An efficient grid based boundary integral approach for 2D quasi-linear problems

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Compared to the finite element method, the boundary element method (BEM) is commonly regarded as being less competitive when applied to nonlinear equations. A major obstacle is the volume integral resulting from the nonlinear terms. If a body-fitting volume mesh is employed, the BEM approach loses its one major advantage, that is, the need for boundary discretization only. In our previous work, an accurate volume integration scheme for potential kernels was proposed and developed. This scheme transfers the volume integral exactly into a surface integral and a "regular" integral that can be evaluated on a uniform Cartesian grid. As a result, no body-fitting volume mesh is required. In this talk, we will present our recent work on the development of an pFFT-accelerated BEM approach for solving 2D quasi-linear problems. Key implementation issues/algorithms as well as the complexity and the performance of the method will be discussed in detail.

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