

Integration Test: Specification Report

Team 2 (CoDeAS 20/21)

26-Feb-2021 09:39:54

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1. IntegrationTest

Test File Options

Close open figures	true
Store MATLAB figures	false
Generate report	false

1.1. IntegrationTest Suite 1

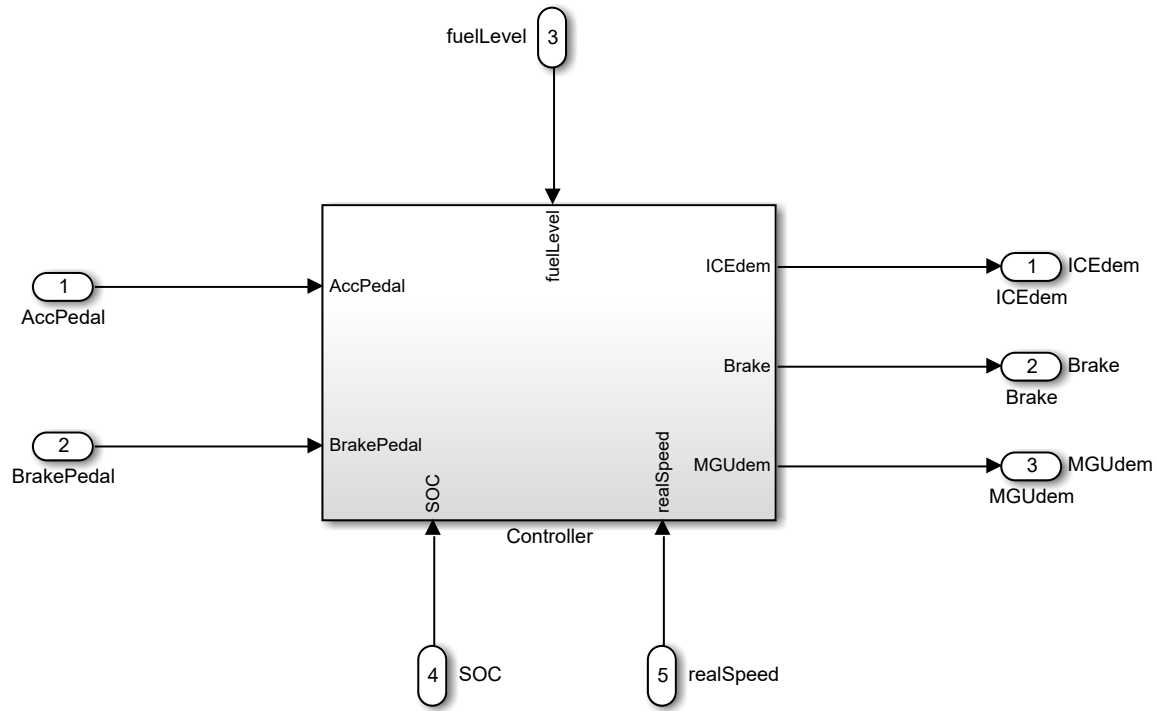
1.1.1. Test Case 1

Test Details

Description	<p>Scenario 1: Vehicle in full electrical drive</p> <p>INPUTS conditions:</p> <ul style="list-style-type: none">- request AccPedal < MaxAccMGU (t = 5s)- Low speed condtions- BrakePedal: 0- SOC > SOCMin- Fuel > fuelMin <p>EXPECTED OUTPUT:</p> <p>Only MGU mode: due to low speed, controller must demand torque only to the MGU (MGUdem != 0).</p>
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System Under Test

Model Name: ControllerModel



Simulation Settings Overrides

Simulation Mode	Model Settings
Releases	Current

External Inputs

Name	File Path	Status
Scenario1.mat (Active)	C:\Users\ivane\Documents\GitHub\hybrid-controller\Hybrid-controller\Test\Integration Test\Inputs\Scenario1.mat	Successfully mapped inputs.

Configuration Settings Overrides

Configuration settings	Do not override model settings
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Logical and Temporal Assessments

Assessments

Enabled	Name	Definition	Requirements
True	Assessment1	At any point of time, if AccPedal > 0 becomes true then, with a delay of at most 0.4 seconds , MGUdem > 0 & ICEdem ==0 & Brake == 0 must be true	

Symbols

Symbol	Scope	Metadata	
AccPedal	Signal	Name	AccPedal:1
		Path	ControllerModel/AccPedal
		Port Index	1
		Field/Element	
MGUdem	Signal	Name	Controller:3
		Path	ControllerModel/Controller

Symbol	Scope	Metadata	
		Port Index	3
		Field/Element	
ICEdem	Signal	Name	Controller:1
		Path	ControllerModel/Controller
		Port Index	1
		Field/Element	
Brake	Signal	Name	Controller:2
		Path	ControllerModel/Controller
		Port Index	2
		Field/Element	

