

Configurations of the two-layer tensegrity structures composed of 3-bar tensegrity units

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Abstract

Assembling the tensegrity units along their axes into the complex tensegrity structure is a common method for setting up the tensegrity structure and can be applied to obtain all kinds of spacial shapes. In the method, how to connect the additional strings is key and is researched here. Physical models of two 3-bar tensegrity units whose rotating angles in unit φ are equal to 150° and 210° respectively are applied to be assembled along their axes into the two-layer tensegrity structures. Based on the physical models, characteristics of the two-layer tensegrity structures are investigated and rationality for the obtained configurations is discussed.

Firstly, how to assemble the two tensegrity units along their axes is described. Figure 1 shows the assembling course. Known from Fig.1, the additional strings are added in order to connect the two units into a structure in equilibrium, which shows again importance of the additional strings in assembling the tensegrity units along their axes.

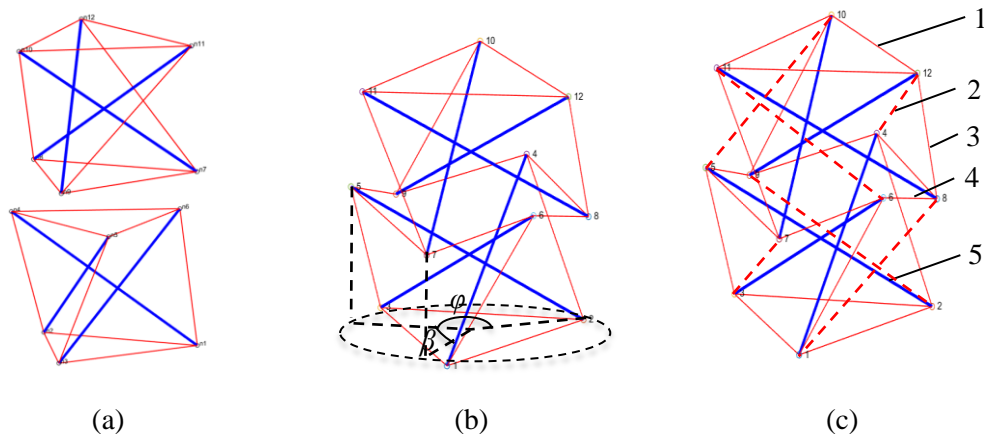


Fig.1 Course for assembling the two tensegrity units along their axes into a two-layer tensegrity structure:1 level string; 2 additional string; 3 declined string; 4 saddle string; 5 bar.

Then, according to the rotating angles in unit of the bottom unit, the two-layer tensegrity structures are classed firstly into two types. The two types are distinguished by connection of the additional strings of the bottom unit. The each type is classified further into two types according to connection of the additional strings of the top unit. So four configurations of the two-layer 3-bar tensegrity structures are presented. The configurations are in equilibrium, but their force and structural characteristics are different. Three forces along their axes are loaded at three nodes on the top plane and changes of the structures are discussed. Finally, after comparing the changes, rationality of the configurations are investigated.

References

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