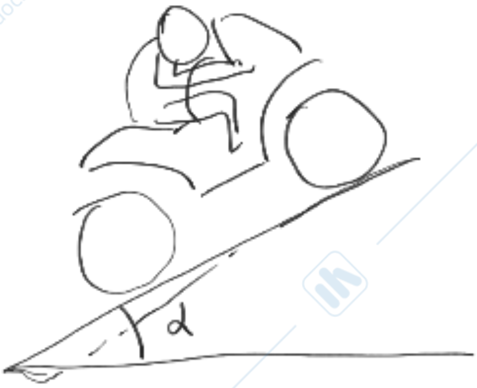
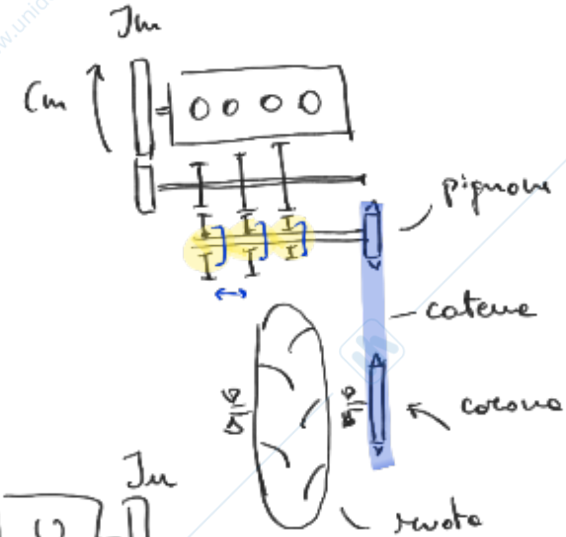
Ese14

