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Tao Lin* (tlin@math.vt.edu), Department of Mathematics, Virginia Tech, Blacksburg, VA 24061, and **Slimane Adjerid** (adjerids@math.vt.edu), Department of Mathematics, Virginia Tech, Blacksburg, VA 24061. *Error Estimation For A Class of Hierarchical Immersed Finite Element Spaces*. Preliminary report.

We consider error estimation for a class of hierarchical immersed finite element spaces. These finite element spaces are introduced to handle 2nd order elliptic boundary value problems with discontinuous coefficients. These immersed finite element spaces are formed in a hierarchical way such that the basis functions for a space with lower degree polynomials constitute a subset of the basis for a space with polynomials one degree higher. The mesh used by an immersed finite element space does not have to be aligned with the locations of the coefficient discontinuity; hence a simple structured mesh can be used. Furthermore, the basis functions in an immersed finite element space are designed to satisfy the jump conditions across the locations of the coefficient discontinuity. We will show that these immersed finite element spaces have the optimal approximation capability for the polynomials employed, and we will provide numerical examples to further illustrate their features. (Received August 22, 2006)