1.1.2. Test Case 2

Test Details

Description	Scenario 2: No charge
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1. IntegrationTest

INPUTS conditions:

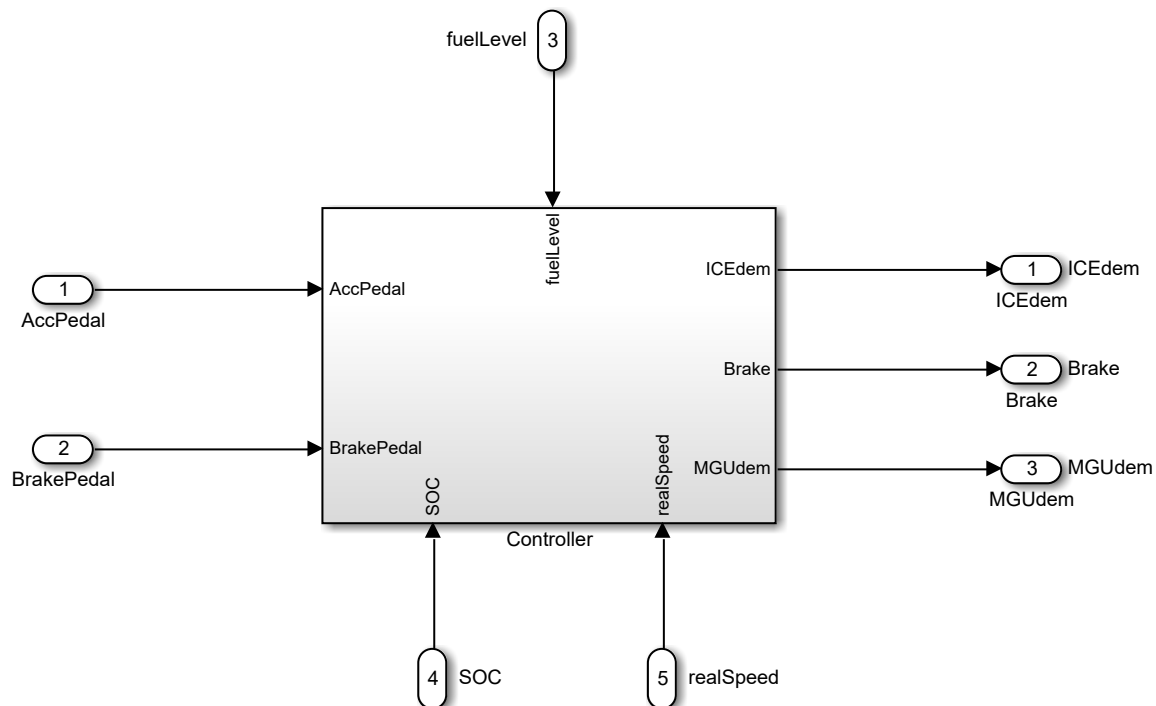
- request AccPedal < MaxAccMGU (t = 5s)
- Low speed condntions
- BrakePedal: 0
- SOC < SOCMin
- Fuel > fuelMin

EXPECTED OUTPUT:

Only ICE mode: due to battery low level, controller must demand torque only to the ICE (ICEdem != 0)discarding the MGU.

System Under Test

Model Name: ControllerModel



Simulation Settings Overrides

Simulation Mode	Model Settings
Releases	Current

External Inputs

Name	File Path	Status
Scenario2.mat (Active)	C:\Users\ivane\Documents\GitHub\hybrid-controller\Hybrid-controller\Test\Integration Test\Inputs\Scenario2.mat	Successfully mapped inputs.

Configuration Settings Overrides

Configuration settings	Do not override model settings
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Logical and Temporal Assessments

Assessments

Enabled	Name	Definition	Requirements
True	Assessment1	At any point of time, if AccPedal > 0 becomes true then, with a delay of at most 0.4 seconds , ICEdem > 0 & Brake == 0 & MGUdem == 0 must be true	

Symbols

Symbol	Scope	Metadata	
AccPedal	Signal	Name	AccPedal:1
		Path	ControllerModel/AccPedal
		Port Index	1
		Field/Element	
ICEdem	Signal	Name	Controller:1
		Path	ControllerModel/Controller
		Port Index	1
		Field/Element	
Brake	Signal	Name	Controller:2
		Path	ControllerModel/Controller
		Port Index	2
		Field/Element	

Symbol	Scope	Metadata	
MGUdem	Signal	Name	Controller:3
		Path	ControllerModel/Controller
		Port Index	3
		Field/Element	

