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Abstract

The generalized finite difference method (GFDM) has been proved to be a good meshless method to solve several linear partial differential equations (pde's): wave propagation, advection-diffusion, plates, beams, etc.
The GFDM allows us to use irregular clouds of nodes that can be of interest for modelling non-linear elliptic pde's.
This paper illustres that the GFD explicit formulae developed to obtain the different derivatives of the pde's are based in the existence of a positive definite matrix that it is obtained using moving least squares approximation and Taylor series development. Also it is shown that in 2D a regular neighbourhood of eight nodes can be regarded as a generalization of a classical finite difference formula with a sixth order truncation error.
This paper shows the application of the GFDM to solving different non-linear problems including applications to heat transfer, acoustics and problems of mass transfer.

Keywords: meshless methods, generalized finite difference method, non-linear elliptic partial differential equations, Newton-Raphson method.

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