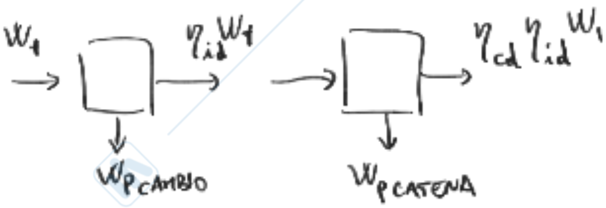




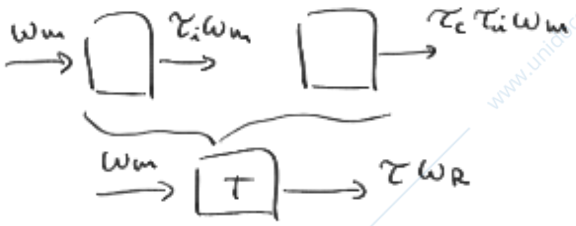
$\tau_I, \tau_{II}, \ldots$ τ_c

$\eta_{Id}, \eta_{IId}, \ldots$ η_{cd}

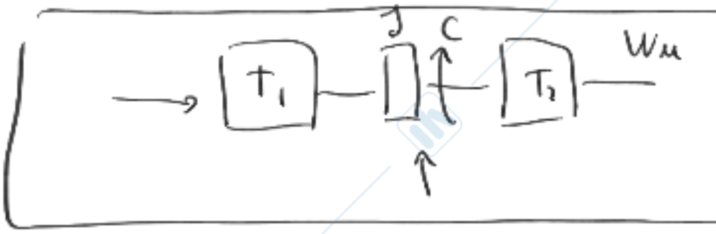
$\eta_{Ir}, \eta_{IIr}, \ldots$ η_{cr}



$\eta_d = \eta_{cd} \cdot \eta_{id}$



$\tau = \tau_c \cdot \tau_i$



$\tau = \tau_1 \tau_2$

$W_u \neq \eta_1 \eta_2 W_m$

τ

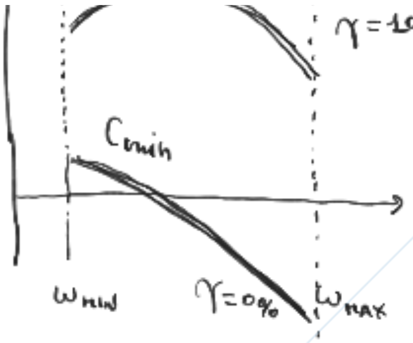
η_d

η_r

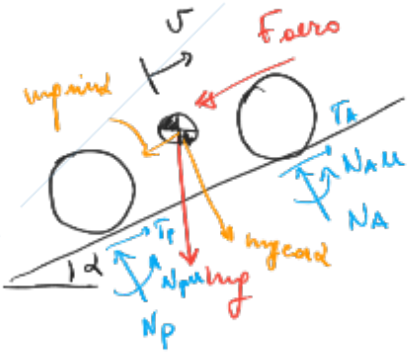
$\tau = \tau_i \cdot \tau_c$

C_m : C_{max}

α % pedale acceleratore



$$C_m = C_m(\underline{\omega_m}, \underline{\gamma})$$



$$m = m_{telaio} + m_{guidatore} + m_{ruote} + m_{motore}$$

$$W_M = m\vec{g} \cdot \vec{v} - F_{aero} v - N_A u \omega_R + - N_P u \omega_R$$

$$W_M = -mg\sin\alpha\, v - b v^2 v - mg\cos\alpha f_v \cancel{R} \frac{v}{\cancel{R}}$$

$$\frac{kg}{m^3} \quad m^2 \left(\frac{m}{s}\right)^2 \qquad \frac{kg\, m^{\cancel{4}}}{\cancel{m^3}\, s^2} \qquad kg\, m/s^2 = N$$

$$F_{aero} = \frac{1}{2} \rho C_D S v^2 = b v^2$$

$$\vec{F}_{aero} = -\frac{1}{2} \rho C_D S |\vec{v}| \vec{v}$$

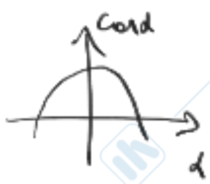
$\Sigma F_\perp = 0$ $\qquad N_A + N_P = mg\cos\alpha$

$u = f_v R$ $\qquad f_v$ coeff res rotolamento

$$-N_A u \omega_R - N_P u \omega_R = -(N_A + N_P) f_v R \omega_R = -mg\cos\alpha f_v R \omega_R$$

$\omega_R = v/R$ puro rotolamento

$$W_M = -\Big(\underbrace{mg\sin\alpha}_{\substack{\text{peso} \\ >0}} + \underbrace{b v^2}_{\substack{F_{aero} \\ >0}} + \underbrace{f_v mg\cos\alpha}_{\substack{\text{res rot} \\ >0}}\Big) v$$



$$= -\underbrace{F_{res}}_{>0} v \qquad (\alpha > 0)$$

Moto a regime $\left(v = \text{cost}, \dot{v} = 0, \frac{dE_c}{dt} = 0\right)$ in salita $(\alpha > 0)$

$$\Sigma W - \frac{dE_c}{dt} = 0$$

$$W_m + W_p + W_u = 0$$

$$\omega_R = \tau \omega_m$$

$$W_u = -F_{res} v$$

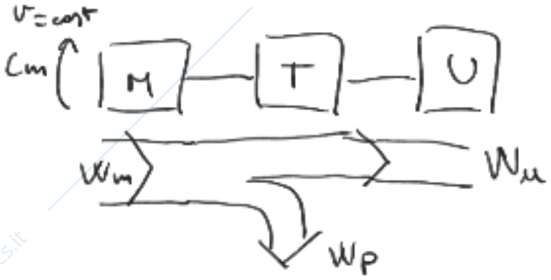
$$\omega_R = v/R \qquad \omega_m = \frac{v}{R\tau}$$

$$W_m = C_m \omega_m = \frac{C_m}{R\tau} v$$

$$W_p = ?$$

REGIME DIRETTO

$v = cost$



W_p è una parte di W_m

$W_m = C_m \omega_m > 0$

$W_u < 0$

REGIME RETROGRADO

$v = cost$

W_p è una parte di W_u

$W_u > 0$

$W_m < 0$ Il motore funziona da freno

$$W_u - W_2 = 0$$

$$W_2 = W_u = -F_{res} v < 0$$

$W_2 < 0 \rightarrow W_2$ non è uscente

W_2 è entrante in U

U richiede potenza

W_2 esce dalla trasmissione $\rightarrow$ DIRETTO

$$W_{p_d} = -(1-\eta_d) W_m$$

$$\Sigma W = W_m + W_u + W_p = 0$$

$$\frac{C_m}{R\tau} \cancel{v} - F_{res} v - (\cancel{1} - \eta_d) \frac{C_m}{R\tau} v = 0$$

