

Macrophages trajectories smoothing by evolving curves

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Abstract

When analyzing cell trajectories, we often have to deal with noisy data due to the random motion of the cells and possible imperfections in cell center detection. To smooth these trajectories, we present a mathematical model and numerical method based on evolving open plane curve approach in the Lagrangian formulation. The model contains the smoothing term given by the influence of local curvature and the term attracting the curve to the original trajectory. For the numerical solution, we use the flowing finite volume method to discretize the advection-diffusion partial differential equation which includes also the asymptotically uniform tangential redistribution of curve grid points. We present results for macrophage trajectories smoothing and present a method how to find the real-time of trajectory discrete points, which then allow us to calculate the smoothed cell velocity.