

# **Application of the Gradient Smoothing Technique to the Natural Neighbour Galerkin Method for the Couple-Stress Elasticity**

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## **Summary**

The natural neighbour Galerkin method is tailored to solve boundary value problems of the couple-stress elasticity to model the size dependent behaviour of materials. This method is based on the displacement-based Galerkin approach, and the calculation of the global stiffness matrix is performed using gradient smoothing technique combined with the non-Sibsonian partition of unity approximation scheme. This method possesses the following properties: the complex C1-continuous approximation scheme is avoided without using either Lagrange multipliers or penalty parameters; no domain integrals involved in the assembly of the global stiffness matrix; and the imposition of essential boundary conditions is straightforward. The validity and accuracy of this method are investigated through numerical examples. The results show that strong size effects can be captured by the numerical method when the length of deformation field and the characteristic length of the material are comparable, and good agreements with analytical solutions are obtained.

