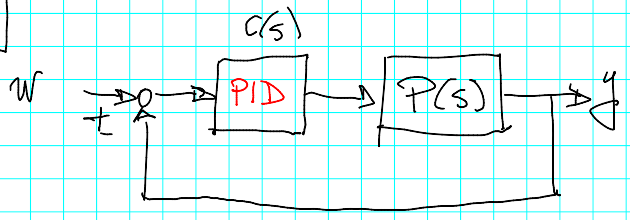
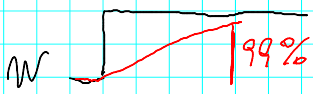
13/03/2019

1

E1



$$P(s) = \frac{10}{(1+100s)(1+5s)}$$



$\varphi_M \geq 60°$

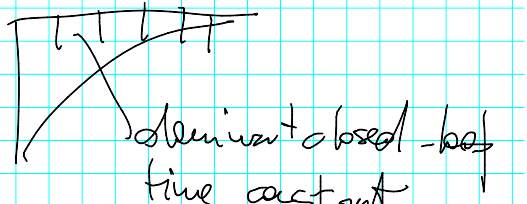
PID $\quad C(s) = K\left(1 + \frac{1}{sT_i} + \frac{sT_d}{1+sT_d/N}\right)$ $\quad$ ISA

$$= K\,\frac{(1+sT_1)(1+sT_2)}{s(1+sT)}$$

settling time 50s

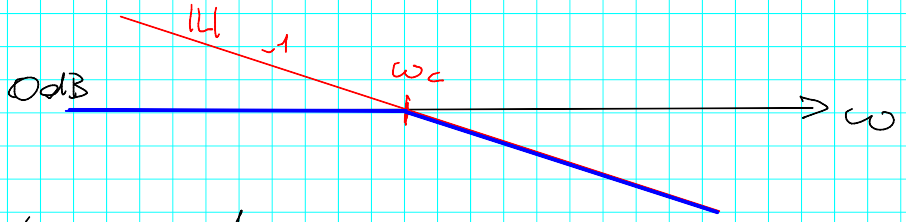
dominant CLTC 10s

$\omega_c = 0.1$



3/ would like to have

$$L(s) = C(s)P(s) \approx \frac{\omega_c}{s}$$



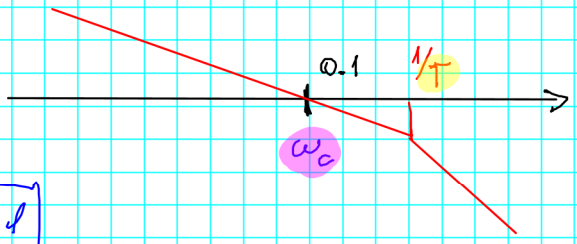
$$\frac{L}{1+L} \approx \frac{1}{1+s/\omega_c}$$

4

$$L(s) = K \frac{(1+100s)(1+5s)}{s(1+5T)} \quad \frac{10}{(1+100s)(1+5s)}$$

$P(s)$

$$\simeq \frac{10K}{s(1+sT)}$$



$10K = 0.1 \Rightarrow \boxed{K = 0.01}$

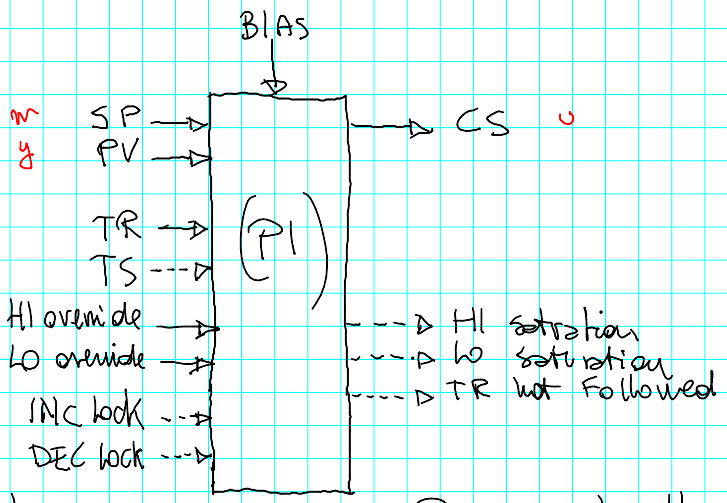
5 need $\varphi_M = 60°$ $\arctg(0.1T) = 30°$

