Quanser Aero 2 Recommended Assessment

Rotor Speed Control

Control Design

1. Evaluate the natural frequency and damping ratio needed to meet the desired peak time and percent overshoot given in Equation 1 in the Lab Procedure.
2. Show how the PI gain equations in Equation 12 in the Concept Review were found.
3. Calculate the PI gains needed for the system response to have the peak time and percent overshoot specifications given Equation 1 in the Lab Procedure.

Rotor Speed Control Simulation

4. Enter the PI equations, *kp* and *ki,* in the MATLAB *aero2_rotor_speed_control_student.mlx* Live script. For the best results, enter the steady-state gain and time constant model parameters found in the *Rotor Modelling* lab. Otherwise use the default values in the script.
5. Show the simulated PI speed control response in a MATLAB figure. Attach the code used to generate the plot.
6. Does the rotor speed control response satisfy the design specifications in Equation 1 of the Lab Procedure? Can this control be implemented on the Aero 2 rotor?

Rotor Speed Control Hardware Implementation

7. Plot the Aero 2 rotor speed control response of the rotor in a MATLAB figure using the saved variables. Make sure the rotor speed and motor voltage are shown. Attach the MATLAB code that was used to generate the plot.
8. Does the rotor speed control response satisfy the design specifications in Equation 1 of the Lab Procedure?
9. Is the response on the hardware different than the simulated response? If so, explain why there is a discrepancy.