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Gagandeep Thapar; AERO 560 HW2

Problem 2

givens

initial conditions

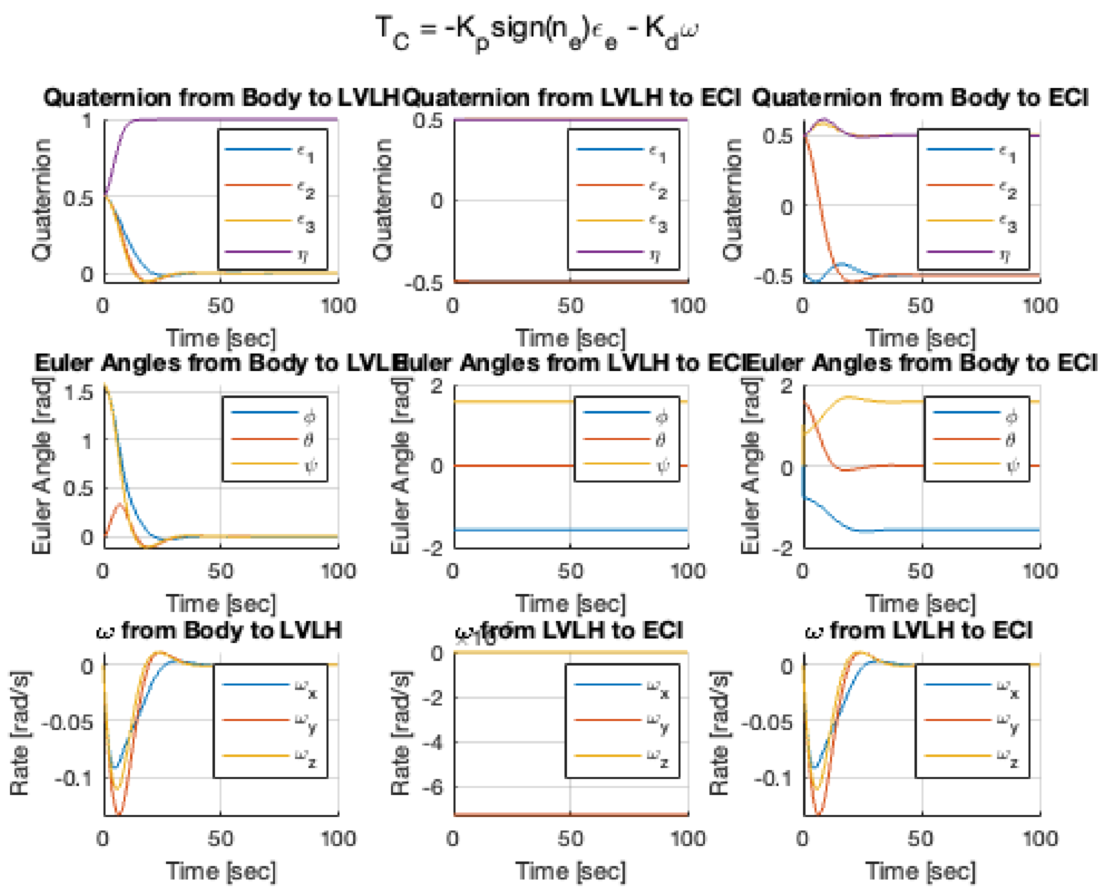
run sim

unpack data: A

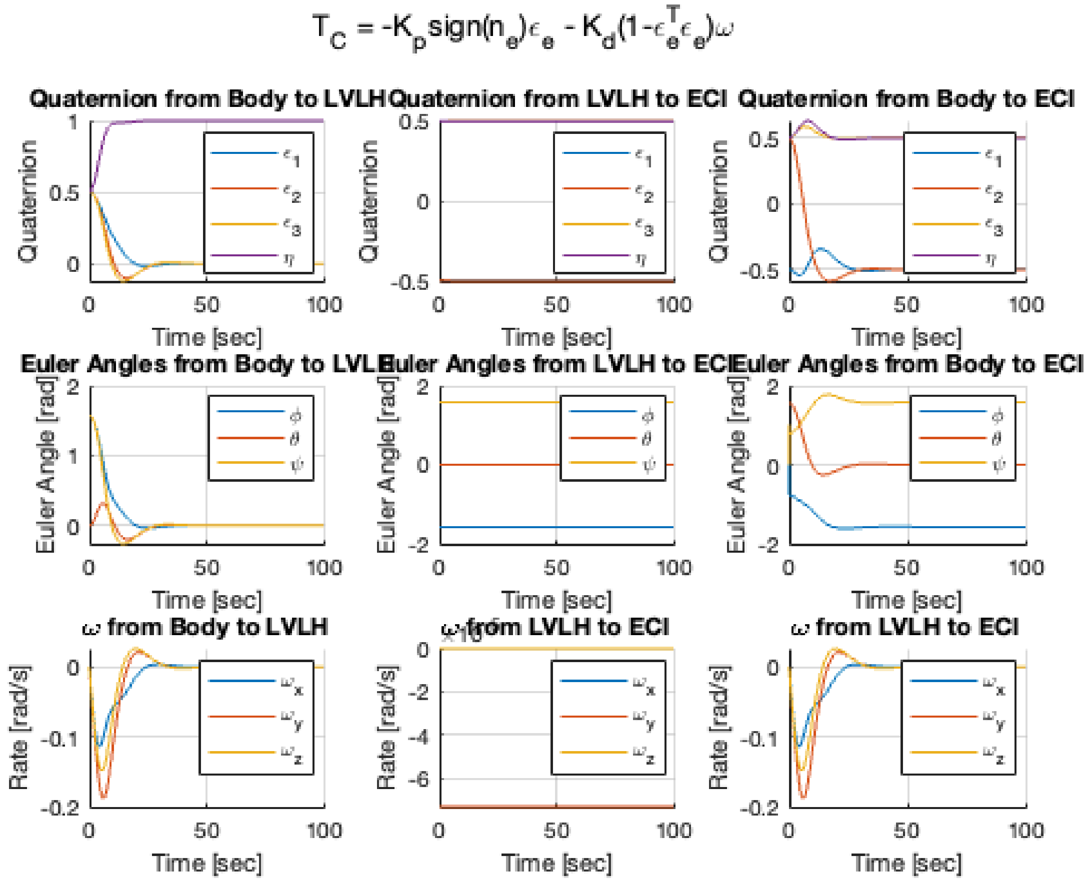
unpack data: B

unpack data: C

plot data: A



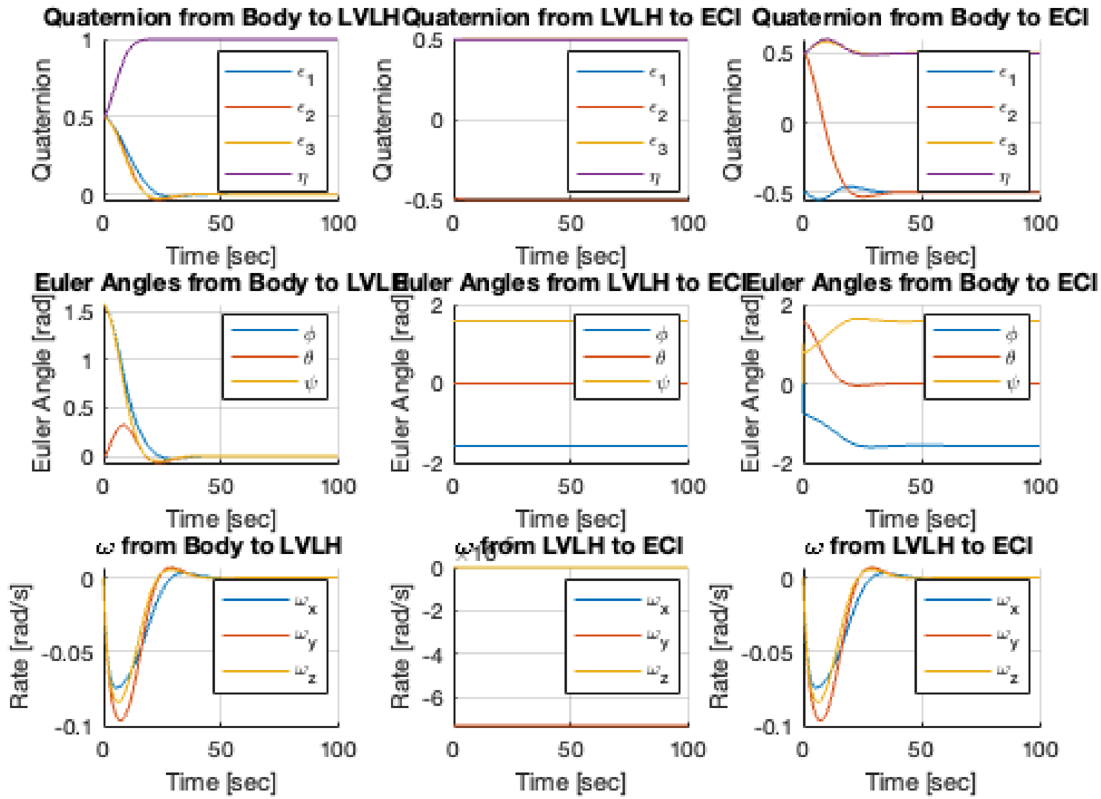
plot data: B



$T_C = -K_p \mathrm{sign}(n_e)\epsilon_e - K_d(1-\epsilon_e^T\epsilon_e)\omega$
Quaternion from Body to LVLH
Quaternion from LVLH to ECI
Quaternion from Body to ECI
Quaternion
ϵ_1
ϵ_2
ϵ_3
η
Euler Angles from Body to LVLH
Euler Angles from LVLH to ECI
Euler Angles from Body to ECI
Euler Angle [rad]
