In [52]:
```
import matplotlib.pyplot as plt
import pycollimator as C
import math
%matplotlib widget

#Set up a connect to the collimator API
token = "507d5f58-59b6-4328-b6b0-xxxxx" #copy your token here - I redacted the token for security purposes
project_uuid = "858d5ed1-16b2-4563-9e5e-8623755fe414" #copy your project uuid here
C.set_auth_token(token, project_uuid)

#View the models within the project file
print(C.list_models())

#Load the models
passive = C.load_model('Passive Suspension Control')
active = C.load_model('Active Suspension Control')

#Run the Simulations and shows Logs
sim_passive = C.run_simulation(passive)
sim_passive.show_logs()
sim_active = C.run_simulation(active)
sim_active.show_logs()

#Transform the simulation results into a pandas dataframe
data_pas = sim_passive.results.to_pandas()
data_act = sim_active.results.to_pandas()


# plt.figure()
# plt.title("Test")
```

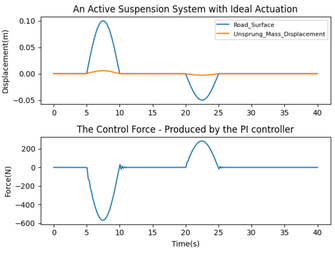
```
[<Model name='Passive Suspension Control'>, <Model name='bump_signal'>, <Model name='Active Suspension Control'>, <Model name='Hydraulic Actuator'>, <Model name='test_hydraulic_controller'>]

2023-07-08 18:57:57.225 INF model compiled successfully simulation_uuid=474e1559-18c3-48ea-a44b-d19daf96c038 time=0.31683611869812012
2023-07-08 18:57:57.270 INF starting model binary 🚀
2023-07-08 18:57:57.454 INF simulation completed successfully 🏁 total_time=0.186044 simulation_time=0.026983

2023-07-08 18:58:03.651 INF model compiled successfully simulation_uuid=7feef6f3-80ce-4cab-8652-d426e016d182 time=0.37740707397460938
2023-07-08 18:58:03.702 INF starting model binary 🚀
2023-07-08 18:58:03.946 INF simulation completed successfully 🏁 total_time=0.245573 simulation_time=0.090861
```

In [53]:
```
#View the first few rows of the dataframes
print(data_pas.head())
print()
print(data_act.head())
```

