

## Form-finding analysis of tensegrity structures using stiffness matrix method

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As a novel type of structures, tensegrities consist of a set of axial pre-compressed bars supported by a set of axial pre-tensioned strings. Due to their unique features and advantages, tensegrities hold promise for a wide diversity of technologically important applications. Form-finding analysis is to search the self-equilibrated configuration of a tensegrity. In this paper, a highly efficient form-finding method of tensegrities is proposed on the basis of the structural stiffness matrix. The stiffness matrix is used to direct the rapid approach to an equilibrated configuration, and the total potential energy serves as the optimization objective to ensure the stability of the obtained configuration. This form-finding method allows us to readily determine the self-equilibrated and stable configuration of a tensegrity from an arbitrary initial state. A number of representative examples are given to demonstrate its accuracy and efficacy for both regular and irregular tensegrity structures.

**Keywords:** tensegrity, form-finding, structural stiffness matrix, numerical analysis