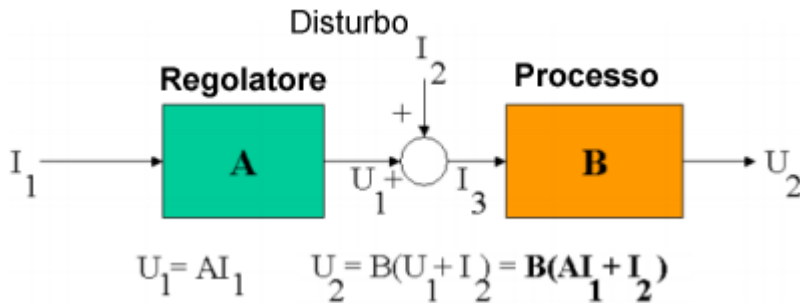


Sistema ad anello chiuso PID



Effetto di un disturbo in ingresso al processo controllato

tau := 12 Ao := 1 t := 0,0.1.. 100 Kp1 := 1 Ti1 := 10

$Gf(s) := \frac{A_o}{1 + s \cdot \text{tau}}$ $E(s) := \frac{1}{s}$ $D(s) := \frac{1}{10 \cdot s}$ $Gc1(s) := Kp1 \cdot \left(1 + \frac{1}{Ti1 \cdot s}\right)$

$G1(s) := \frac{(Gc1(s) + D(s)) \cdot Gf(s)}{1 + (Gc1(s) + D(s)) \cdot Gf(s)}$ simplify $\rightarrow \frac{5 \cdot s + 1}{60 \cdot s^2 + 10 \cdot s + 1}$

$U1(s) := E(s) \cdot G1(s)$ $U1(t) := U1(s)$ invlaplace $\rightarrow 1 - \cos\left(\frac{\sqrt{5} \cdot \sqrt{7} \cdot t}{60}\right) \cdot e^{-\frac{t}{12}}$

Kp2 := 1 Ti2 := 10 Td2 := 0

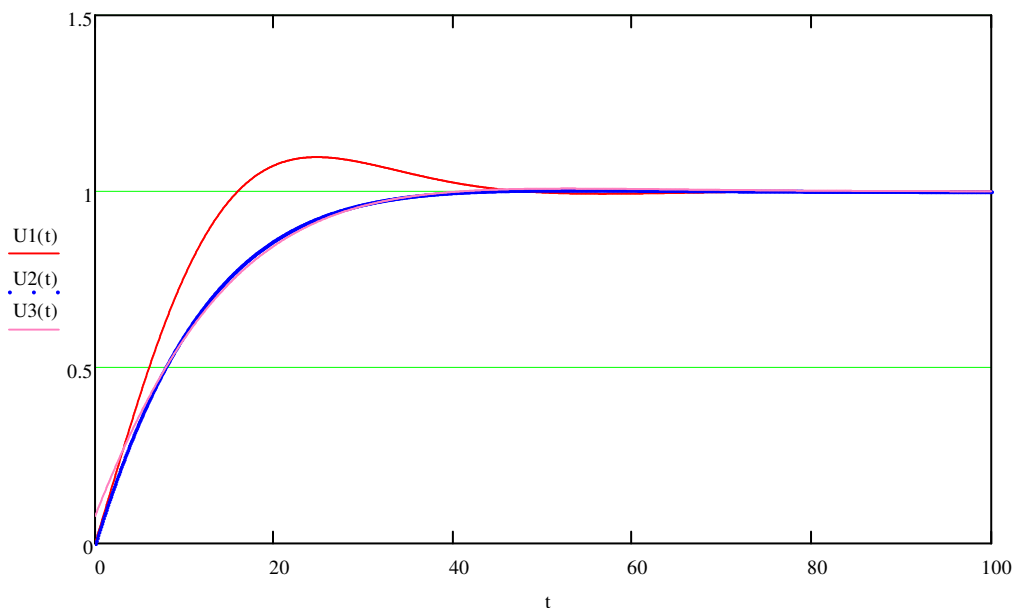
$Gc2(s) := Kp2 \cdot \left(1 + s \cdot Td2 + \frac{1}{Ti2 \cdot s}\right)$ $G2(s) := \frac{Gc2(s) \cdot Gf(s)}{1 + Gc2(s) \cdot Gf(s)}$ simplify $\rightarrow \frac{10 \cdot s + 1}{120 \cdot s^2 + 20 \cdot s + 1}$

$U2(s) := E(s) \cdot G2(s)$ $U2(t) := U2(s)$ invlaplace $\rightarrow 1 - e^{-\frac{t}{12}} \cdot \cos\left(\frac{\sqrt{5} \cdot t}{60}\right)$

Kp3 := 1 Ti3 := 10 Td3 := 1

$Gc3(s) := Kp3 \cdot \left(1 + s \cdot Td3 + \frac{1}{Ti3 \cdot s}\right)$ $G3(s) := \frac{Gc3(s) \cdot Gf(s)}{1 + Gc3(s) \cdot Gf(s)}$ simplify $\rightarrow \frac{110 \cdot s + 12}{13 \cdot (130 \cdot s^2 + 20 \cdot s + 1)} + \frac{1}{13}$

$U3(s) := E(s) \cdot G3(s)$ $U3(t) := U3(s)$ invlaplace $\rightarrow 1 - \frac{\sqrt{3} \cdot \sqrt{10} \cdot \sin\left(\frac{\sqrt{3} \cdot \sqrt{10} \cdot t}{130}\right) \cdot e^{-\frac{t}{13}}}{39} - \frac{12 \cdot \cos\left(\frac{\sqrt{3} \cdot \sqrt{10} \cdot t}{130}\right) \cdot e^{-\frac{t}{13}}}{13}$



La retroazione annulla il disturbo e mantiene il sistema stabile