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LOCAL ERROR ESTIMATES AND ADAPTIVE REFINEMENT FOR FIRST-ORDER SYSTEM LEAST SQUARES (FOSLS)*

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Abstract. We establish an a-posteriori error estimate, with corresponding bounds, that is valid for any FOSLS L^2-minimization problem. Such estimates follow almost immediately from the FOSLS formulation, but they are usually difficult to establish for other methodologies. We present some numerical examples to support our theoretical results. We also establish a local a-priori lower error bound that is useful for indicating when refinement is necessary and for determining the initial grid. Finally, we obtain a sharp theoretical error estimate under certain assumptions on the refinement region and show how this provides the basis for an effective refinement strategy. The local a-priori lower error bound and the sharp theoretical error estimate both appear to be unique to the least-squares approach.

Key words. adaptive mesh refinement, a-posteriori error estimates, first-order system least-squares.

AMS subject classifications. 65N15, 65N30, 65N50.

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