IMPERIAL

Blowing Suction in flat plate

Víctor Ballester
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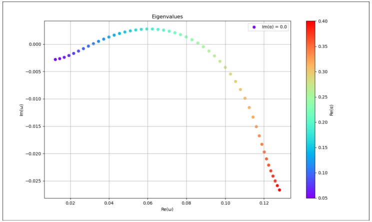
Blowing and suction

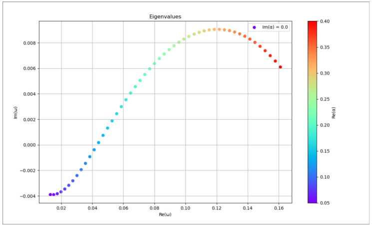
- I modify the BC of v on the wall with:

$$v(x,t) = A\sin\theta(1-\cos\theta)\sin(\omega t)\mathbf{1}_{x\in(x_0,x_0+\ell)}$$

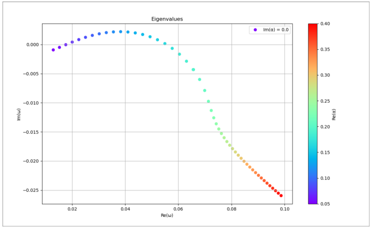
  where $A = 0.003$, $x_0 = 0$ (for the flat plate!), $\ell = 2\pi/\alpha_r$, $\omega = \omega_r$ and $\theta = \alpha_r(x - x_0)$. The pair (α_r, ω_r) is taken from Orr-Sommerfeld eq. Probably I will increase a little bit ω because ω_r is very small.
- I found the function $\sin\theta(1-\cos\theta)$ in a paper. I assume they use it to make a $\mathcal{C}^2$ contact as well as keep the integral of the curve big, in order to "maximize" the forcing.
- Orr-Sommerfeld analysis for $w = 15$:



$x = 15\delta^*$ (downstream edge)



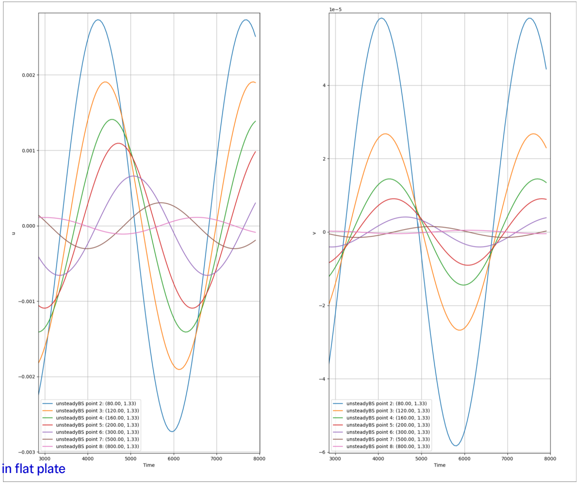
$x = 300\delta^*$ (downstream edge)



$x = 900\delta^*$ (downstream edge)

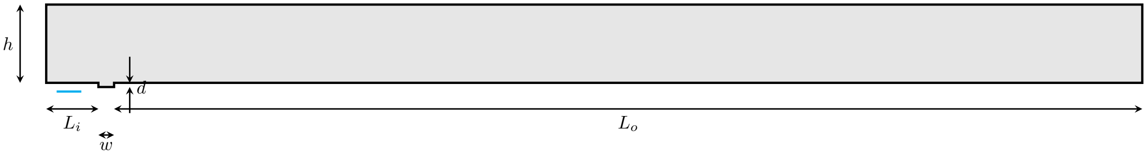
Flat DNS TS amplitudes

- Evolution of different points in the domain of the u (left) and v (right) fields (linear solver with blowing and suction).



General comments

- Should I increase the upstream region for blowing and suction in the gap version?



- I was not able to make the Coupled direct solver work, but I haven't tried too much.
- I have all the ingredients to compute the $n(x)$ curves. I am in the postprocessing part now.

$$n(x) = \max_{\omega} \ln\left(\frac{A(x,\omega)}{A_0(\omega)}\right) = \max_{\omega} \int_{x_0}^{x} -\alpha_i(x,\omega)dx$$

for a perturbation of the form $\tilde{v}(x,y,t) = v(y)\exp\{i(\alpha x - \omega t)\}$ and $\alpha_i = \mathrm{Im}(\alpha)$.