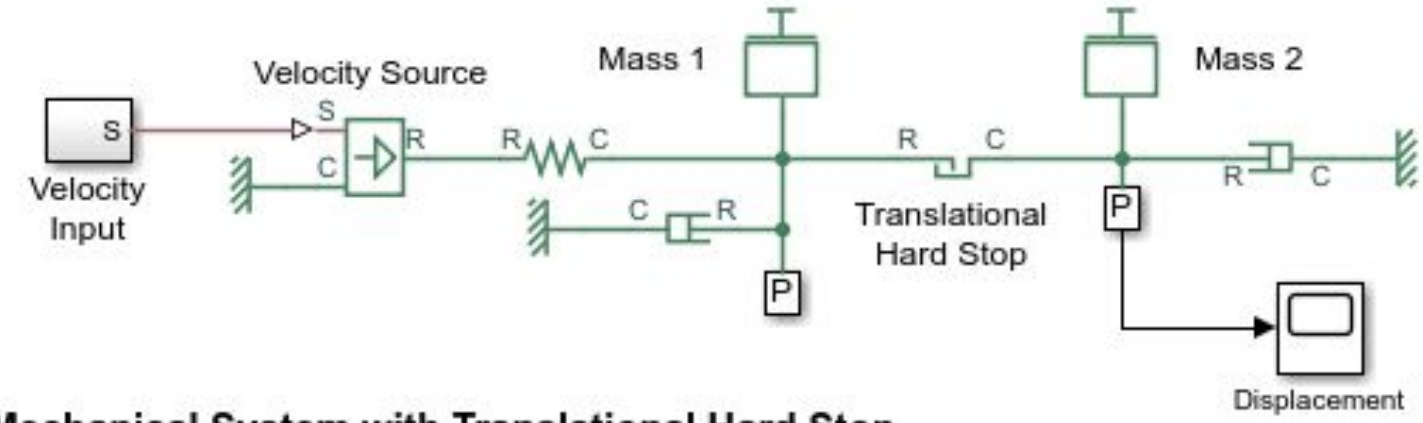
Exemplos de Sistemas

Fundamentos de Controle

Mechanical System with Translational Hard Stop

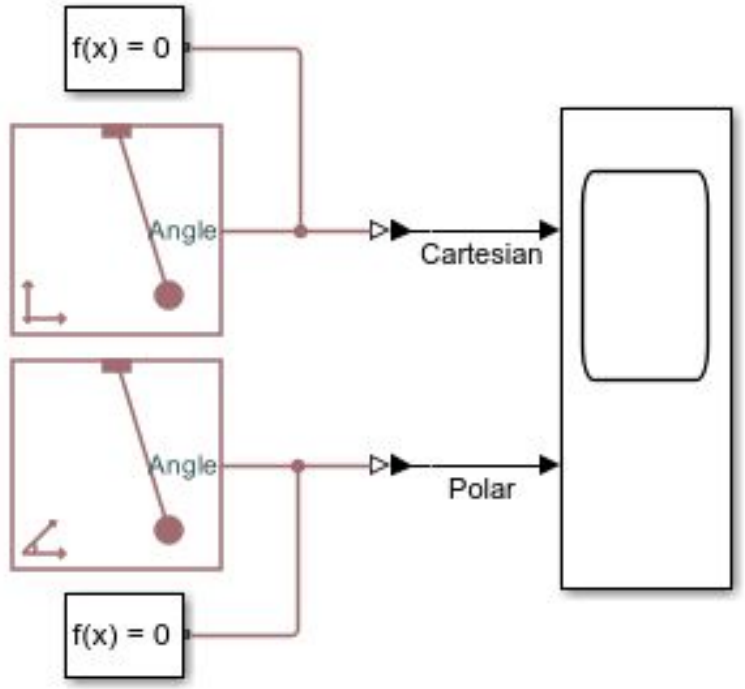


Mechanical System with Translational Hard Stop

1. Plot displacement of Mass 1 and Mass 2 (see code)
2. Plot hysteresis curve of mass displacements (see code)
3. Explore simulation results using Simscape Results Explorer
4. Learn more about this example

