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Boundary element method for a free third boundary problem modeling tumor growth with spectral accuracy ☆

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Abstract

By boundary element method, we present a numerical iterative process for solving a free third boundary problem modeling tumor growth with spectral accuracy. The piecewise quadratic curves are fitted to maintain local smoothness of the boundary at every node. The double-layer and single-layer potentials with weakly singular kernels are evaluated with spectral accuracy. The method of characteristics is employed to transform interfacial velocity PDE into discrete ODEs. The numerical integral formula for weakly singular operator with logarithmic singularity is deduced and the convergence and error are presented. The nonradially symmetric solutions of the free boundary problem on a perturbed boundary are provided to test the accuracy and effectiveness of the numerical method.

Keywords: Double-layer and single-layer potentials, characteristic curve, weakly singular kernel, spectral accuracy
2000 MSC: 46E35, 65D05, 65J05

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