1.1.3. Test Case 3

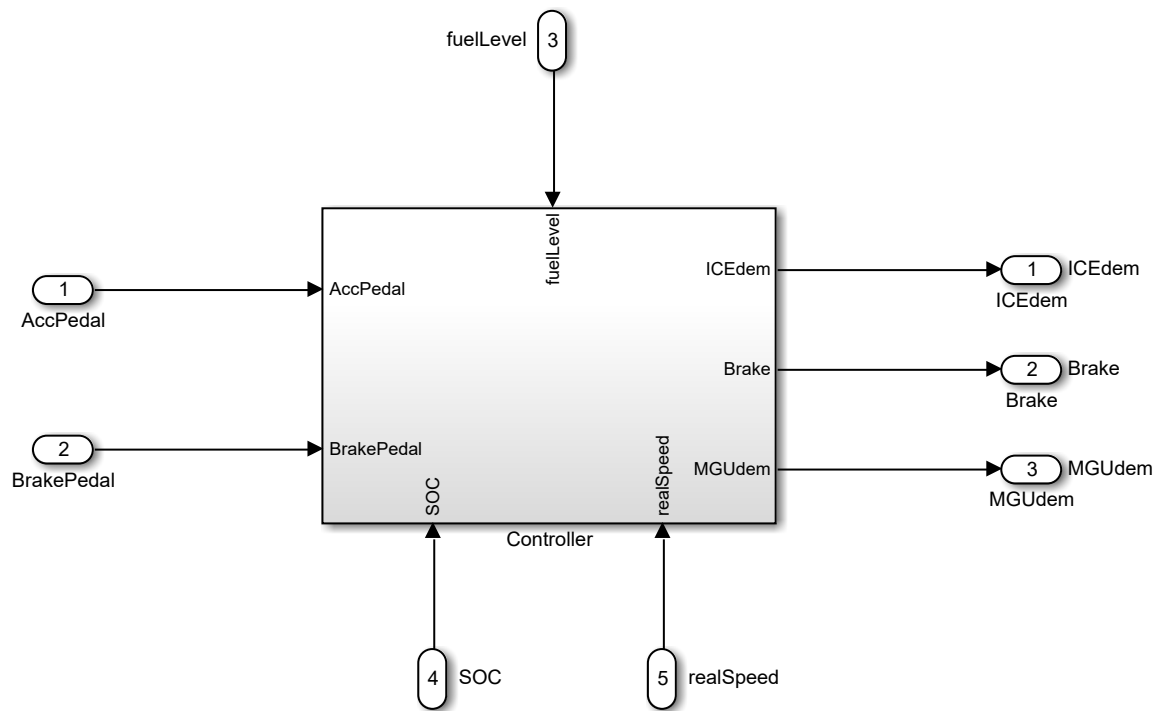
Test Details

Description	<p>Scenario 3: No fuel conditions</p> <p>INPUTS conditions:</p> <ul style="list-style-type: none"> - request AccPedal > MaxAccMGU (t = 5s) - Low speed condtions - BrakePedal: 0 - SOC > SOCMin - Fuel < fuelMin <p>EXPECTED OUTPUT:</p> <p>Only MGU mode and saturation at max value of MGU request: due to low speed and low fuel level, a saturation of the MGU request in termsof torque is</p>
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	expected because of the higher request after 5s.
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System Under Test

Model Name: ControllerModel



Simulation Settings Overrides

Simulation Mode	Model Settings
Releases	Current

External Inputs

Name	File Path	Status
Scenario3.mat (Active)	C:\Users\ivane\Documents\GitHub\hybrid-controller\Hybrid-controller\Test\Integration Test\Inputs\Scenario3.mat	Successfully mapped inputs.

Configuration Settings Overrides

Configuration settings	Do not override model settings
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Logical and Temporal Assessments

Assessments

Enabled	Name	Definition	Requirements
True	Assessment1	At any point of time, if AccPedal > 0 becomes true then, with a delay of at most 0.4 seconds , ICEdem == 0 & MGUdem == 1 & Brake == 0 must be true	

Symbols

Symbol	Scope	Metadata	
AccPedal	Signal	Name	AccPedal:1
		Path	ControllerModel/AccPedal
		Port Index	1
		Field/Element	
ICEdem	Signal	Name	Controller:1
		Path	ControllerModel/Controller

Symbol	Scope	Metadata	
		Port Index	1
		Field/Element	
MGUdem	Signal	Name	Controller:3
		Path	ControllerModel/Controller
		Port Index	3
		Field/Element	
Brake	Signal	Name	Controller:2
		Path	ControllerModel/Controller
		Port Index	2
		Field/Element	

1.1.4. Test Case 4

Test Details

Description	Scenario 4: No charge conditions
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INPUTS conditions:

