03MIQ – Automotive Control Systems

Simulation (Simulink) laboratory exercises #4

Note

For some help refer to the Powertrain Blockset™ guide or help: https://it.mathworks.com/help/autoblks/

To access the powertrain blockset examples and tutorials provided by the MathWorks: type "s*imulink*" in the Matlab command window → by scrolling down in the tab *New* you will find CI and SI project templates. In the tab *Examples* you will find working examples implemented by the MathWorks.

Lab 4.1: 06 December 2021

The aim of this and following exercises is to implement and compare different Lambda controllers, open loop and closed loop, in *Simulink* environment.

Load in the Workspace the *TOLOAD.mat* file. Then open the provided *Simulink* model *Lambda_lab_OL.slx.*

- Compare implemented control strategy to those discussed during the lectures.
  Which are the differences between the strategies implemented in Simulink?
- Run simulations with the two open loop controller already implemented.
  Which one performs better?
- Save the results obtained in the 3 simulation (no control, ffwd map, OL correction) as they will be used as reference in the 2nd part of this laboratory.

Lab 4.2: 13 December 2021 (Exam matter)

Modify the given *Simulink* model, *Lambda_lab_OL.slx,* by implementing a closed loop Lambda controller.

Plot the results together with the ones obtained in the previous laboratory in order to see if any improvement is achieved.

You may start with a PI controller tuned in any manner you are comfortable with.