↑
ω

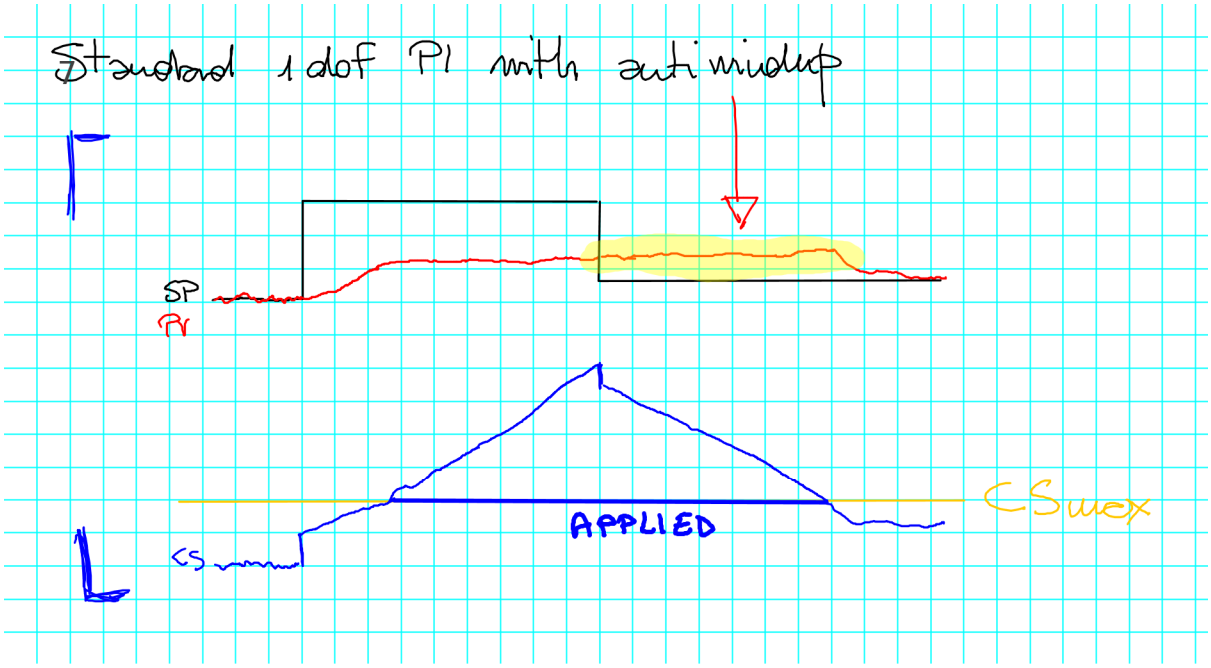
...

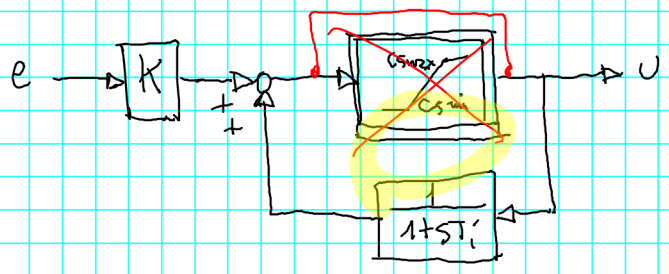
REGULATORS FOR "COMPLEX" CONTROL SCHEMES