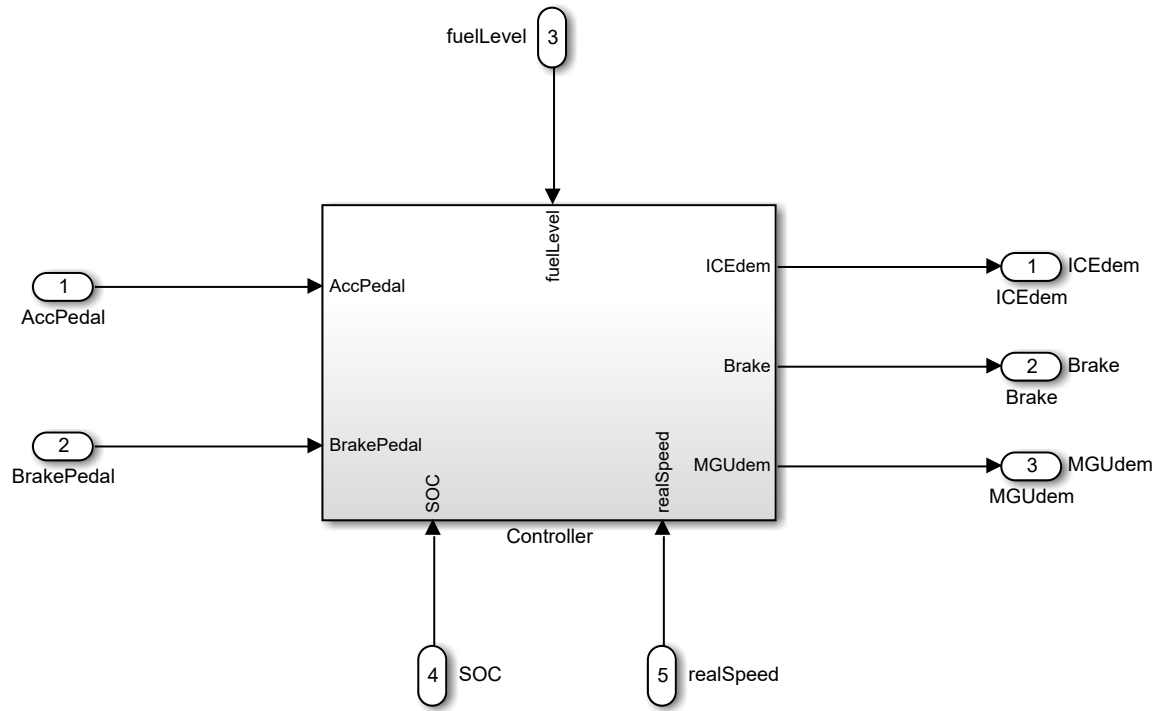
- request AccPedal > MaxAccICE (t = 5s)
- Low speed condtions
- BrakePedal: 0
- SOC < SOCMin
- Fuel > fuelMin

EXPECTED OUTPUT:

Only ICE mode and saturation at max value of ICE request: expected saturation of the ICE torque request because of the higher AccPedal (higher with respect to the maximum ICE acceleration) request after 5s. No MGU request expected due to low SOC level.

System Under Test

Model Name: ControllerModel



Simulation Settings Overrides

Simulation Mode	Model Settings
Releases	Current

External Inputs

Name	File Path	Status
Scenario4.mat (Active)	C:\Users\ivane\Documents\GitHub\hybrid-controller\Hybrid-controller\Test\Integration Test\Inputs\Scenario4.mat	Successfully mapped inputs.

Configuration Settings Overrides

Configuration settings	Do not override model settings
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Logical and Temporal Assessments

Assessments

Enabled	Name	Definition	Requirements
True	Assessment1	At any point of time, if AccPedal > 0 becomes true then, with a delay of at most 0.4 seconds , ICEdem == 1 & MGUdem == 0 & Brake == 0 must be true	

Symbols

Symbol	Scope	Metadata	
AccPedal	Signal	Name	AccPedal:1
		Path	ControllerModel/AccPedal
		Port Index	1
		Field/Element	
ICEdem	Signal	Name	Controller:1
		Path	ControllerModel/Controller

Symbol	Scope	Metadata	
		Port Index	1
		Field/Element	
MGUdem	Signal	Name	Controller:3
		Path	ControllerModel/Controller
		Port Index	3
		Field/Element	
Brake	Signal	Name	Controller:2
		Path	ControllerModel/Controller
		Port Index	2
		Field/Element	

1.1.5. Test Case 5

Test Details

Description	Scenario 5: Combined and Regen. braking transition
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INPUTS conditions:

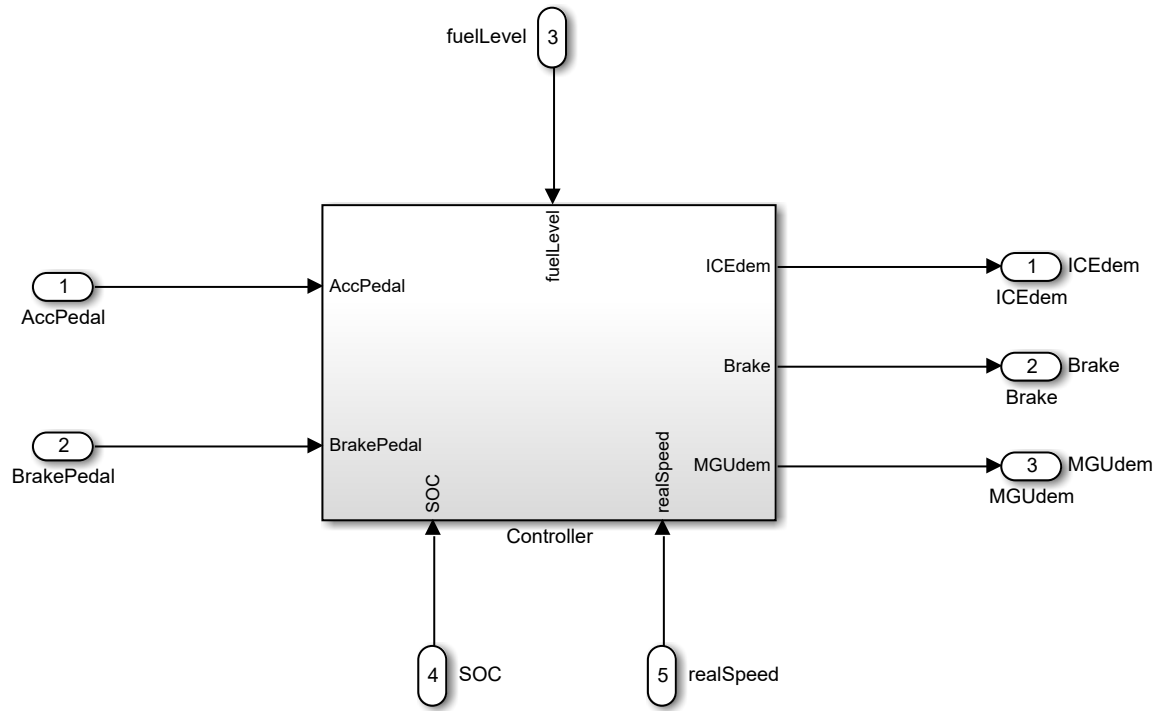
- request AccPedal > MaxAccMGU (t = 5s)
- High speed condtions
- BrakePedal: != 0 at t = 5s
- SOC > SOCMin
- Fuel > fuelMin

EXPECTED OUTPUT:

Both MGU and ICE requests, Regen. braking when braking: in this case car is traveling at high speed, so that the controller cannot work in Electrical Drive only. Both fuel and SOC are above the minimum for working. When braking, Regen. braking state is expected.

System Under Test

Model Name: ControllerModel



Simulation Settings Overrides

Simulation Mode	Model Settings
Releases	Current

External Inputs

Name	File Path	Status
Scenario5.mat (Active)	C:\Users\ivane\Documents\GitHub\hybrid-controller\Hybrid-controller\Test\Integration Test\Inputs\Scenario5.mat	Successfully mapped inputs.

Configuration Settings Overrides

Configuration settings	Do not override model settings
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Logical and Temporal Assessments

Assessments

Enabled	Name	Definition	Requirements
True	Assessment1	At any point of time, whenever AccPedal > 0 is true then, with a delay of at most 0.2 seconds , ICEdem > 0 & MGUdem > 0 & Brake == 0 must be true	
True	Assessment2	At any point of time, whenever BrakePedal > 0 is true then, with a delay of at most 0.4 seconds , MGUdem < 0 & ICEdem == 0 & Brake > 0 must be true	

Symbols

Symbol	Scope	Metadata	
AccPedal	Signal		
		Name	AccPedal:1
		Path	ControllerModel/AccPedal
		Port Index	1
		Field/Element	

Symbol	Scope	Metadata	
ICEdem	Signal		
		Name	Controller:1
		Path	ControllerModel/Controller
		Port Index	1
		Field/Element	
MGUdem	Signal		
		Name	Controller:3
		Path	ControllerModel/Controller
		Port Index	3
		Field/Element	
Brake	Signal		
		Name	Controller:2
		Path	ControllerModel/Controller
		Port Index	2
		Field/Element	

Symbol	Scope	Metadata	
BrakePedal	Signal	Name	BrakePedal:1
		Path	ControllerModel/BrakePedal
		Port Index	1
		Field/Element	

