

# LOWEST-ORDER EQUIVALENT NONSTANDARD FINITE ELEMENT METHODS FOR FOURTH-ORDER PLATES

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## ABSTRACT

The popular (piecewise) quadratic schemes for the fourth-order plate bending problems based on triangles are the nonconforming Morley finite element, the discontinuous Galerkin, the  $C^0$  interior penalty, and the WOPSIP schemes. Those methods are modified in their right-hand side  $F \in H^{-2}(\Omega)$  replaced by  $F(JI_M)$  and then are quasi-optimal in their respective discrete norms. The smoother  $JI_M$  is defined for a piecewise smooth input function by a (generalized) Morley interpolation  $I_M$  followed by a companion operator  $J$ . An abstract framework for the error analysis in the energy, weaker and piecewise Sobolev norms for the schemes is outlined for linear and semi-linear problems with trilinear nonlinearity. Applications include the biharmonic plate bending problem, stream function vorticity formulation of incompressible 2D Navier-Stokes problem, and the von Kármán plate bending problem. This is a joint work with C. Carstensen, G.C. Remesan, and D. Shylaja.

## REFERENCES

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- [2] C. Carstensen, Neela Nataraj *Lowest-order equivalent nonstandard finite element methods for biharmonic plates*, ESAIM: Mathematical Modelling and Numerical Analysis, 56(1), 41–78 (2022)

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