## Method#02 - PID control: Tuning PID controller of the LTI, SISO system

Let's consider the following UAV stabilization system

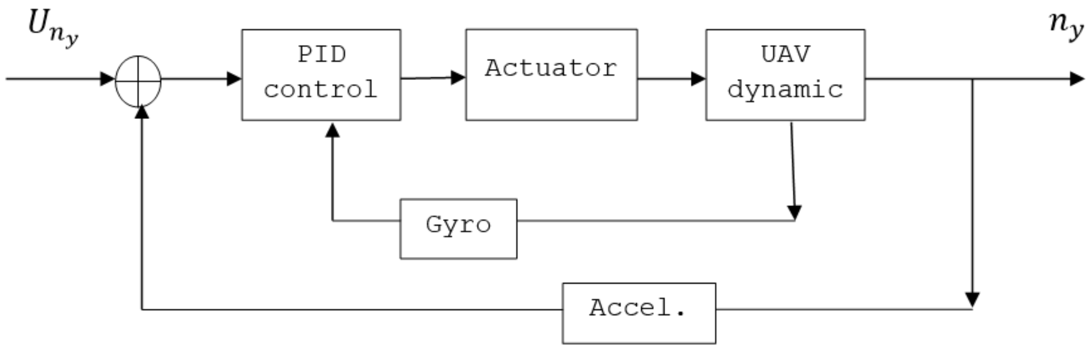


Fig.2.01 – Functional block-diagram of the UAV stabilization system

### Assumptions

Measurment noise&errors of the Gyro and Accelerometer aren't taking into account in the model: $W_{gyro}(s)=1$, $W_{accel}(s)=1$.

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### PID controller

$$\delta(t) = K_P e(t) + K_D \omega_z(t) + K_I \int_0^T e(t)dt \, , \tag{2.01}$$

### Actuator

$$W_{act} = \frac{1}{T_{act}s+1}, \tag{2.02}$$

where $T_{act} = \frac{1}{K_{act}}$ is actuator time constant, $K_{act} = 20$.

### UAV dynamics

$$W_{\delta}^{\omega_z} = \frac{K(T_1 s+1)}{T_2^2 s^2 + 2\xi T_2 + 1}, \; W_{\omega_z}^{\dot{\vartheta}} = \frac{1}{T_1 s+1}, W_{\dot{\vartheta}}^{n_y} = \frac{V}{g}, \tag{2.03}$$

where

$K = 1,$

$T_1 =$ 0.7 $(s)$, $T_2 = 0.5$ $(s)$,

$\xi = 0.3.$