1.1.6. Test Case 6

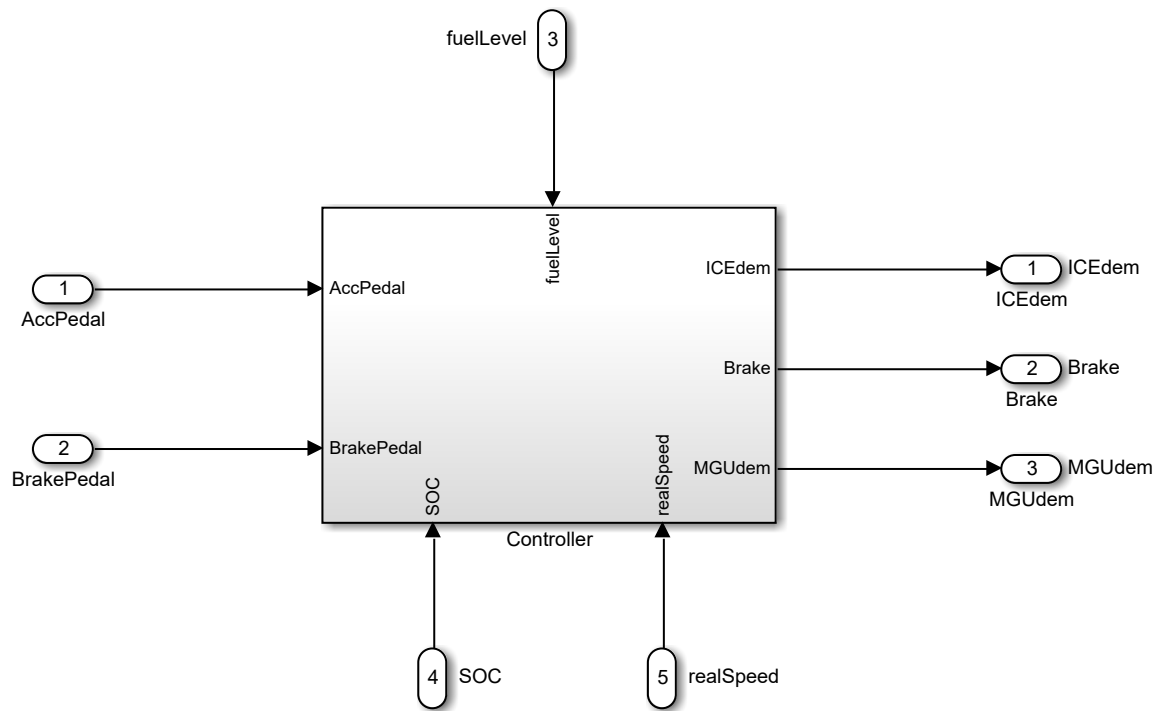
Test Details

Description	<p>Scenario 6: Dead conditions (no fuel, no charge) and Regen. braking</p> <p>INPUTS conditions:</p> <ul style="list-style-type: none"> - request AccPedal (until t = 5s) - Low speed condtions - BrakePedal: != 0 at t = 5s - SOC < SOCMin - Fuel < fuelMin <p>EXPECTED OUTPUT:</p> <ul style="list-style-type: none"> - ICEdem == MGUdem == 0. - When Brake > 0 MGUdem < 0
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SOC and fuel are below the minimum and there is a request from AccPedal. The system must provide zero output in this particular condition, but must also be able to switch to Regenerative Braking when there comes BrakePedal request.

System Under Test

Model Name: ControllerModel



Simulation Settings Overrides

Simulation Mode	Model Settings
Releases	Current

External Inputs

Name	File Path	Status
Scenario6.mat (Active)	C:\Users\livane\Documents\GitHub\hybrid-controller\Hybrid-controller\Test\Integration Test\Inputs\Scenario6.mat	Successfully mapped inputs.

Configuration Settings Overrides

Configuration settings	Do not override model settings
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Logical and Temporal Assessments

Assessments

Enabled	Name	Definition	Requirements
True	Assessment1	At any point of time, whenever AccPedal > 0 is true then, with no delay, ICEdem == 0 & MGUdem == 0 & Brake == 0 must be true	
True	Assessment2	At any point of time, whenever BrakePedal > 0 is true then, with a delay of at most 0.25 seconds , Brake > 0 must be true	
True	Assessment3	At any point of time, whenever BrakePedal > 0 is true then, with a delay of at most 0.4 seconds , MGUdem < 0 & MGUdem < 1 must be true	

Symbols

Symbol	Scope	Metadata	
AccPedal	Signal	Name	AccPedal:1
		Path	ControllerModel/AccPedal
		Port Index	1
		Field/Element	
ICEdem	Signal	Name	Controller:1
		Path	ControllerModel/Controller
		Port Index	1
		Field/Element	
MGUdem	Signal	Name	Controller:3
		Path	ControllerModel/Controller
		Port Index	3
		Field/Element	

Symbol	Scope	Metadata	
Brake	Signal	Name	Controller:2
		Path	ControllerModel/Controller
		Port Index	2
		Field/Element	
BrakePedal	Signal	Name	BrakePedal:1
		Path	ControllerModel/BrakePedal
		Port Index	1
		Field/Element	

