Novel algebraic results for tensegrity structures

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Kinematics and statics of tensegrities are addressed by means of a novel algebraic formulation. The inequality constraints enforced by cable-type unilateral structural members are explicitly dealt with in the equilibrium and compatibility problems. Fundamental tensegrity properties (rigidity, pre-stressability, and stability) are focused from a novel structural perspective, and algebraic criteria for their assessment are established. Moreover, an operative algorithm for the analysis of the large-displacement elastic tensegrity response is proposed, resulting in a general design tool not limited by special requirements in terms of structural symmetries, member properties or connectivity. Exemplary applications highlight the effectiveness of the proposed approach for designing tensegrity structures endowed with smart global behavior related to the optimal tuning of structural stiffness.

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