Isogeometric analysis of monoclinic 3D concrete printing Timoshenko beam

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3D printable concrete construction techniques have been well developed in the past decade. 3D printable concrete can be used to build free forms and shapes of structural components. In this paper, the isogeometric analysis (IGA) of 3D concrete printing monoclinic curved beam is made. Timoshenko curved beam theory in three dimensions is investigated. Definitions, properties, formula, and algorithms of Non-Uniform Rational B-Spline (NURBS) curves are reviewed. Corresponding finite element weak forms, discretization, and IGA formulations are derived and developed. Several numerical experiments are carried out and results are in a good agreement with experimental data in literature. It is indicated that the proposed isogeometric approach is feasible, accurate, and efficient to conduct an in-depth analysis of 3D concrete printing monoclinic Timoshenko beam.

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