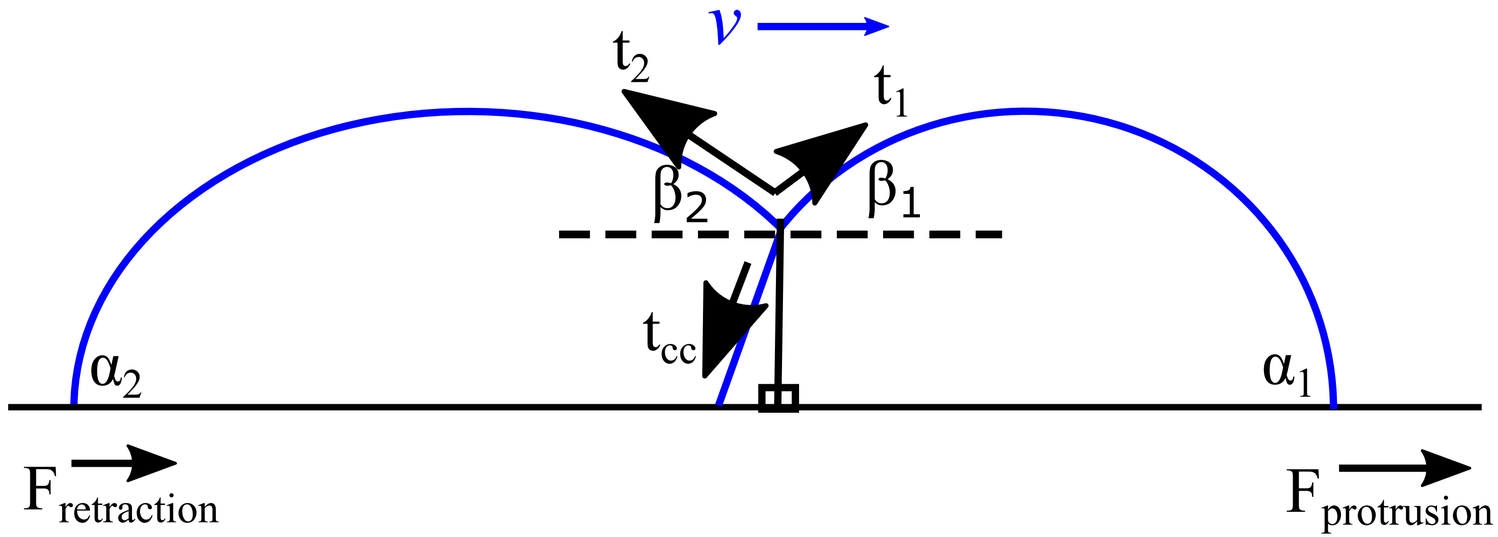
Two cell bubble model



Knowns: Tensions, retractile and protrusive forces, drag coefficient ($t_1, t_2, t_{cc}, f, \zeta$)

Key unknowns:

- Speed (v)
- Morphology (angles ($\alpha_1, \alpha_2, \beta_1, \beta_2, w, \gamma, x$), radii ($r_1, r_2, r_{cc}$), h)

Numerical algorithm:

Guess v

Guess w

Find α_1, α_2 from force balance at the front and rear
(@ front: protrusive forces are balanced by tension)
(@ rear: retractile forces are balanced by tension)

Find β_1, β_2 from force balance at the top of the cell-cell Interaction region

Given $\alpha_1, \alpha_2, \beta_1, \beta_2$ to find r_1 and r_2 from area conservation