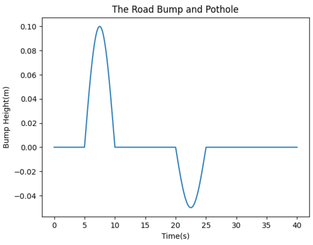
```
        Adder_0.out_0  Adder_1.out_0  Gain_0.out_0  Clock_0.out_0  \
time
0.0000            0.0            0.0           0.0         0.0000
0.0001            0.0            0.0           0.0         0.0001
0.0011            0.0            0.0           0.0         0.0011
0.0111            0.0            0.0           0.0         0.0111
0.1000            0.0            0.0           0.0         0.1000

        Adder_2.out_0  Adder_3.out_0  Kt.out_0  bs.out_0  Derivative_0.out_0  \
time
0.0000            0.0            0.0       0.0       0.0                 0.0
0.0001            0.0            0.0       0.0       0.0                 0.0
0.0011            0.0            0.0       0.0       0.0                 0.0
0.0111            0.0            0.0       0.0       0.0                 0.0
0.1000            0.0            0.0       0.0       0.0                 0.0

        Integrator_Zsdot.out_0  Adder_4.out_0  Ks.out_0  \
time
0.0000                     0.0            0.0       0.0
0.0001                     0.0            0.0       0.0
0.0011                     0.0            0.0       0.0
0.0111                     0.0            0.0       0.0
0.1000                     0.0            0.0       0.0

        Integrator_Zudot.out_0  integrator_Zs.out_0  Integrator_Zu.out_0  \
time
0.0000                     0.0                  0.0                  0.0
0.0001                     0.0                  0.0                  0.0
0.0011                     0.0                  0.0                  0.0
0.0111                     0.0                  0.0                  0.0
0.1000                     0.0                  0.0                  0.0

        Zr_Road_Input.out_0  bt.out_0  Adder_5.out_0  Gain_1.out_0  \
time
0.0000                  0.0       0.0            0.0          -0.0
0.0001                  0.0       0.0            0.0          -0.0
0.0011                  0.0       0.0            0.0          -0.0
0.0111                  0.0       0.0            0.0          -0.0
0.1000                  0.0       0.0            0.0          -0.0

        Gain_2.out_0
time
0.0000           0.0
0.0001           0.0
0.0011           0.0
0.0111           0.0
0.1000           0.0

        Adder_3.out_0  Integrator_Zsdot.out_0  Adder_5.out_0  \
time
0.0000            0.0                     0.0            0.0
0.0001            0.0                     0.0            0.0
0.0002            0.0                     0.0            0.0
0.0012            0.0                     0.0            0.0
0.0022            0.0                     0.0            0.0

        Zr_Road_Input.out_0  Derivative_0.out_0  Adder_1.out_0  Gain_2.out_0  \
time
0.0000                  0.0                 0.0            0.0           0.0
0.0001                  0.0                 0.0            0.0           0.0
0.0002                  0.0                 0.0            0.0           0.0
0.0012                  0.0                 0.0            0.0           0.0
0.0022                  0.0                 0.0            0.0           0.0

        Gain_0.out_0  Control_Force.out_0  Integrator_Zu.out_0  ...  \
time                                                            ...
0.0000           0.0                  0.0                  0.0  ...
0.0001           0.0                  0.0                  0.0  ...
0.0002           0.0                  0.0                  0.0  ...
0.0012           0.0                  0.0                  0.0  ...
0.0022           0.0                  0.0                  0.0  ...

        Integrator_0.out_0  Clock_0.out_0  Zs_Error.out_0  Adder_2.out_0  \
time
0.0000                 0.0         0.0000             0.0            0.0
0.0001                 0.0         0.0001             0.0            0.0
0.0002                 0.0         0.0002             0.0            0.0
0.0012                 0.0         0.0012             0.0            0.0
0.0022                 0.0         0.0022             0.0            0.0

        Gain_1.out_0  Integrator_Zudot.out_0  Kp.out_0  Ki.out_0  bs.out_0  \
time
0.0000          -0.0                     0.0       0.0       0.0       0.0
0.0001          -0.0                     0.0       0.0       0.0       0.0
0.0002          -0.0                     0.0       0.0       0.0       0.0
0.0012          -0.0                     0.0       0.0       0.0       0.0
0.0022          -0.0                     0.0       0.0       0.0       0.0

        Adder_0.out_0
time
0.0000            0.0
0.0001            0.0
0.0002            0.0
0.0012            0.0
0.0022            0.0

[5 rows x 26 columns]
```

In [54]:
```
#Plot the results

#Plot the road bump and potholes
plt.figure(1)
plt.title('The Road Bump and Pothole')
plt.plot(data_pas['Zr_Road_Input.out_0'])
plt.ylabel('Bump Height(m)')
plt.xlabel('Time(s)')

#Plot the Road Bump and the Car's displacement for the passive suspension system
plt.figure(2)
plt.title("A Passive Suspension System")
plt.plot(data_pas['Zr_Road_Input.out_0'])
plt.plot(data_pas['integrator_Zs.out_0'] )
plt.ylabel('Displacement(m)')
plt.xlabel('Time(s)')
plt.legend(['Road_Surface','Unsprung_Mass_Displacement'],loc = 'upper right',fontsize=8)

#Plot the Road Bump and the Car's displacement and the control force for the active suspension system
# plt.figure(3)
# Create a figure with two subplots
fig, axs = plt.subplots(2, 1)
# Plot the data on the subplots and set the titles
axs[0].plot(data_act['Zr_Road_Input.out_0'])
axs[0].plot(data_act['integrator_Zs.out_0'])
axs[0].set_title("An Active Suspension System with Ideal Actuation")
axs[0].set_ylabel('Displacement(m)')
axs[0].legend(['Road_Surface','Unsprung_Mass_Displacement'],loc = 'upper right',fontsize=8)

axs[1].plot(data_act['Control_Force.out_0'])
axs[1].set_title("The Control Force - Produced by the PI controller")
axs[1].set_ylabel('Force(N)')
axs[1].set_xlabel('Time(s)')

# Adjust the layout of the subplots
fig.tight_layout()

# Show the plots
plt.show()
```

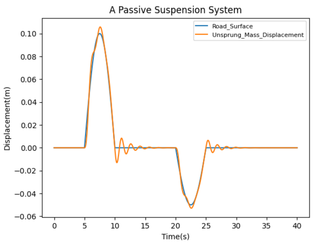
Figure



Figure



Figure



In [ ]: