Massachusetts Institute of Technology
2.004 Dynamics and Control II

Lab Section: TPM

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Lab 2 – Characterization of The Flywheel Plant

Experiment #2. Derive angular velocity

wheel_vel = (wheel_pos-pre_wheel_pos)/loop_time;

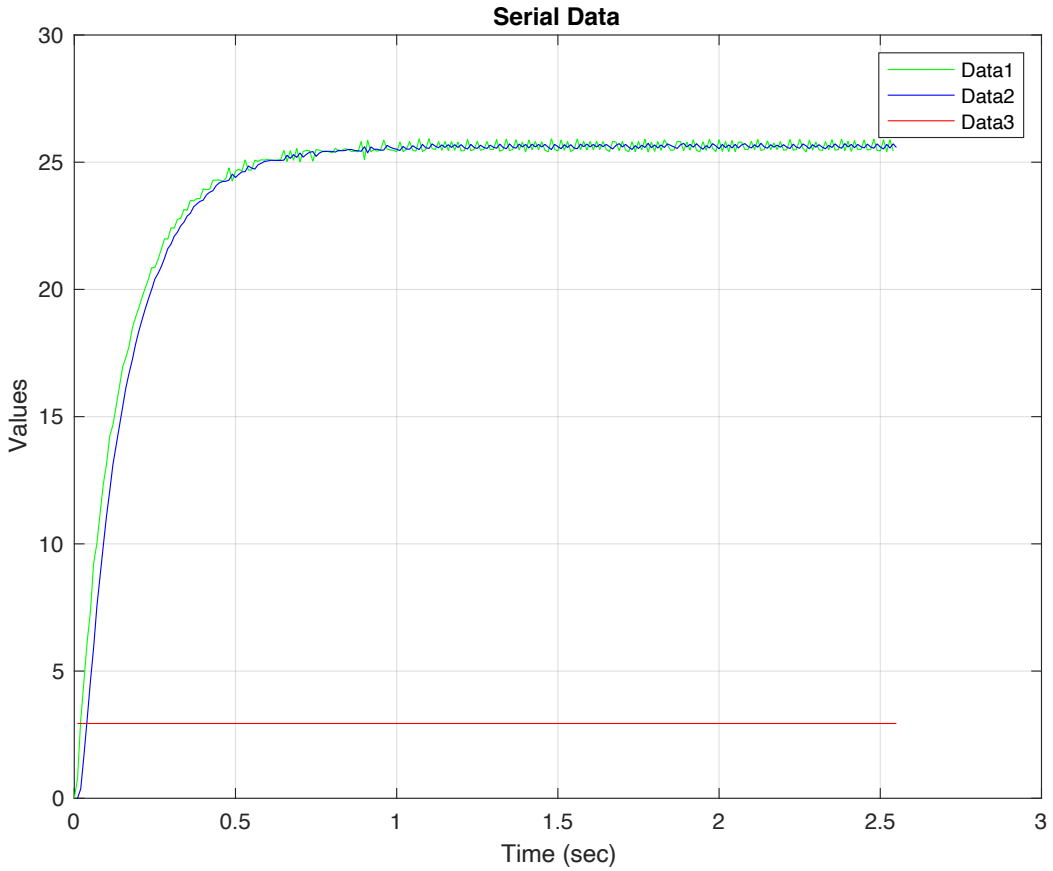
Experiment #3. Low-pass filter

*filt_vel = alpha*wheel_vel + (1-alpha)*filt_vel;*

Determine the value of alpha if the sampling period is 0.01s and the desired filter cutoff frequency is 15Hz.