1.1.7. Test Case 7

Test Details

Description	<p>Scenario 7: Increasing speed</p> <p>INPUTS conditions:</p> <ul style="list-style-type: none">- request AccPedal- Speed uniformly increasing up to above the Max-SpeedMGU
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1. IntegrationTest

- BrakePedal: 0

- SOC > SOCMin

- Fuel > fuelMin

EXPECTED OUTPUT:

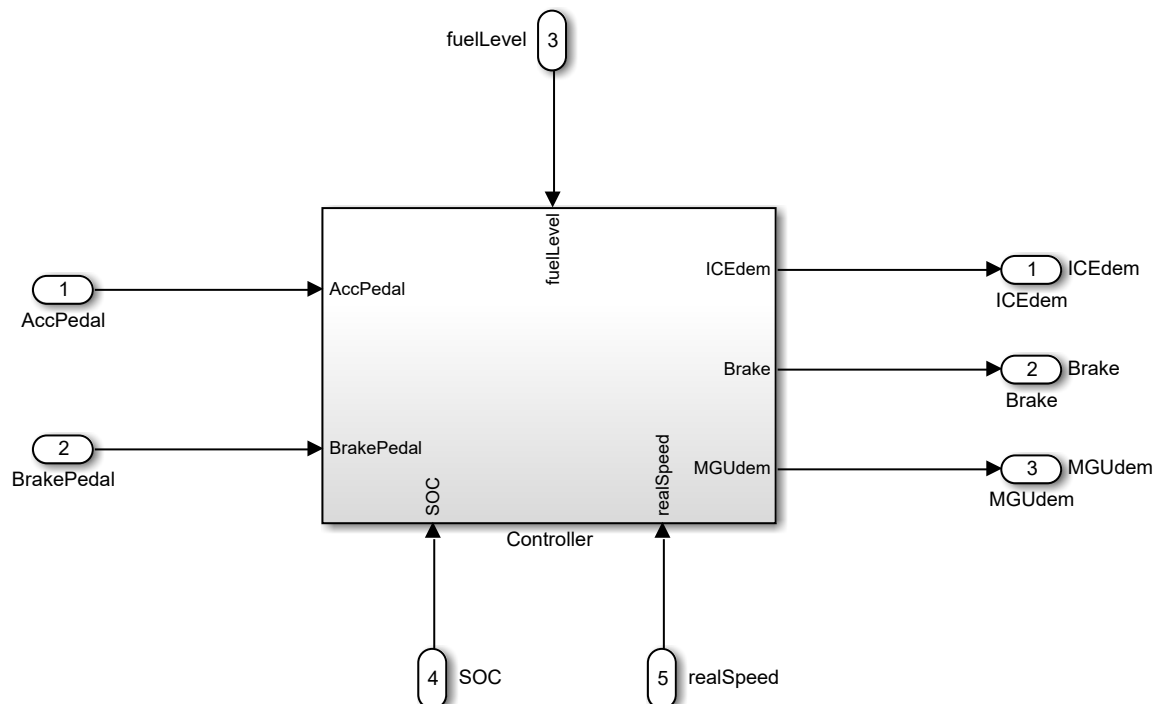
- ICEdem != 0

- MGUdem != 0

Vehicle is driving in a town environment at low speed, then gets in an extraurban scenario, travelling at higher speed. Here the controllers shall be able to switch from Electrical drive to Combined mode, demanding torque to both engines.

System Under Test

Model Name: ControllerModel



Simulation Settings Overrides

Simulation Mode	Model Settings
Releases	Current

External Inputs

Name	File Path	Status
Scenario7.mat (Active)	C:\Users\ivane\Documents\GitHub\hybrid-controller\Hybrid-controller\Test\Integration Test\Inputs\Scenario7.mat	Successfully mapped inputs.

Configuration Settings Overrides

Configuration settings	Do not override model settings
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Logical and Temporal Assessments

Assessments

Enabled	Name	Definition	Requirements
True	Assessment1	At any point of time, whenever RealSpeed > 45 is true then, with a delay of at most 0.4 seconds , ICEdem > 0 must be true	
True	Assessment2	At any point of time, whenever AccPedal > 0 & RealSpeed > 45 is true then, with a delay of at most 0.2 seconds , MGUdem > 0 & ICEdem > 0 must be true	

Symbols

Symbol	Scope	Metadata	
RealSpeed	Signal	Name	realSpeed:1
		Path	ControllerModel/realSpeed
		Port Index	1
		Field/Element	
ICEdem	Signal	Name	Controller:1
		Path	ControllerModel/Controller
		Port Index	1
		Field/Element	
AccPedal	Signal	Name	AccPedal:1
		Path	ControllerModel/AccPedal
		Port Index	1
		Field/Element	