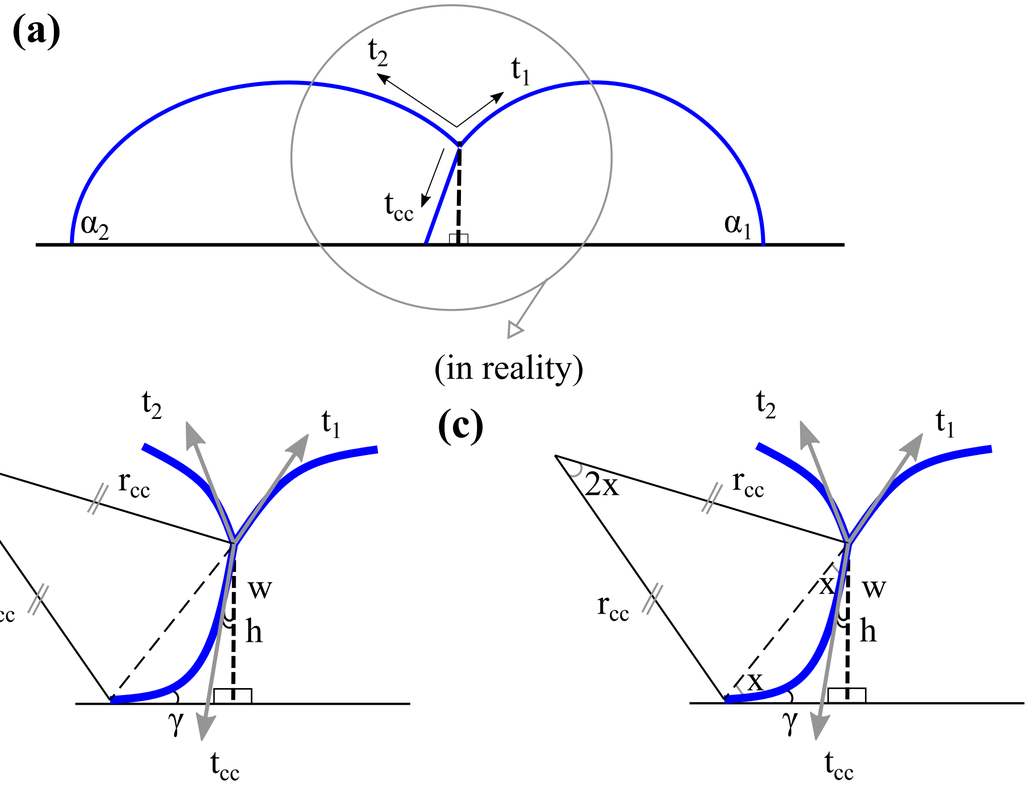
From Laplace's Law compute intracellular pressures (p_1, p_2)

Pressure difference is used to compute the radius of curvature at the cell-cell interface (r_{cc})

Compute h_1 and h_2 from trigonometry (given w and r_{cc})

If h_1 is different from h_2, **adjust** w

From force balance at the bottom of the cell-cell interaction region, compute velocity. If velocity is different from initial guess, **adjust** v

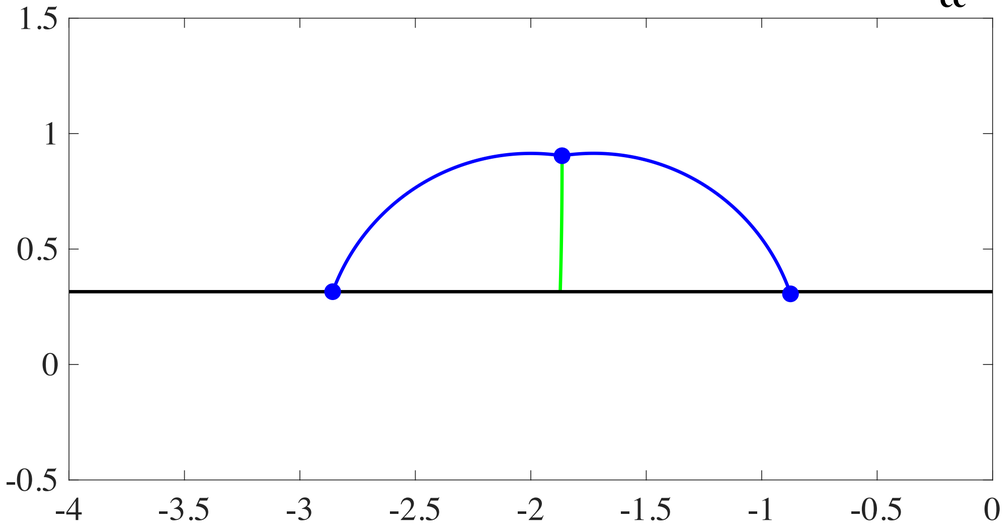


(1) Equal tensions in the two cells

$T_1 = 1$ $Alpha_1 = 71.0513$ $Beta_1 = 8.7415$

$T_2 = 1$ $Alpha_2 = 69.823$ $Beta_2 = 8.5123$

Gamma = 91.6489, w = 0.11459, v = 0.087778, h = 0.58882, $t_{cc} = 0.3$



(2) 10% higher tension in trailer cell

$T_1 = 1$ $Alpha_1 = 82.8923$ $Beta_1 = 7.9436$

$T_2 = 1.1$ $Alpha_2 = 83.207$ $Beta_2 = 7.5551$

Gamma = 87.6488, w = 19.4806, v = 0.13011, h = 0.70709, $t_{cc} = 0.3$