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ISOGEOMETRIC BOUNDARY ELEMENT METHOD IN PLANE MICROPOLAR ELASTICITY

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Micropolar (Cosserat) theory of elasticity is one of the microcontinuum field theories that incorporates couple-stresses and independent microrotations into the description of a deformation [1]. This theory is suitable for predicting mechanical behavior of materials when it is significantly affected by material microstructure, since the intrinsic material lengths are introduced directly into the constitutive equations. Examples of Cosserat materials include fibre-reinforced composites, metal foams and human bones.

The fundamental solutions of plane Cosserat elasticity have been derived, and it has been shown that the boundary value problems can be transformed into systems of boundary integral equations, which can be subsequently solved by the boundary element method. In the present work the isogeometric formulation is employed where the NURBS basis functions are used to discretize the boundary geometry and the field variables: displacements, microrotation, tractions and couple-traction [2], [3].

The efficiency of the method is demonstrated for various geometries and material parameters. The convergence of the solutions is studied depending on the positions of the collocation points and the number of Gauss points. The results are compared with those obtained by conventional boundary and finite element methods.

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