Title: **A New Ghost Cell/Level Set Method for Moving Boundary Problems: Application to Tumor Growth**

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The authors present a set of techniques and improvements on previous techniques that, when put together, give a practical method to deal with moving boundaries that evolve in a non-linear, quasi-steady fashion.

Although the method is mainly design to address the simulation of brain tumor growth, this paper is a very good source for the solution of practical problems involving reaction-diffusion equations with a moving boundary, many of which arise in fluid mechanic and biomechanics

The authors present several improvements to the level set/ghost cell method[1−4], to wit: a technique for robustly and accurately calculating geometric quantities (i.e., curvature and normal vectors), new normal derivative jump discretization that preserves the tangential derivative jump, nonlinear adaptive Gauss-Seidel-type iterative scheme for solving linear and nonlinear quasi-steady reaction-diffusion equations and a novel approximation to the numerical representation of the Heaviside function.

the presentation is very clear and detailed, and examples are described such as the Hele-Shaw flow in a heterogeneous material and tumor growth in a heterogeneous tissue.

References:

1. Glimm, J. et al., Conservative front tracking and level set algorithms
   `http://www.pnas.org/content/98/25/14198.full.pdf/`

2. Fedkiw, R. et al., A Non-Oscillatory Eulerian Approach to Interfaces in Multimaterial Flows (The Ghost Fluid Method)
   `http://public.lanl.gov/aslam/cam98-17.pdf/`

3. Osher, S. and Sethian, J., Fronts Propagating with Curvature Dependent Speed: Algorithms Based on Hamilton-Jacobi Formulations
`http://math.berkeley.edu/ sethian/2006/Papers/sethian.osher.88.pdf/`

4. Hogeaa, C., Murraya, B. and Sethian, J., Computational modeling of solid tumor evolution via a general Cartesian mesh/level set method
`http://math.berkeley.edu/ sethian/2006/Papers/sethian.angiogenesis.fdmp.2005.pdf/`

See also:

Macklin, P., Toward Computational Oncology: Nonlinear Simulation of Centimeter-Scale Tumor Growth in Complex, Heterogeneous Tissues (PhD Dissertation)
`http://biomathematics.shis.uth.tmc.edu/downloads/papers/Macklin_PhD_Dissertation_2007.pdf/`