$\alpha = 0.01/(0.01+1/(15*2*pi)) = 0.4851936$

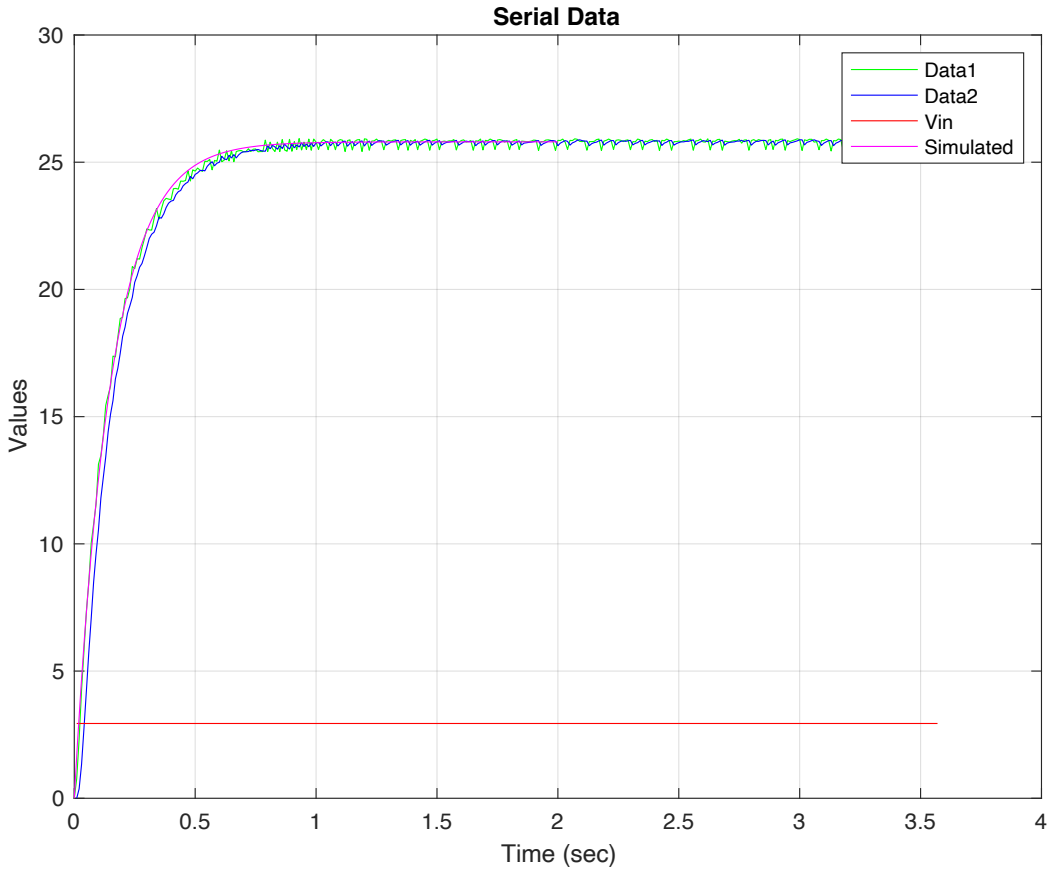
Experiment #4. Open-loop transfer function



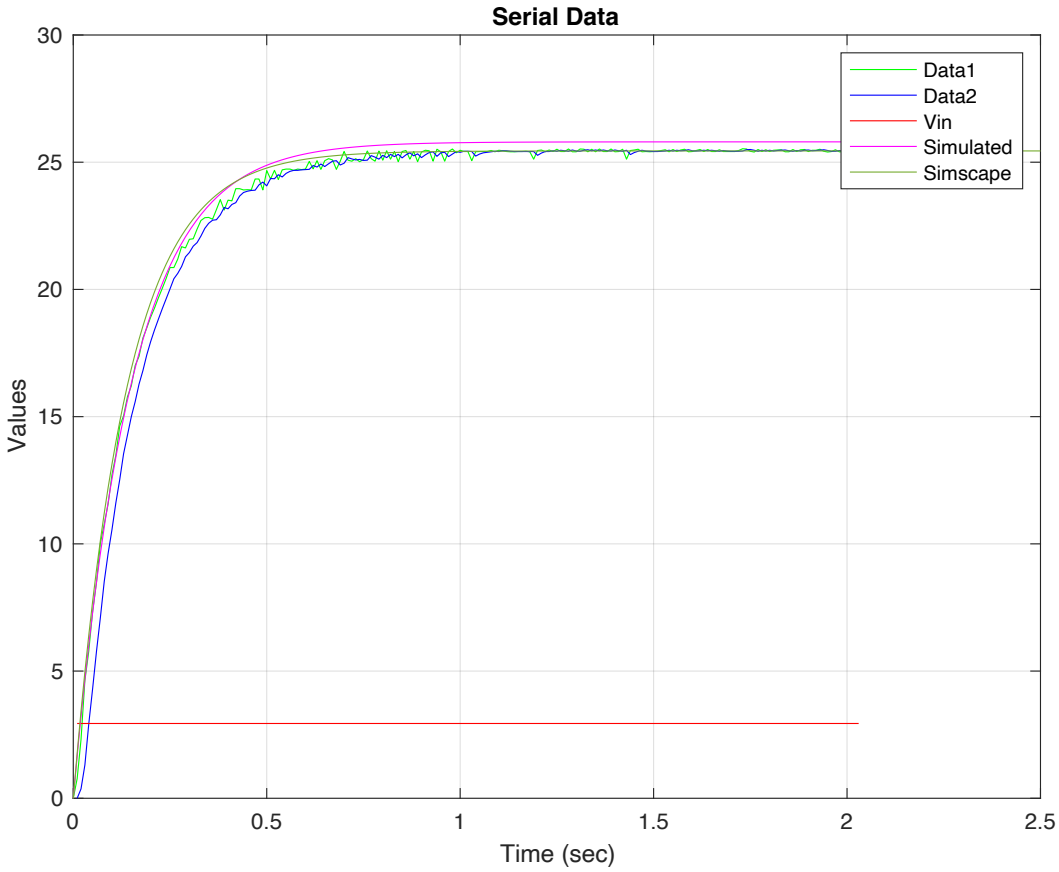
Open-loop transfer function (input: PWM pin voltage, output: wheel angular velocity):

Tau = 0.15s
Vss = 25.8
Vin = 2.94
Kdc = 8.7755102

$$G(s) = \frac{\Omega(s)}{V_c(s)} = \frac{K_{dc}}{\tau s+1} = 8.7755102/(0.15s+1)$$



Extra Credit Task: Simscape Simulation



$K_v(or\ K_b) = 0.0075$ V

$R = 3.2$ ohms

$b = 0.00096$ N*m