Standard Tank-Style Drive Train Cascade Controller

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$\Theta(t)$ = Robot yaw angle

$V_N(t)$ = Nominal robot velocity

$V_L(t)$ = Left side velocity

$V_R(t)$ = Right side velocity

$S_T(t)$ = Total distance traveled by robot

$S_L(t)$ = Total distance traveled by left side

$S_R(t)$ = Total distance traveled by right side

Where hat denotes target
and blank denotes measured

Gyroscope Sensor

$\hat{\Theta}(t)$

Turn PID

Set

PV

$\hat{V}_N(t)$

LV PID

Left Drive

Left Encoder

Set

PV

$V_L(t) = \dfrac{d}{dt} S_L(t)$

$\hat{S}_T(t)$

Set

Position PID

PV

$S_T(t) = \displaystyle\int_{t_0}^{t_f} \dfrac{V_R(t) + V_L(t)}{2} dt$

$V_R(t) = \dfrac{d}{dt} S_R(t)$

PV

RV PID

Right Drive

Right Encoder

Set