ssc_mechanical_system_translational_hardstop

Pendulum in Cartesian and Polar Coordinates

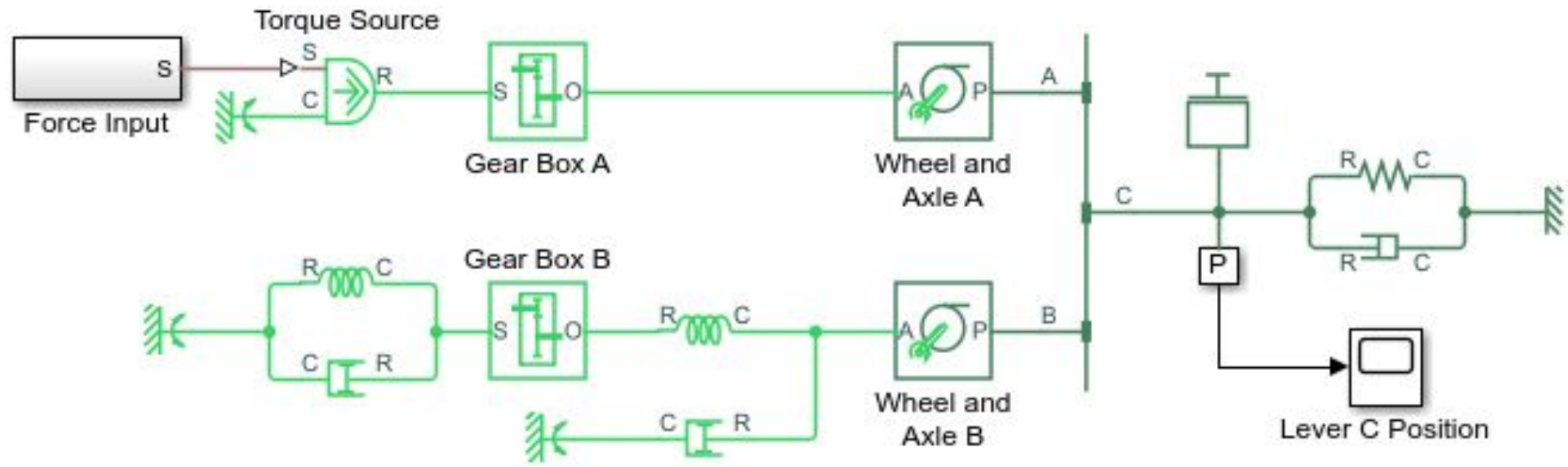


Pendulum in Cartesian and Polar Coordinates

1. Set parameters (see code)
2. Plot comparison of pendulum angle (see code)
3. Plot comparison of pendulum energy (see code)
4. Explore simulation results using Simscape Results Explorer
5. Learn more about this example