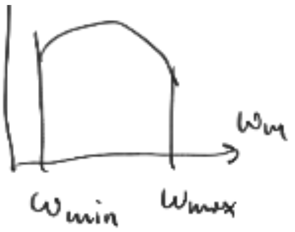
$$\eta_d \frac{C_m}{R\tau} \cancel{v} = F_{res} \cancel{v}$$

$$F_m = F_{res}$$

$$\tau = \frac{\omega_u}{\omega_e} = \frac{rad/s}{rad/s} = 1$$

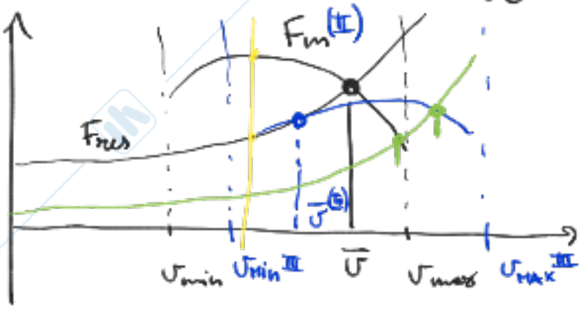
$$\eta_d = \frac{W_{uscente}}{W_{entrante}} = \frac{W}{W} = 1$$

$C_m \uparrow$



$$\omega_m = \frac{v}{R\tau} \qquad v_{min} = \omega_{min} R\tau$$

$$F_m = \frac{\eta_d C_m}{R\tau} \qquad v_{max} = \omega_{max} R\tau$$



$\tau_{II} \rightarrow \tau_{III} \uparrow$

$F_{II} > F_{III}$

$v_{II} < v_{III}$

$$F_{res} = mg \sin\alpha + f_v mg \cos\alpha + b v^2$$

Marcia in salita con accelerazione > 0

$$W_m + W_u + W_p = \frac{dE_c}{dt}$$

$$E_c = \frac{1}{2} m v^2 + 2 \frac{1}{2} J_R \omega_R^2 + \frac{1}{2} J_m \omega_m^2$$

$$= \frac{1}{2} \left(m + 2 \frac{J_R}{R^2} + \frac{J_m}{R^2 \tau^2} \right) v^2$$

$$E_c = \frac{1}{2} m_{eq} v^2$$

$$\frac{dE_c}{dt} = m_{eq} a v$$

a) $a > 0$ MOTO DIRETTO

$-J_m \omega_m \dot{\omega}_m < 0$

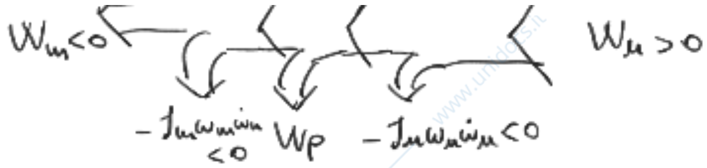
$W_{inerzia}$, utilizz

$$W_p = -(1 - \eta_d)(W_m - J_m \omega_m \dot{\omega}_m)$$

$a > 0$ MOTO RETROGRADO

U fa da generatore

M fa da freno



$$W_p = -(1-\eta_r)(W_u - J_u \omega_u \dot\omega_u)$$

DIRETTO o RETROGRADO?

$$W_u - W_2 = \frac{dE_{cu}}{dt}$$

$$E_{cu} = \frac{1}{2} m v^2 + 2 \frac{1}{2} J_R \omega_R^2$$

$$= \frac{1}{2}\left(m + 2\frac{J_R}{R^2}\right) v^2$$

$$\frac{dE_{cu}}{dt} = \underline{(m + 2J/R^2)\, a v} = W_{in,u}$$

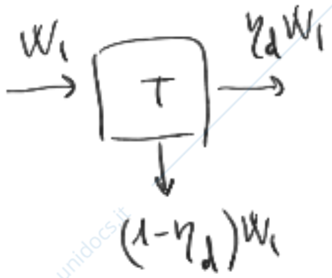
$$W_2 = W_u - \frac{dE_{cu}}{dt}$$

$$W_2 = \underbrace{-F_{res} \overset{>0}{v}}_{<0} \underbrace{- \underbrace{(m + 2J/R^2)\, \overset{>0}{a} \overset{>0}{v}}_{>0}}_{<0} < 0$$

