Energy Based A Posteriori Error Estimates for Elliptic Problems and Bilinear Hierarchical Bases

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Hierarchical finite element bases can be used for preconditioning large systems solving partial differential equations. The a posteriori energy based error estimates were developed for multilevel function spaces. There are two main objectives in our presentation. We derived new formulae for the estimates, that may exploit the quantities which are obtainable by iterative multilevel methods. As the second result, we compute the constants in the strengthened Cauchy - Bunyakowski - Schwarz inequality for the hierarchical bilinear finite element functions. We study both of the h and p hierarchical refinement and we compare the accuracy of the introduced error estimates for these cases. Several examples are included.