Symbol	Scope	Metadata	
MGUdem	Signal		
		Name	Controller:3
		Path	ControllerModel/Controller
		Port Index	3
		Field/Element	

1.1.8. Test Case 8

Test Details

Description	<p>Scenario 8: Recharging</p> <p>INPUTS conditions:</p> <ul style="list-style-type: none"> - AccPedal: <ul style="list-style-type: none"> - request up to t = 5s - request between t = 7s and t = 10s - Low Speed - BrakePedal: request between at t = 5s and t = 7s - SOC < SOCMin until t = 7s - Fuel > fuelMin <p>EXPECTED OUTPUT:</p>
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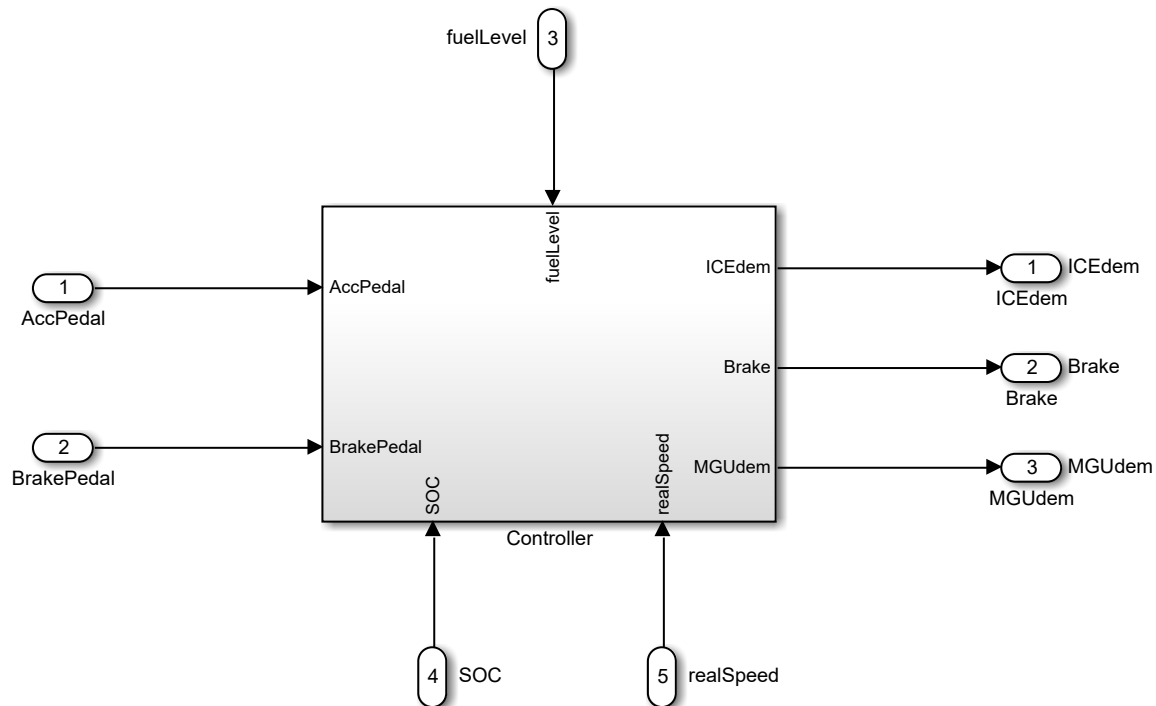
- SOC increasing

- When SOC > SOCmin, MGUdem != 0

Vehicle starts with an almost empty battery, using only the IC engine. During the drive, the battery recharges through Regenerative Braking and when the State Of Charge is sufficient, the controller can require torque to the MGU.

System Under Test

Model Name: ControllerModel



Simulation Settings Overrides

Simulation Mode	Model Settings
Releases	Current

External Inputs

Name	File Path	Status
Scenario8.mat (Active)	C:\Users\livane\Documents\GitHub\hybrid-controller\Hybrid-controller\Test\Integration Test\Inputs\Scenario8.mat	Successfully mapped inputs.

Configuration Settings Overrides

Configuration settings	Do not override model settings
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Logical and Temporal Assessments

Assessments

Enabled	Name	Definition	Requirements
True	Assessment1	At any point of time, whenever SOC > 15 & AccPedal > 0 is true then, with a delay of at most 0.4 seconds , MGUdem > 0 must be true	

Symbols

Symbol	Scope	Metadata
SOC	Signal	
		Name
		Path
		Port Index
		SOC:1
		ControllerModel/SOC
		1

Symbol	Scope	Metadata	
		Field/Element	
AccPedal	Signal	Name	AccPedal:1
		Path	ControllerModel/AccPedal
		Port Index	1
		Field/Element	
MGUdem	Signal	Name	Controller:3
		Path	ControllerModel/Controller
		Port Index	3
		Field/Element	