Cell’s dorsal surface is; the boundary of this surface is(see figure). This flat surface is in the x-y-plane; x-axis is the direction of the tactic directional cue, and the cell is polarized in that direction. The ventral surface,, is given by the equation: , where[pN/um] is the cortex tension and is a given parameter, and[pN/um^2] is variable in time (see below). The boundary condition for eq.is. In addition, the volume of the cell is conserved:whereis the constant model parameter – cell volume.

The boundary of the dorsal surface (we’ll call it cell edge) is deforming in a locally normal direction (see fig) with local velocity, which is a function of 1) anglebetween the x-axis and polar angular coordinate of the point at the edge, and 2) of the contact anglewhereare Cartesian coordinates of the point at the cell edge with polar coordinate. To measure, we need to define the cell center (cross in the fig). One convenient way to define it is find the dashed line parallel to the x-axis which divides the dorsal surface in two equal halves (so that areas to the left and right from this line are the same:), and then take the center of the dashed line (see fig).

Let us try the following velocity of the boundary, which can be derived from a force balance combined with Young-Dupre eq.: .

Hereare model parameters.

First, scale and non-dimensionalize the model. I would take volume^1/3 as length scale, T\*(length scale) as force scale; (length scale)/kappa\_2 as time scale.

Then, think about the numerics. The algorithm probably should be similar to that in Hunter’s paper:

At any time step,

1. On a given, solvewith. Find P from the condition: . (In Hunter’s paper it seems they have some neat trick for doing that)
2. Find the cell center, compute, deform the cell edge.



X-axis (directional cue, direction of cell polarization)

