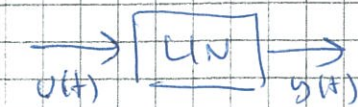


# LINEAR MODELS OF NONLINEAR SYSTEMS

(6) (1)

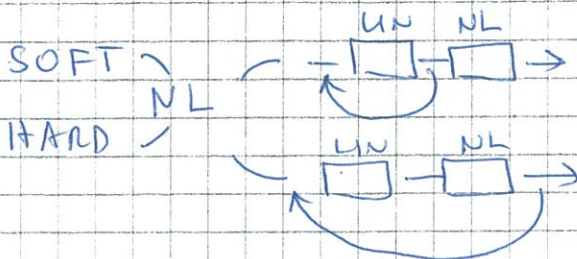


FRF INDEPENDENT FROM  $u(t)$

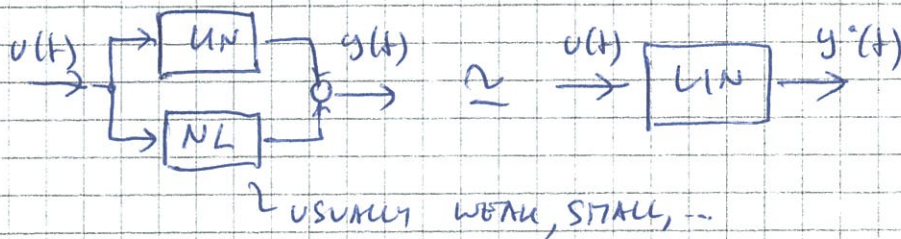


GAIN COLORING

HARMONICS, SUBHARMONICS  
BIFURCATIONS, CHAOS  
UNSTABLE ATTRACTORS  
NONUNIQUE STEADY STATE,  
NONLINEAR RESONANCES...



## BEST LINEAR APPROXIMATION (BLA)



$$e(t) = y(t) - y^*(t)$$

$$y^*(t) = G(q) u(t)$$

$$\left( e(t) = N[\hat{x}_0(t)] - G(q) u(t) \right)$$

DEPENDS ON  $u(t)$ !

$$\hat{G}_{BLA}(q) = \arg \min_G \mathbb{E} \{ (y(t) - G(q) u(t))^2 \}$$

OR

$$\mathbb{E} \{ |y(t) - G(q) u(t)|^2 \}$$

IF  $\hat{G}_{BLA}(q)$  CAUSAL, STABLE  $\rightarrow$  SECOND ORDER EQUIVALENT

(FOR A GIVEN INPUT)