ssc_pendulum

Simple Mechanical System

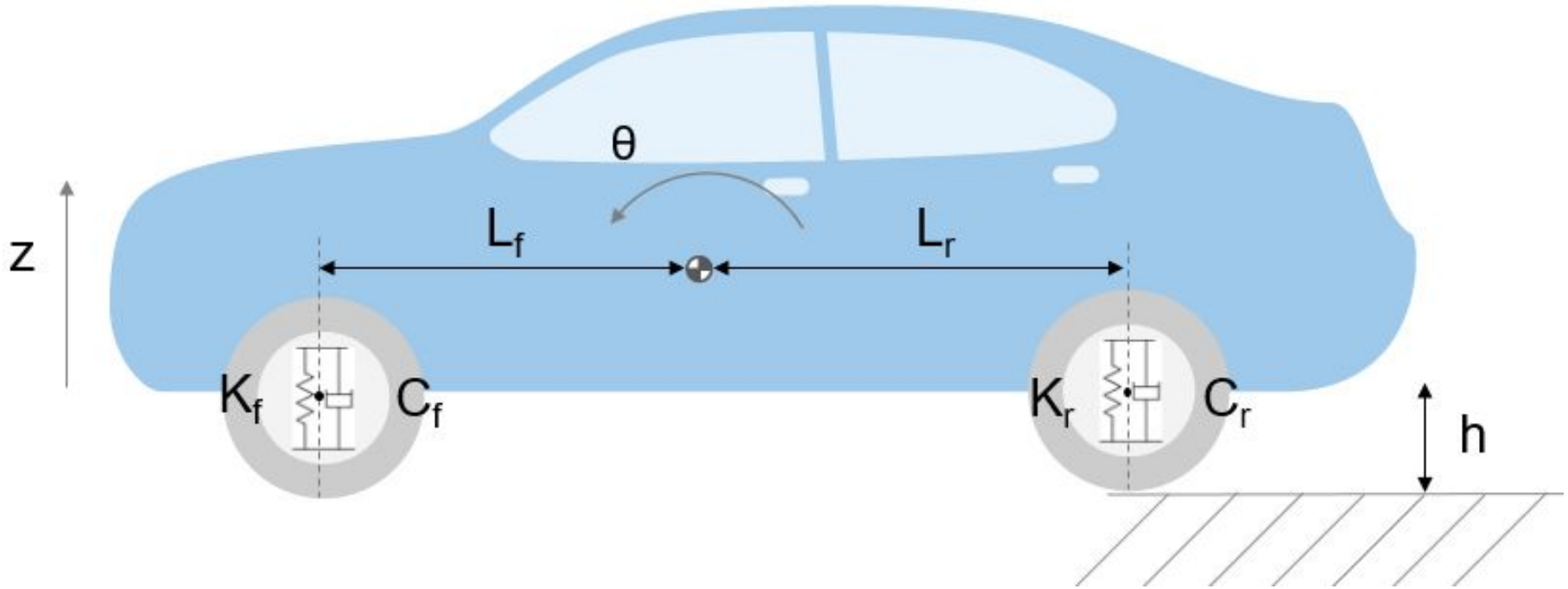


Simple Mechanical System

1. Explore simulation results using Simscape Results Explorer
2. Learn more about this example

ssc_simple_mechanical_system

Automotive Suspension



openExample('simulink_automotive/AutomotiveSuspensionExample')

Equation 1 describes the influence of the front suspension on the bounce (i.e. vertical degree of freedom):

$$F_f = 2K_f(L_f\theta - (z+h)) + 2C_f(L_f\dot{\theta} - \dot{z})$$

where:

$F_f, F_r =$ upward force on body from front/rear suspension

$K_f, K_r =$ front and rear suspension spring constant

$C_f, C_r =$ front and rear suspension damping rate

$L_f, L_r =$ horizontal distance from gravity center to front/rear suspension

$\theta, \dot{\theta} =$ pitch (rotational) angle and its rate of change

$z, \dot{z} =$ bounce (vertical) distance and its rate of change

$h =$ road height

Equations 2 describe pitch moments due to the suspension.

$$M_f = -L_f F_f$$

$$F_r = -2K_r(L_r\theta + (z+h)) - 2C_r(L_r\dot{\theta} + \dot{z})$$

$$M_r = L_r F_r$$

where:

$$M_f, M_r = \text{ Pitch moment due to front/rear suspension}$$

Equations 3 resolves the forces and moments result in body motion, according to Newton's Second Law:

$$m_b\ddot{z} = F_f + F_r - m_b g$$

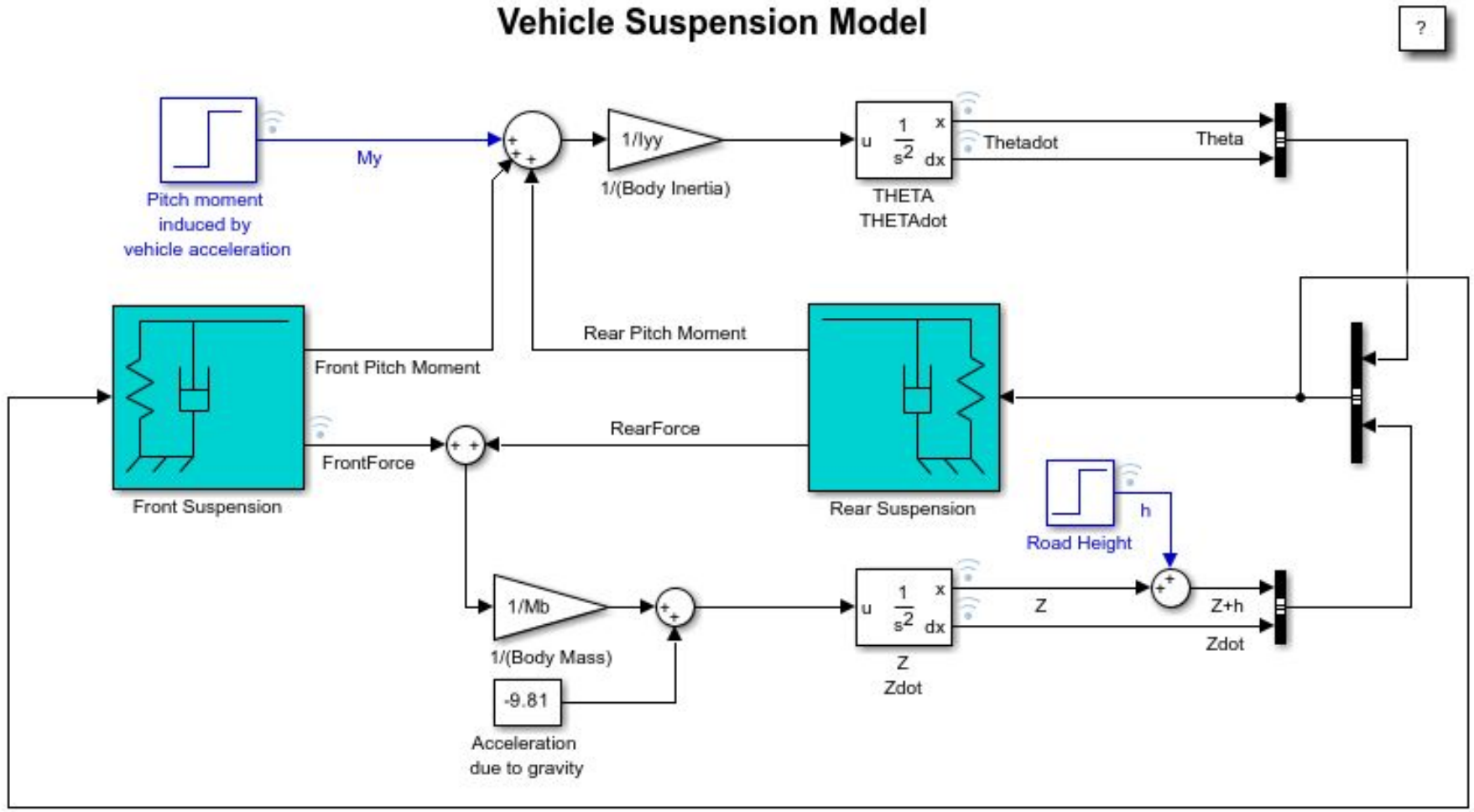
$$I_{yy}\ddot{\theta} = M_f + M_r + M_y$$

where:

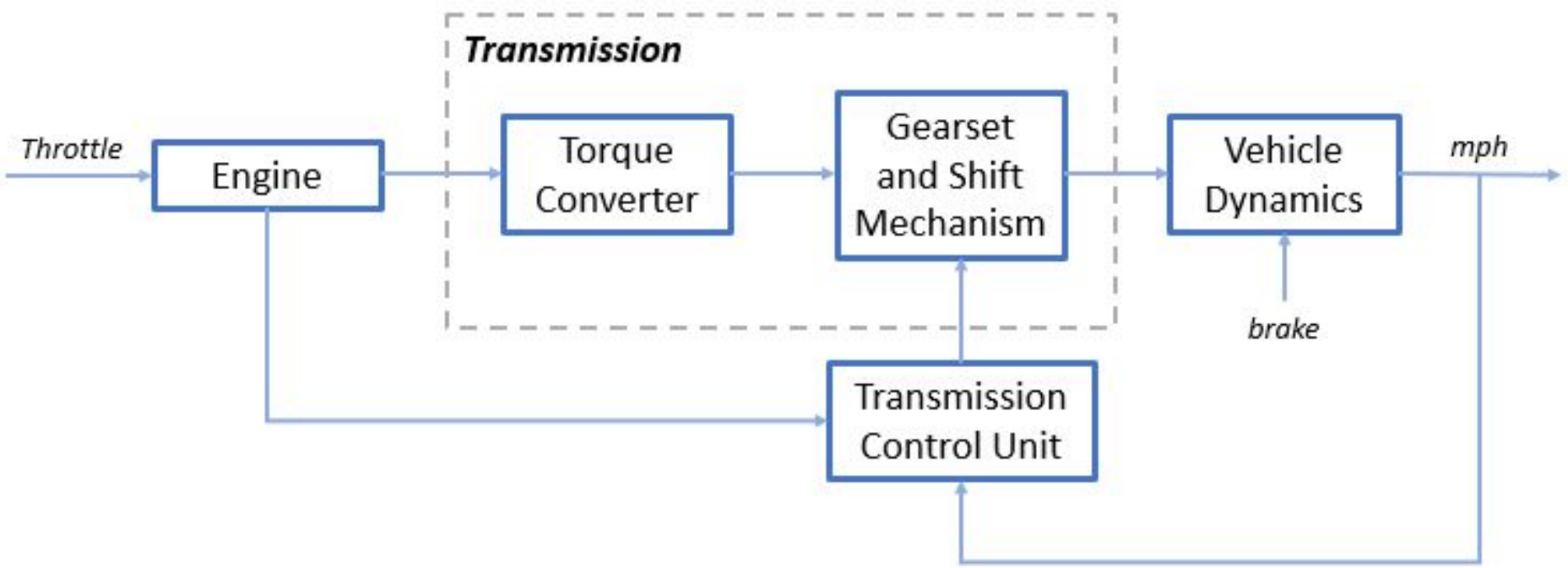
$$m_b = \text{ body mass}$$

$$M_y = \text{ pitch moment induced by vehicle acceleration}$$

$$I_{yy} = \text{ body moment of inertia about gravity center}$$

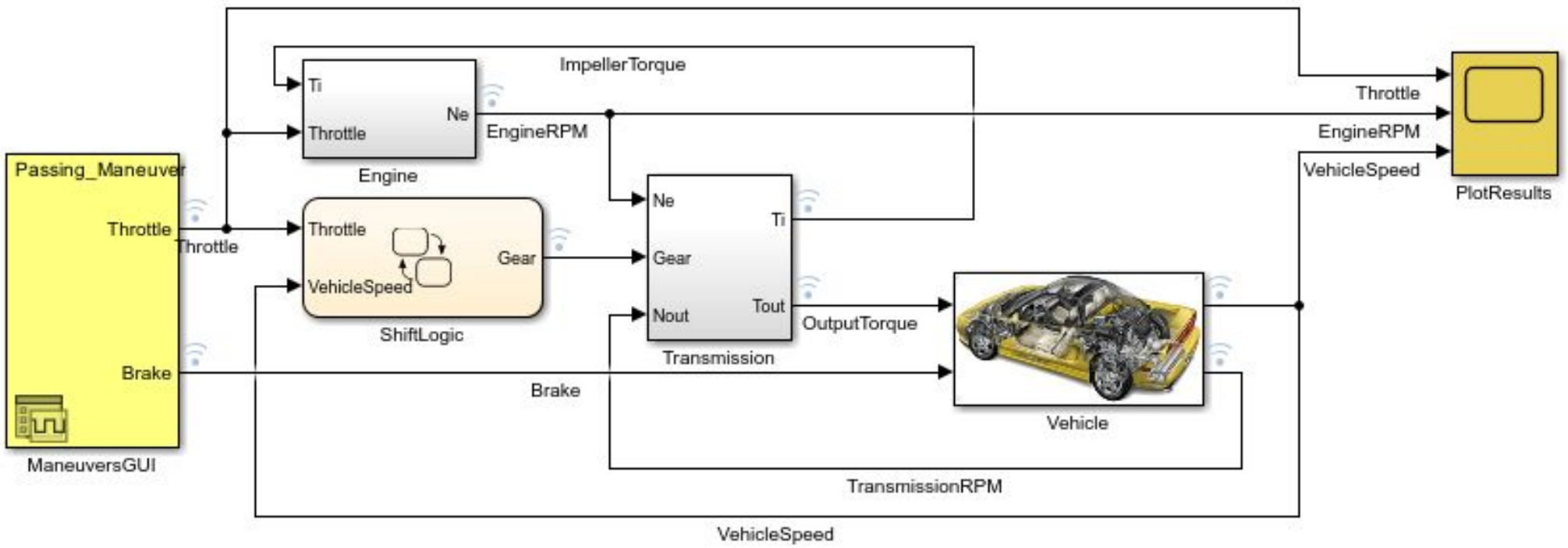


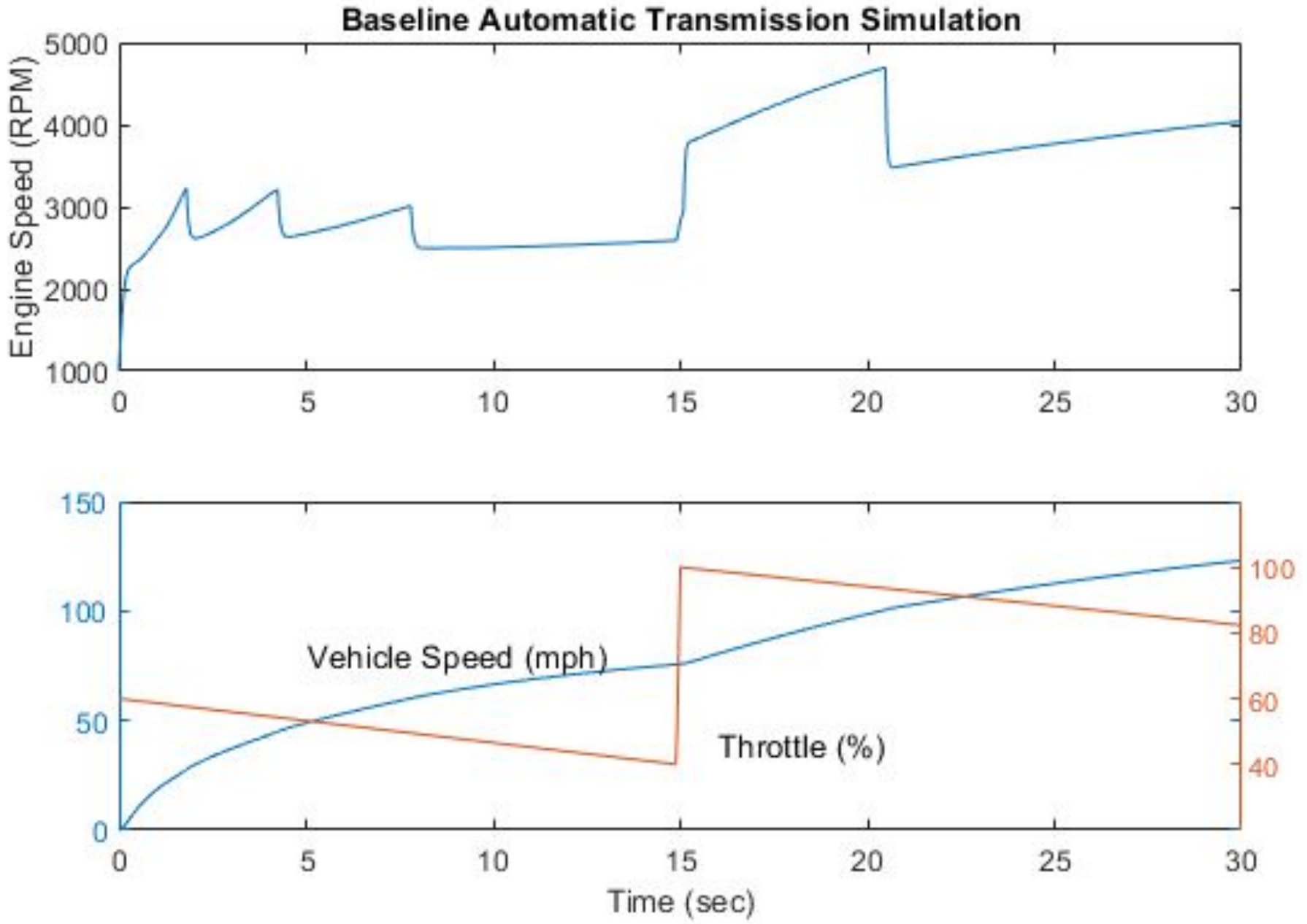
Modeling an Automatic Transmission Controller



openExample('simulink_automotive/ModelingAnAutomaticTransmissionControllerExample')

Modeling an Automatic Transmission Controller




Baseline Automatic Transmission Simulation
Engine Speed (RPM)
5000
4000
3000
2000
1000
0
5
10
15
20
25
30
150
100
50
0
Vehicle Speed (mph)
Throttle (%)
100
80
60
40
Time (sec)