1 4faW12Sa

Hi Ruojun, I think the kind of asymptotics we were doing is not necessary here, as there is a steady solution to the problem. i.e., we can solve

$$U\partial_y \phi = D\nabla^2\phi + \delta(x,y)$$

for the steady solution $\phi(x,y)$. I think the solution is pretty close to

$$\frac{e^{-(U/2D)r(1-\sin\theta)}}{r}$$

but that doesn't seem to work. The solution needs to limit to $1/r$ as $r \to 0$. If we can find the right solution, I suspect we'll find that the level sets do not have the same shape as what you see in the IDLA with drift simulations. That makes the problem more difficult, but also more interesting! Maybe you could study more carefully the growth of the pattern in y to get a more accurate value of the exponent we observed.

2 12/5 4faW14W (Continue from Meeting 7 12/4 W14T)

Ah! I think I found the Green's function, almost by luck. I tried to do the integration from yesterday but couldn't get the right answer. I'll see if my guess works out. It should be something like:

$$e^{Uy/2D}K_0(Ur/2D)$$

where K_0 is a modified Bessel function of the second kind. What I did is a wrote a guess $g(r)e^{Uy/2D}$, then got a modified Bessel equation for $g(r)$. The solution that decays at ∞ is K_0. It probably needs to be multiplied by $1/2\pi$ to be the actual Green's function, but for our purposes that doesn't matter much.

Yes, it should be the ϕ we were looking for yesterday.

Note that for large r it has a simpler form. Maybe now we should try to compute the area contained in a contour? Probably using the large-r asymptotic form.