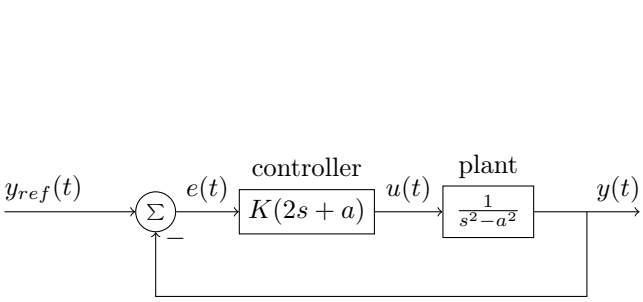
Pole placement, root locus and lead-lag

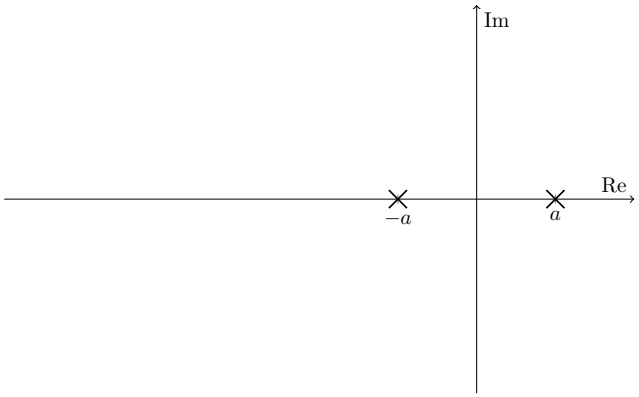
Kjartan Halvorsen

The inverted pendulum

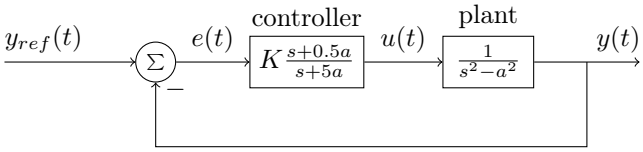
The friction-less, inverted pendulum has two poles symmetric about the imaginary axis.

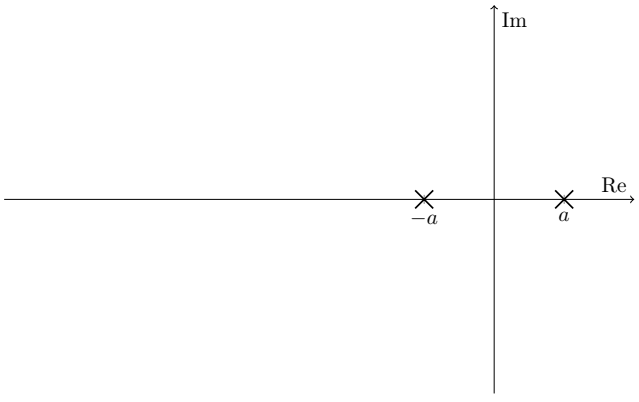
PD-control





Modified PD-control

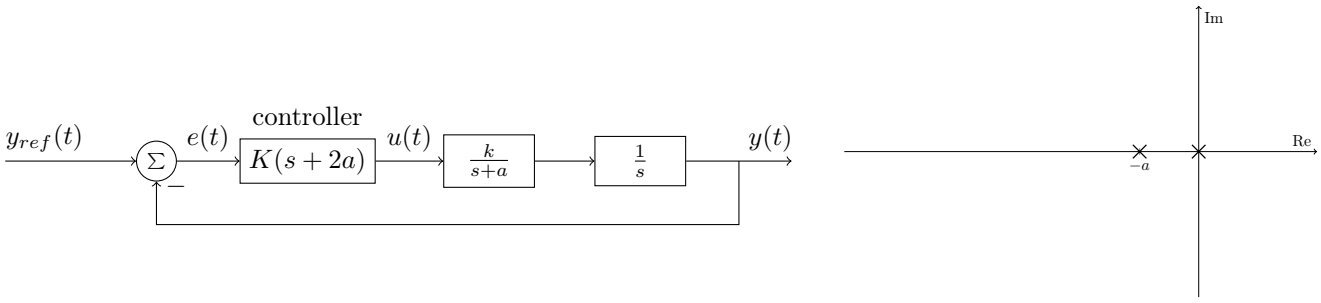




The DC-motor

The dynamics of the velocity of the DC motor is a first-order system when the input is armature voltage. By integrating once, we get the shaft angle as the output.

PD-control



Lag-compensator

A lag compensator is a controller with one pole and one zero, and where the pole is closer to the origin than the zero. Such a compensator increases the gain at low frequencies, at the expense of more oscillatory response.