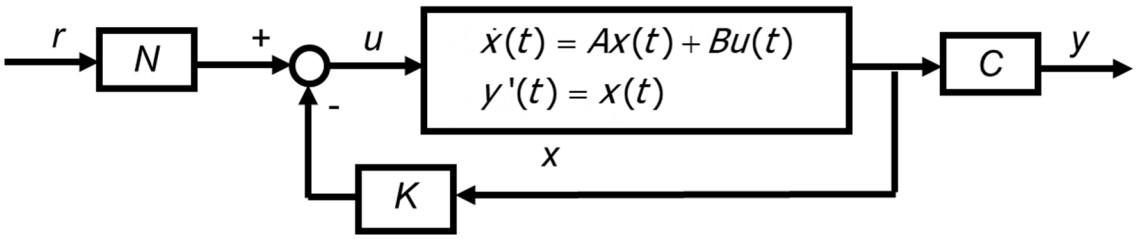
Static feedback of the state

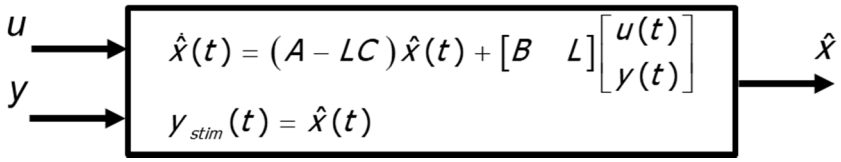
$$\begin{cases} \dot{x}(t) = Ax(t) + Bu(t) \\ y(t) = Cx(t) \end{cases} \qquad u(t) = -Kx(t) + Nr(t) \qquad \dot{x}(t) = (A - BK)x(t) + BNr(t)$$



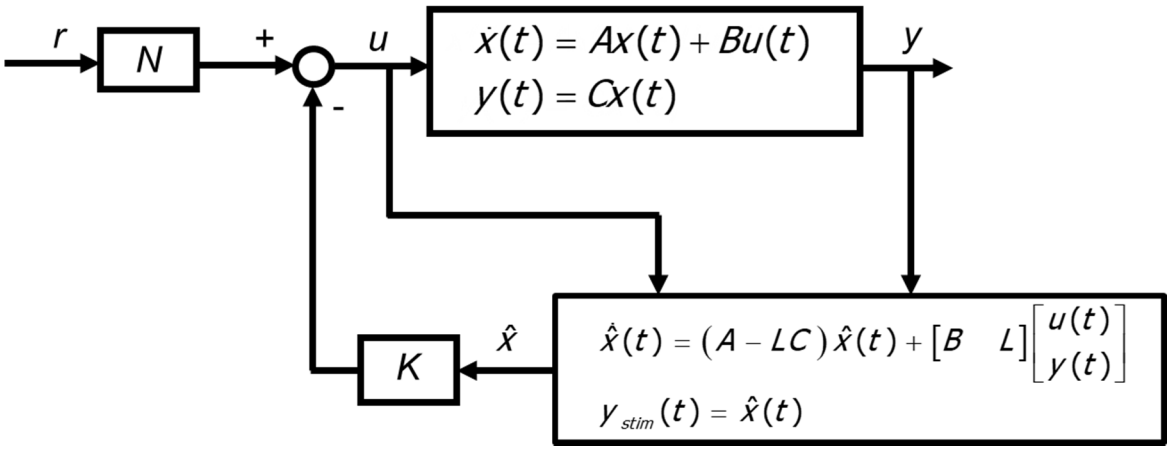
State observer

$$\dot{\hat{x}}(t) = (A - LC)\hat{x}(t) + \begin{bmatrix} B & L \end{bmatrix} \begin{bmatrix} u(t) \\ y(t) \end{bmatrix}$$

$$y_{stim}(t) = \hat{x}(t)$$



Static feedback of the estimated state



$$H(s) = \frac{K}{(1 + \tau s)^2}, \tau = \frac{1}{\omega_n}$$

y_∞	t'_r	$t_{s,\,5\%}$	$t_{s,\,1\%}$
$\bar{u} \cdot K$	$\approx 3.36 \cdot \tau$	$\approx 4.74 \cdot \tau$	$\approx 6.64 \cdot \tau$