A Posteriori Error Estimators For Locally Conservative Methods

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We present a unified analysis of some implicit and explicit error estimators for locally conservative methods applied to second order elliptic problems. These estimators guarantee upper bounds (with constant one) for the true error measured in the energy norm up to high order perturbation due to data oscillation. The implicit error estimator is computed by solving local Neumann roblems, like the Bank–Weiser type, where the Neumann data are provided in a natural way by the locally conservative methods. This can be considered as the equilibrated residual method extended to locally conservative methods which are typically based on discontinuous approximation spaces. We also derive some explicit error estimators of residual type by bounding the implicit error estimator further from above. Our analysis is based on a proper decomposition of the error itself, and seems more direct than other approaches based on the Helmholtz decomposition of the gradient of the error. The results are applied to the P1 nonconforming FEM and discontinuous Galerkin FEM.