A posteriori error estimates for nonconforming finite element methods for fourth-order problems on rectangles

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The a posteriori error analysis of conforming finite element discretisations of the biharmonic problem for plates is well established, but nonconforming discretisations are more easy to implement in practice. The a posteriori error analysis for the Morley plate element appears very particular because two edge contributions from an integration by parts vanish simultaneously. This miracle does not arise for popular rectangular nonconforming finite element schemes like the nonconforming rectangular Morley finite element, the incomplete biquadratic finite element, and the Adini finite element. This talk introduces a novel methodology and utilises some conforming discrete space on macro elements to prove reliability and efficiency of an explicit residual-based a posteriori error estimator for two of there methods. An application to the Morley triangular finite element shows the surprising result that *all* averaging techniques yield reliable error bounds. Numerical experiments confirm the reliability and efficiency for the established a posteriori error control on uniform and graded tensor-product meshes.

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