ϕ
θ
ψ
ω from Body to LVLH
ω from LVLH to ECI
ω from LVLH to ECI
Rate [rad/s]
ω_x
ω_y
ω_z
Time [sec]

plot data: C

$$T_C = -K_p \mathrm{sign}(n_e)\epsilon_e - K_d(1+\epsilon_e^T\epsilon_e)\omega$$



plot misc

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4. The satellite can maintain pointing with the disturbance torque. Setting the disturbance torque to 0 results in a similar result with the satellite reaching steady state in less time.

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5. The max torque exerted (in the second control law) is 698.61 Nm. With a height of 10.00 m, the satellite must exert 139.72 N of thrust. No EP is currently capable of producing that much thrust.

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6. Each control law requires different amount of torque for different amounts of time, however, each reach steady state in a similar amount of time. Control Law B has a greater peak than its counterparts as expected due to the control law looking at the difference in the quaternion near equilibrium (which will cause a larger torque requirement initially).

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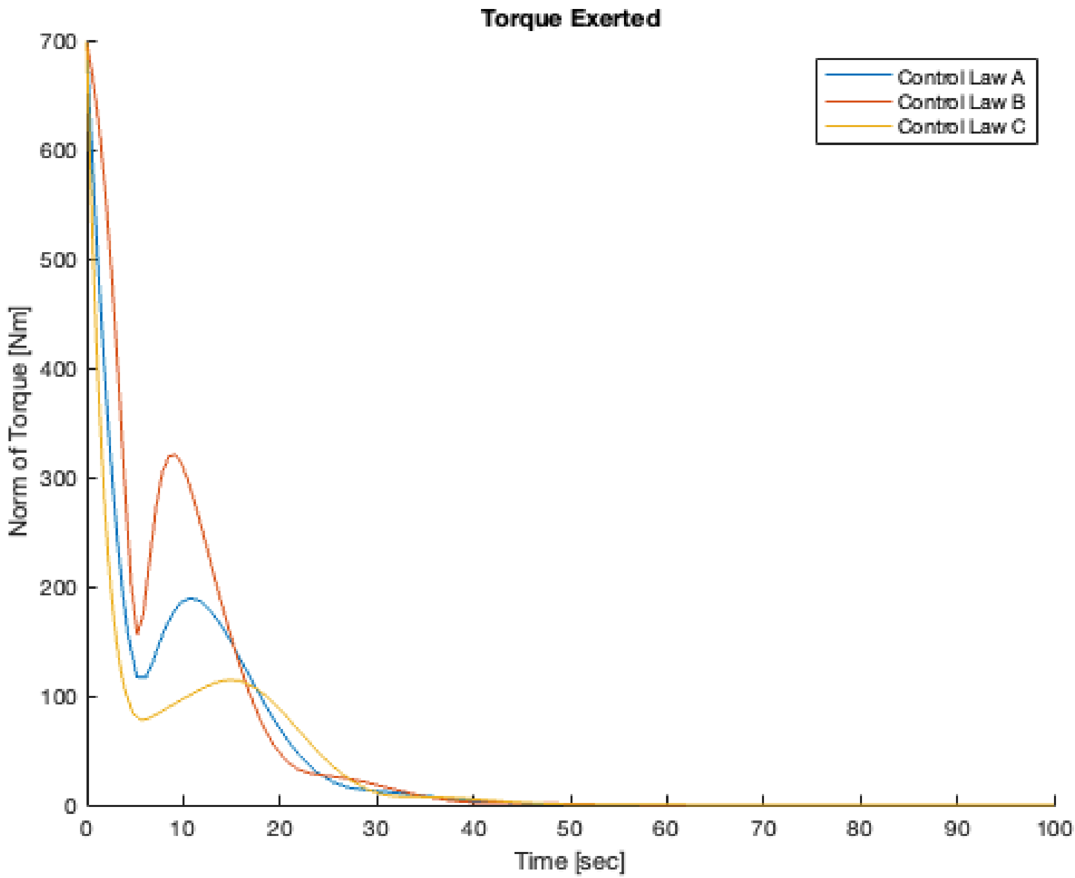

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