.

For the IASS2019 competition and exhibition of innovative lightweight structures, our proposal is to build a 4m diameter sphere with weaving structure system. The weaving structure system uses continuous rods, and in order to fulfill the transportation requirement of the completion, our idea is to build the sphere with very thin FRP rods. The weaving grid will be comparatively denser and the multi-layer weaving method will be used to achieve better structural performance. Preliminary simulation shows that the sphere could be a double-layered weaving structure constructed by around 1200m CFRP rods with the section diameter of 3mm, and the weight of the whole structure is less than 20 kilogram. The structural design and fabrication of joints will be optimized in the next months in order to improve the structural performance and construction quality.



References

[1] Weixin HUANG, Chenglin WU, Jiankun Huang, A Weaving Structure for Design & Construction of Organic Geometry, Proceedings of the IASS Annual Symposium 2017, Hamburg, Germany, 25 - 28th September, 2017

[2] W. X. HUANG, D. YAN and P. LUO and X. L. LI, Digital Desian and Construction of a Weaving Structure, The 8th International Conference on Fibre-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2016), Hong Kong, 2016.12

[3] Julian Lienhard, Holger Alpermann, Christoph Gengnagel and Jan Knippers, Active Bending, A Review on Structures where Bending is used as a Self-Formation Process, International Journal of Space Structures, Volume 28 · Number 3 & 4 · 2013, pp188-196