typical block



For simplicity here we refer to a PI controller

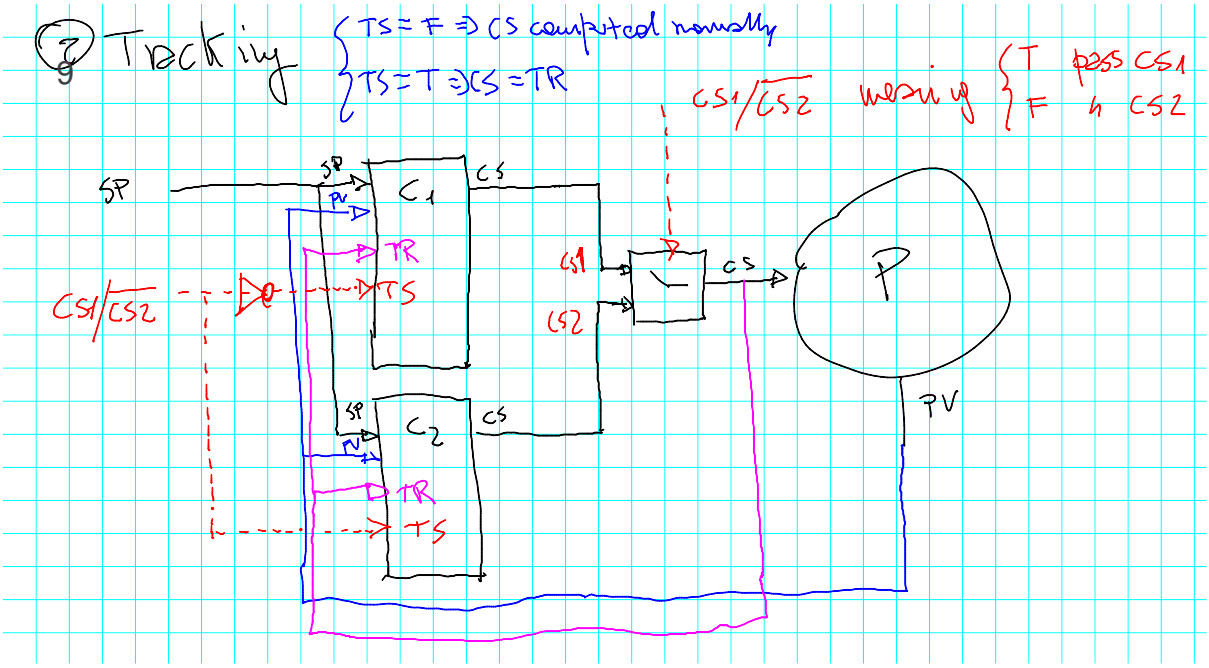

Standard 1 dof PI with anti windup
SP
PV
APPLIED
CS
CSwex



no saturation (—) $\frac{U}{E} = K \frac{1}{1 - \frac{1}{1+sT_i}} =$

$= K \frac{1+sT_i}{sT_i}$ (PI)

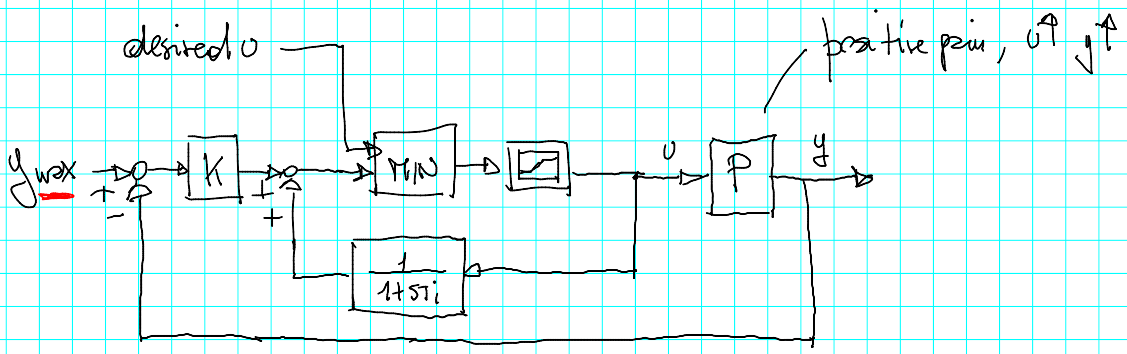
saturation ⇒ loop opens ⇒ no integrator anymore


Tracking
TS = F ⇒ CS computed normally
TS = T ⇒ CS = TR
CS1/CS2
working
T pass CS1
F ↳ CS2
SP
SP
PV
C1
CS
TR
TS
CS1/CS2
CS1
CS2
CS
P
PV
SP
C2
CS
TR
TS

(13) BIAS

A controller input that is added to the CS value computed by the control law

(13) override (HI)



12