

A traveling domain solution

Y.S. Choi

Department of Mathematics, University of Connecticut, Storrs, CT 06269.

Abstract

Biological cells like fish keratocyte have been observed to move at (more or less) a steady velocity while keeping its general shape. What kinds of equations and boundary conditions should be prescribed for a moving boundary problem in order to generate such a configuration?

We have recently proved the existence of a domain $\Omega \subset \mathbf{R}^2$ that travels to the right at a constant speed k and a function b which solves a nonlinear elliptic equation in the domain with constant Dirichlet boundary condition. The unknowns include the shape of the domain Ω , the speed k and the solution b . As there is no analogue in the literature, we call them a traveling domain solution. Previously we have proved the well posedness and the existence of a traveling domain solution to a 1D cell motility model first suggested by Mogilner and Verzi. The current model, which involves curvature of the domain, is a generalization to 2D.

In this talk we will examine both the 1D and the 2D results. Ideas in the proof will be presented. On the other hand, technical details will be minimized for a general audience.