$$W_m - W_1 = \frac{dE_{cm}}{dt}$$

$$W_1 = W_m - \frac{dE_{cm}}{dt}$$

$$= C_m \omega_m - J_m \omega_m \dot\omega_m$$



$$W_p = -(1-\eta_d)(C_m \omega_m - J_m \omega_m \dot\omega_m)$$

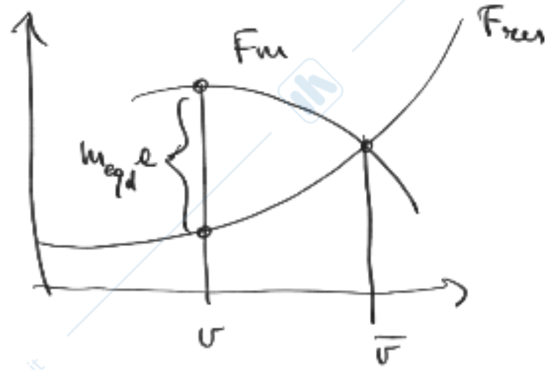
$$W_m + W_u + W_p = \frac{dE_c}{dt}$$

$$\frac{C_m}{\cancel{R\tau}} v - F_{res} v - (\cancel{1}-\eta_d)\left(\frac{C_m}{R\tau} v - \frac{J_m}{R^2\tau^2} v a\right) = \left(m + 2\frac{J_R}{R^2} + \frac{J_m}{\cancel{R^2\tau^2}}\right) \cdot v a$$

$$\eta_d \frac{C_m}{R\tau} v - F_{res} v = \left(m + 2\frac{J_R}{R^2} + \eta_d \frac{J_m}{R^2\tau^2}\right) a v$$

$$F_m - F_{res} = m_{eqd}\, a$$

$$a = \frac{F_m - F_{res}}{m_{eqd}}$$



$a<0$ in salita

$$W_m - W_z = \frac{dE_{c,u}}{dt}$$

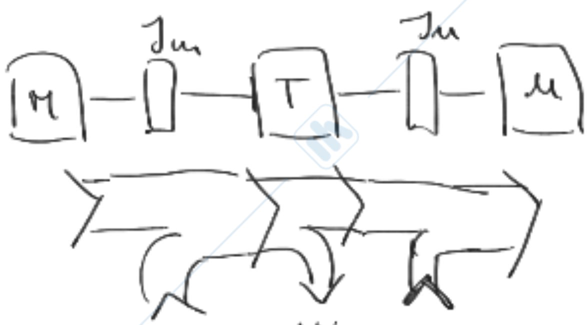
$$\underbrace{-F_{res} v}_{<0} - \underbrace{\left(m + 2\frac{J_R}{R^2}\right) v a}_{>0} = W_z$$

$$W_z \gtrless 0 \ ?$$

$W_z < 0$ DIRETTO $\rightarrow$ $-\left(m + 2\frac{J_R}{R^2}\right)\cancel{v} a < F_{res} \cancel{v}$

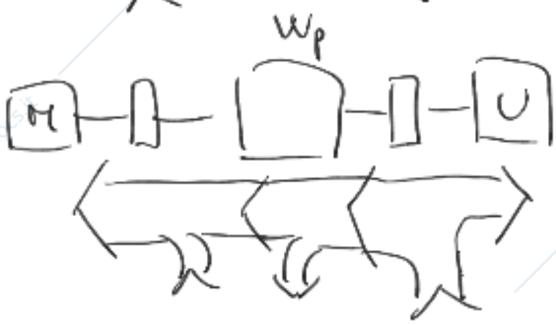
$W_z > 0$ RETROGRADO

$$a > \frac{-F_{res}}{m + 2\frac{J_R}{R^2}} = -a_{lim}$$



DIRETTO

$$W_{in} = -\underbrace{J\omega\dot{\omega}}_{>0\ <0} > 0$$



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Ip moto DIRETTO

$$F_m - F_{res} = m_{eqd}\, a$$

$$a = \frac{F_m - F_{res}}{m_{eqd}} \rightarrow a \rightarrow \text{verifica ip moto diretto}$$

DIRETTO $\xrightarrow[W]{m} \boxed{T} \xrightarrow[W]{u}$

RETROGRADO $\xleftarrow{m} \boxed{T} \xleftarrow{u}$

Ultima modifica: 12:15