Homework 5

Problem 1.

Show that the transformation

$$w(x) = u(x) + c_0 \int_0^x u(y) \, dy$$
(1)

and the boundary control

$$u_x(1) = -c_0 u(1) - c_1 \left(u_t(1) + c_0 \int_0^1 u_t(y) \, dy \right)$$
(2)

convert the plant

$$u_{tt} = u_{xx} \tag{3}$$

$$u_x(0) = 0 \tag{4}$$

into the asymptotically stable system

$$w_{tt} = w_{xx} \tag{5}$$

$$w_x(0) = c_0 w(0)$$
 (6)

$$w_x(1) = -c_1 w_t(1). (7)$$

Problem 2.

In Problem 1 determine c_0 and c_1 such that the first pair of poles is around $-1.15 \pm j1.5$. In order to do this, use the GUI available on the class website.

Problem 3.

Read Section II (except Subsection II-C) in paper 4 on the class website. (This is the material that all of Antranik's simulations refer to.)