

TSFS09 3B

December 4, 2025

1 Simulink Implementation

Download the driveline model from the course homepage. All your implementations should be done in the "car/car_model/controller/controller"-block. There is also a script "DoSim.m" that initializes the model, simulates it, and plots relevant signals.

- Implement an observer for the driveline using a "state space"-block together with the solution from prerequisite 5.
- Set the observer gain to zero, simulate, and demonstrate the performance of the observer with plots of the observed and the real drive line variables in the same plot.
- Use your calculated observer gain, simulate, and demonstrate the performance of the observer with plots of the observed and the real drive line variables in the same plot. Is the performance improved compared to exercise 2?
- Implement a state feedback controller that damps the drive line oscillations. In the controller block reference states are already given. Use them to try to damp the oscillations in vehicle acceleration and drive shaft torsion. The requirements for the controller are:
 - The vehicle acceleration should be around $1.5m/s^2$ when the feedback controller is active.
 - The maximum allowed rise time and overshoot of the acceleration is displayed in the plot produced by the Matlab script.
- Display the final result according to the following questions:
 1. Plot the vehicle acceleration with and without the state feedback. Attach the plot with the vehicle acceleration and demanded torques for both cases, comment the results.
 2. Demonstrate the performance of the controller with plots of the drive line variables both in damped and undamped mode. Comment the results.