

Approximation Results for the Generalized Finite Element Method

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Abstract Approximation results for particle methods are presented, with application to the Generalized Finite Element Method. Classically, approximation results for uniformly distributed particles and associated particle shape functions were proved using the Fourier Transform. Our first result is a new proof in the case of uniformly distributed particles that doesn't use the Fourier Transform. Our second result generalizes this proof to cover general, non-uniformly distributed, particles. This second result can be applied to a wide variety of particle or meshfree methods. These two results are for the situation in which one shape function is associated with each particle. The more general situation, in which more than one shape functions is associated with each particle, is of interest. We will also present results for this situation. The emphasis will be on careful mathematical analysis and on results that apply to a wide variety of approximation methods. This work is joint with Ivo Babuška and Uday Banerjee.