Feedback on reports for PI-control of a pneumatic tank

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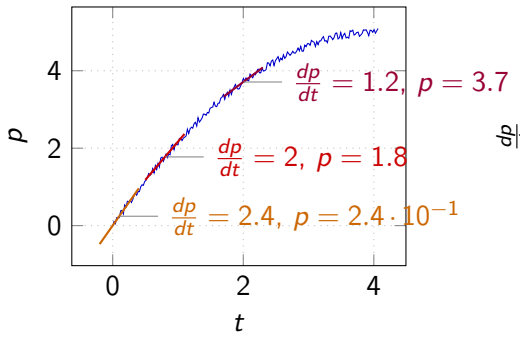
April 22, 2020

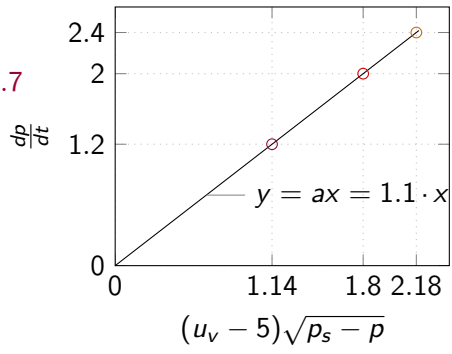
Estimating the parameter of the model

The model is

$$\underbrace{\frac{dp}{dt}}_{y} = a \underbrace{(u_v - 5)\sqrt{p_s - p}}_{x},$$

fit a in $y = ax$.



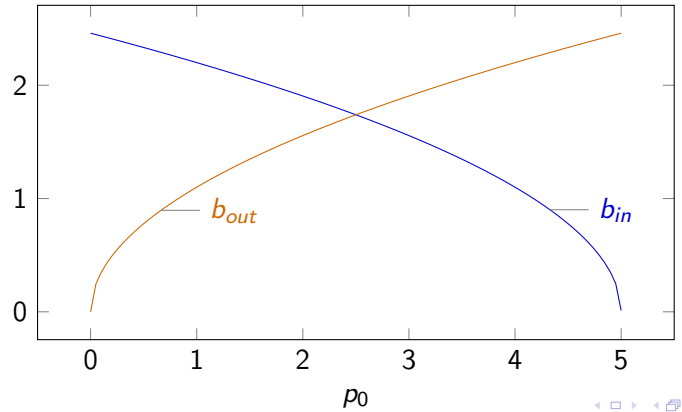


The linearized model paramater b dependence on the operating pressure

We obtained the following linearized models

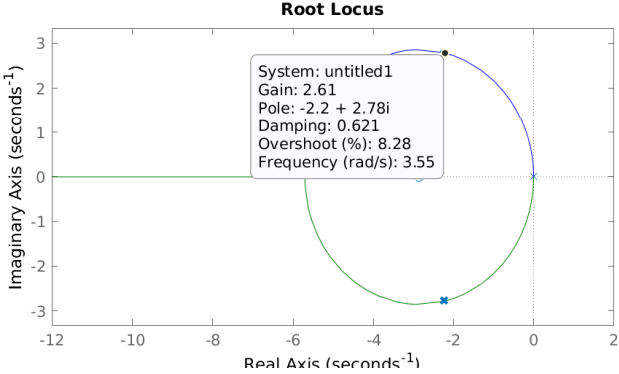
$$\frac{d}{dt}y(t) = b_{in}u(t), \quad b_{in} = a\sqrt{p_s - p_0}, \quad \text{for air in} \tag{1}$$

$$\frac{d}{dt}y(t) = b_{out}u(t), \quad b_{out} = a\sqrt{p_0}, \quad \text{for air out} \tag{2}$$



PI-controller design

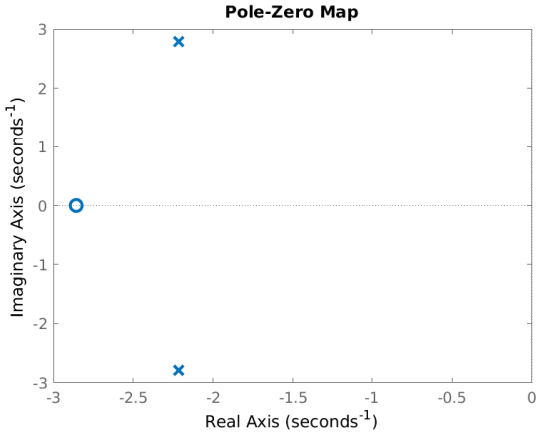
Using the controller $F(s) = K\left(1 + \frac{1}{sT_i}\right) = K\frac{sT_i+1}{sT_i}$ with $T_i = 0.35$



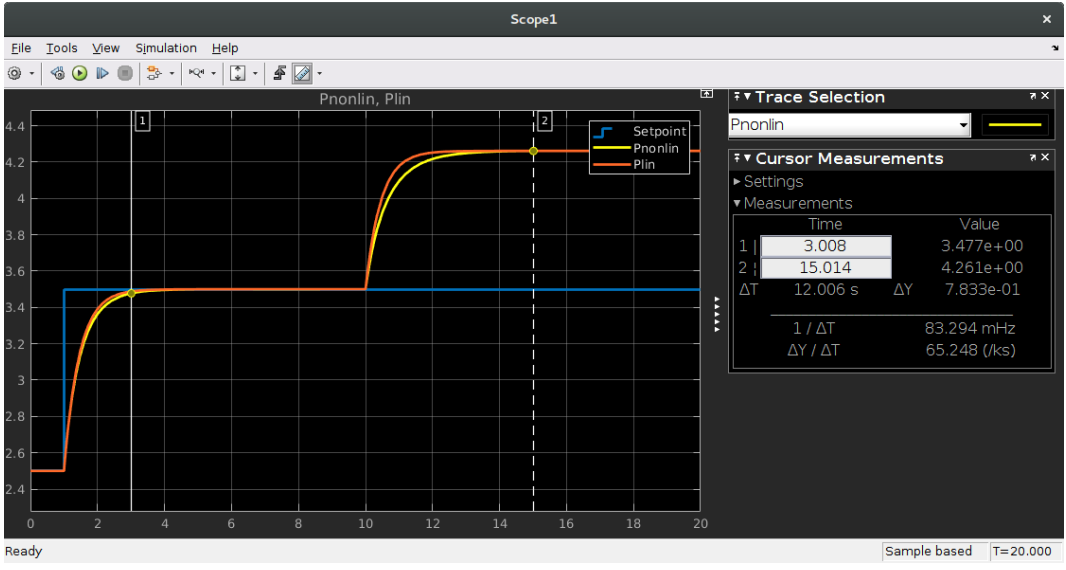
PI-controller design, contd

The (linear) closed-loop system becomes

$$G_c(s) = \frac{4.43s + 12.7}{s^2 + 4.43s + 12.7}$$



Simulations, P-controller



Simulations, PI-controller