System Dynamics and Control

University Mechanical Engineering · Vocabulary in context

Word	Example
system dynamics	**System dynamics** describes how a machine responds over time.
control /kən'trəʊl/	A **control** system keeps the motor at the right speed.
lumped parameters	With **lumped parameters**, a tank becomes one capacitance.
state-space form	The mount model fits the **state-space form** with a 2 × 2 matrix. 2 × 2
transfer function	With zero initial conditions, the **transfer function** is Y(s)/U(s). Y(s)/U(s)
time constant /taɪm 'kɒnstənt/	The **time constant** is RC. RC
dc motor	A small **dc motor** turns the valve through a gearbox.
back emf	The **back emf** grows with speed and limits it.
mechanical time constant	The motor's **mechanical time constant** is 9.6 ms. 9.6 ms
poles /pəʊlz/	Simple **poles** at 0 and -2 give constant and decaying terms. 0 -2
zeros /'zɪərəʊz/	**Zeros** can add overshoot to a step response.
stable /'steɪbl/	A **stable** sort keeps equal items in the same order.
overshoot /ˌəʊvə'ʃuːt/	With final value 10, 20% **overshoot** gives peak 12. 10、 20% 12

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crossover	At **crossover** the loop gain is exactly one. 1
phase margin	At gain crossover, **phase margin** measures separation from −180°. −180°
error /ˈerə/	The controller acts on the **error** between set point and measurement.
PID controller	A **PID controller** combines proportional, integral and derivative action. 、
rate limit	The 12 V supply sets the valve's **rate limit**. 12 V
integrator windup	**Integrator windup** made the valve overshoot to 159°. 159°
Anti-windup	**Anti-windup** stops the integral while the output is saturated.
ADC /ˌeɪ diː ˈsiː/	An ideal 12-bit **ADC** over 3.3 V has 0.806 mV steps. 3.3 V 12-bit 0.806 mV。
zero-order hold	A **zero-order hold** keeps the output constant between samples.
Nyquist frequency	Filter out noise above the **Nyquist frequency**.
aliasing /ˈeɪlɪəsɪŋ/	**Aliasing** folds a high frequency into the band as a false low.
measurand	Water temperature is the **measurand** of the Pt100. Pt100
platinum resistance thermometer	A **platinum resistance thermometer** changes by 0.385 Ω per kelvin. 0.385 Ω
signal chain	Follow the **signal chain** from sensor to ADC. ADC

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error budget	The **error budget** shows the sensor dominates.
bandwidth /ˈbændwɪdθ/	A fast connection has a high **bandwidth**.

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