Requirements Report for ACC_System

Table of Contents

List of Tables

Chapter 1. Model Information for "ACC_System"

Table 1.1. ACC_System

ModelVersion	1.36	*ConfigurationManager*	N/A
Created	Sat Mar 25 18:49:37 2023	*Creator*	jamesbond
LastModifiedDate	Sat Apr 01 01:23:19 2023	*LastModifiedBy*	jamesbond

Chapter 2. Traceability Summary for "ACC_System"

Table 2.1. Artifacts linked in model

ID	Artifact names stored by RMI	Last modified	# links
DOC1	ACC.slreqx	Sat Apr 01 21:04:00 2023	5

Chapter 3. System - Subsystem

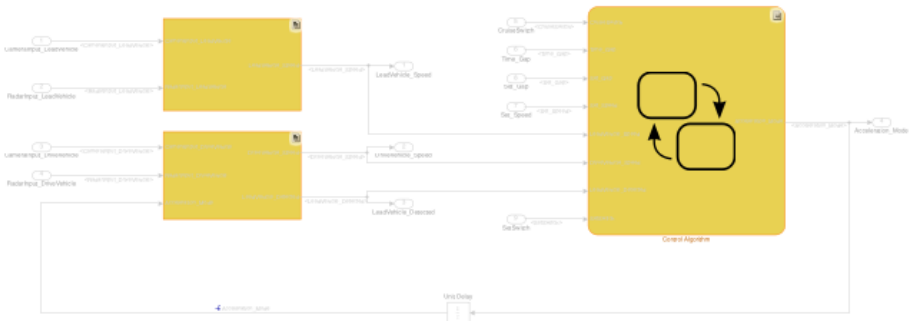

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Table 3.1. Objects in ACC_System/Subsystem that have Requirement Links

Linked Object	Requirements Data

Linked Object	Requirements Data	
Control Algorithm	1. "ACC_Control_Algorithm_SwReq_03" ------- Details from ACC.slreqx: ------- Description: Adaptive Cruise Control feature has 3 major modes of operation: OFF Mode, STANDBY Mode & ON Mode. This particular requirement has to be implemented as state machine logic in Simulink. The input signals to this state machine system are (Signal Name: Time_Gap, Set_Speed, Set_Gap, CruiseSwitch, SetSwitch). Also, the output signals (Signal Name: DriveVehicle_Speed & LeadVehicle_Detected) from requirement-2 is fed back as an input signal into this state machine block. Additionally, output signal (Signal Name: LeadVehicle_Speed) from requirement-1 is given as an input signal to this state machine block as well. Output from this subsystem is a signal (Signal Name: Acceleration_Mode) which governs the vehicular speed of the drive vehicle which automatically adjusts its speed & velocity to match the lead vehicle.	DOC1, at "3"

Table 3.2. Objects in "Subsystem" that are not linked to requirements

Name	Type
Acceleration_Mode	Outport
CameraInput_DriveVehicle	Inport
CameraInput_LeadVehicle	Inport
CruiseSwitch	Inport
DriveVehicle_Speed	Outport
LeadVehicle_Detected	Outport
LeadVehicle_Speed	Outport
RadarInput_DriveVehicle	Inport
RadarInput_LeadVehicle	Inport
Set_Gap	Inport
Set_Speed	Inport
SetSwitch	Inport
Time_Gap	Inport
Unit Delay	UnitDelay

Chapter 4. System - Subsystem

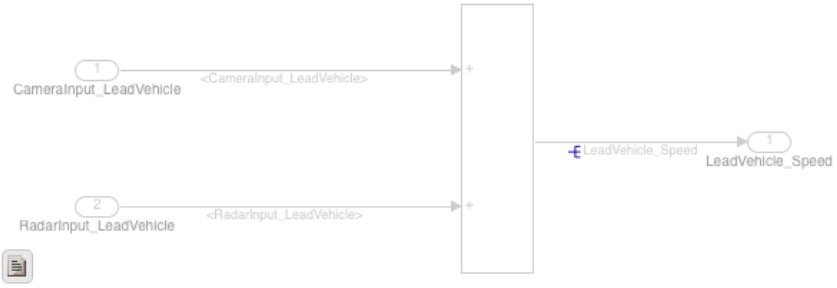

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Table 4.1. ACC_System/Subsystem/Subsystem Requirements Data

Link#	Link Description	Link Target (document name and location ID)
1.	"LeadVehicle_SwReq_01" ------- Details from ACC.slreqx: ------- Description: Lead Vehicle is a vehicle which is driving in the road ahead of our drive vehicle. Two input signals (Signal Name: CameraInput_LeadVehicle & RadarInput_LeadVehicle). Ideally sensor fusion techniques will be deployed to process & analyze data from camera & radar. For complexity reasons, let's not adapt to any such algorithms. We can simply add both the radar & camera inputs & the corresponding output is read as Speed profile output (Signal Name: LeadVehicle_Speed). Speed data of the lead vehicle is critical in implementing the Adaptive Cruise Control algorithm.	DOC1, at "1"

Table 4.2. Objects in "Subsystem" that are not linked to requirements

Name	Type
Add	Sum
CameraInput_LeadVehicle	Inport
LeadVehicle_Speed	Outport

Name	Type
RadarInput_LeadVehicle	Inport

Chapter 5. System - Subsystem1

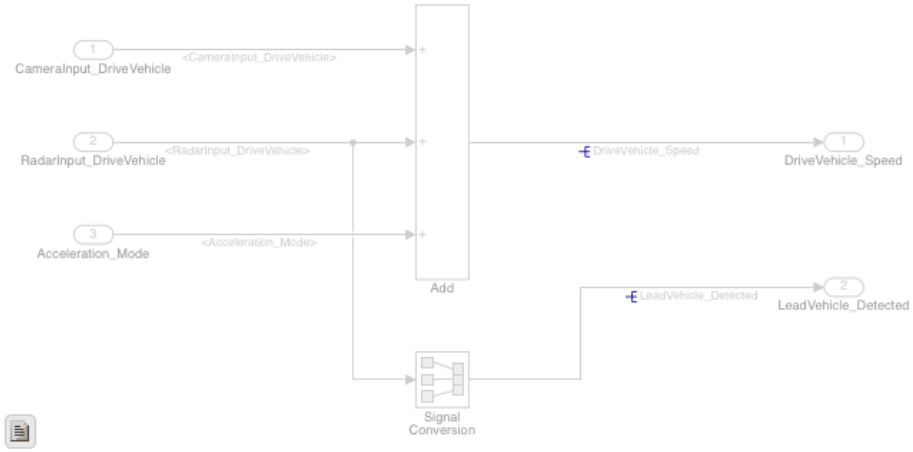

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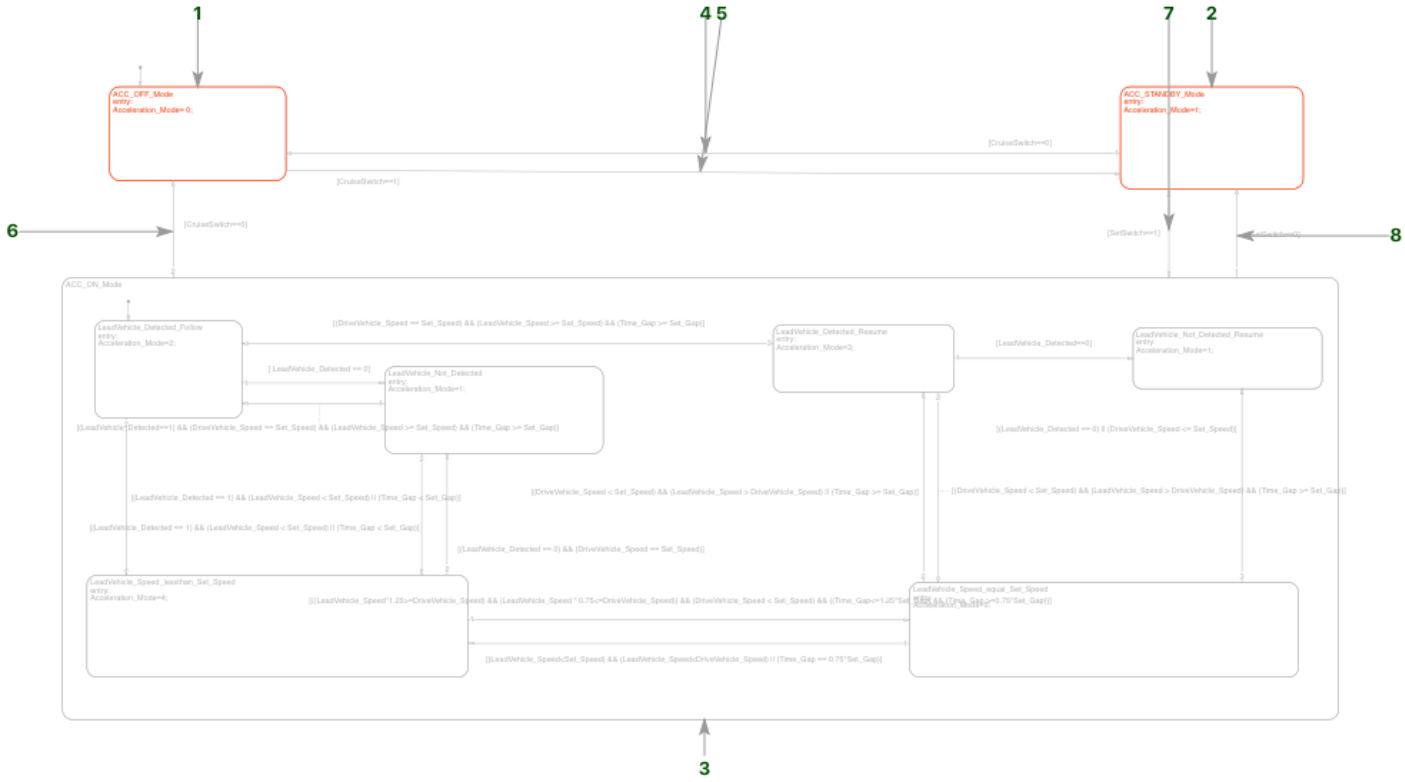
Table 5.1. ACC_System/Subsystem/Subsystem1 Requirements Data

Link#	Link Description	Link Target (document name and location ID)
1.	"DriveVehicle_SwRqe_02" ------- Details from ACC.slreqx: ------- Description: Drive Vehicle is the vehicle driven by the user & this is the vehicle which has ACC algorithm in it. Like the Lead Vehicle, Drive Vehicle algorithm also has 2 input signals (Signal Name: CameraInput_DriveVehicle, RadarInput_DriveVehicle) & one signal coming as an Input to this subsystem (Signal Name: Acceleration_Mode) – three inputs into this requirement in total. Like the above requirement, sensor fusion techniques will also be deployed here, for complexity reasons we are ignoring them. Two output signals come from this subsystem (Signal Name: DriveVehicle_Speed & LeadVehicle_Detected). Signal DriveVehicle_Speed is summation of three input signals mentioned above & LeadVehicle_Detected is renamed from Input Signal RadarInput_DriveVehicle by mere use of Signal Conversion block.	DOC1, at "2"

Table 5.2. Objects in "Subsystem1" that are not linked to requirements

Name	Type
Acceleration_Mode	Inport
Add	Sum
CameraInput_DriveVehicle	Inport
DriveVehicle_Speed	Outport
LeadVehicle_Detected	Outport
RadarInput_DriveVehicle	Inport
Signal Conversion	SignalConversion

Chapter 6. Chart - Control Algorithm



(1) ACC_OFF_Mode
(2) ACC_STANDBY_Mode
(3) ACC_ON_Mode
(4) [CruiseSwitch==0]
(5) [CruiseSwitch==1]
(6) [CruiseSwitch==0]
(7) [SetSwitch==1]
(8) [SetSwitch==0]

Table 6.1. Chart Requirements

Link#	Link Description	Link Target (document name and location ID)
1.	"ACC_Control_Algorithm_SwReq_03" ------- Details from ACC.slreqx: ------- Description: Adaptive Cruise Control feature has 3 major modes of operation: OFF Mode, STANDBY Mode & ON Mode. This particular requirement has to be implemented as state machine logic in Simulink. The input signals to this state machine system are (Signal Name: Time_Gap, Set_Speed, Set_Gap, CruiseSwitch, SetSwitch). Also, the output signals (Signal Name: DriveVehicle_Speed & LeadVehicle_Detected) from requirement-2 is fed back as an input signal into this state machine block. Additionally, output signal (Signal Name: LeadVehicle_Speed) from requirement-1 is given as an input signal to this state machine block as well. Output from this subsystem is a signal (Signal Name: Acceleration_Mode) which governs the vehicular speed of the drive vehicle which automatically adjusts its speed & velocity to match the lead vehicle.	DOC1, at "3"

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Table 6.2. Objects in "Control Algorithm" that have requirements

Linked Object	Requirements

Linked Object	Requirements	
ACC_OFF_Mode	1. "ACC_Control_Algorithm_SwReq_03" ------- Details from ACC.slreqx: ------- Description: Adaptive Cruise Control feature has 3 major modes of operation: OFF Mode, STANDBY Mode & ON Mode. This particular requirement has to be implemented as state machine logic in Simulink. The input signals to this state machine system are (Signal Name: Time_Gap, Set_Speed, Set_Gap, CruiseSwitch, SetSwitch). Also, the output signals (Signal Name: DriveVehicle_Speed & LeadVehicle_Detected) from requirement-2 is fed back as an input signal into this state machine block. Additionally, output signal (Signal Name: LeadVehicle_Speed) from requirement-1 is given as an input signal to this state machine block as well. Output from this subsystem is a signal (Signal Name: Acceleration_Mode) which governs the vehicular speed of the drive vehicle which automatically adjusts its speed & velocity to match the lead vehicle.	DOC1, at "3"
ACC_STANDBY_Mode	1. "ACC Standby Mode state logic_03_02" ------- Details from ACC.slreqx: ------- Description: This is the second activated state inside state machine logic. Output signal Acceleration_Mode is at value 1 in this state. This state is governed by both input signals CruiseSwitch & SetSwitch. If CruiseSwitch is equal to 1, state ACC STANDBY mode will get activated. If CruiseSwitch is equal to 0, state ACC OFF mode will get activated, from either ACC ON mode or ACC STANDBY mode If SetSwitch is equal to 1, state ACC ON mode will get activated. If SetSwitch is equal to 0, state ACC STANDBY mode will get activated.	DOC1, at "7"

Table 6.3. Objects in "Control Algorithm" that are not linked to requirements

Name	Type
ACC_ON_Mode	State
Default Transition 2	Transition
[CruiseSwitch==0]	Transition
[CruiseSwitch==1]	Transition
[CruiseSwitch==0]	Transition
[SetSwitch==1]	Transition
[SetSwitch==0]	Transition
LeadVehicle_Detected_Follow	State
LeadVehicle_Detected_Resume	State
LeadVehicle_Not_Detected_Resume	State
LeadVehicle_Not_Detected	State
LeadVehicle_Speed_lessthan_Set_Speed	State
LeadVehicle_Speed_equal_Set_Speed	State
Default Transition 10	Transition
[(DriveVehicle_Speed == Set_Speed) && (LeadVehicle_Speed >= Set_Speed) && (Time_Gap >= Set_Gap)]	Transition
[LeadVehicle_Detected==0]	Transition
[LeadVehicle_Detected == 0]	Transition
[(LeadVehicle_Detected == 0) || (DriveVehicle_Speed <= Set_Speed)]	Transition
[(DriveVehicle_Speed < Set_Speed) && (LeadVehicle_Speed > DriveVehicle_Speed) || (Time_Gap >= Set_Gap)]	Transition
[(DriveVehicle_Speed < Set_Speed) && (LeadVehicle_Speed > DriveVehicle_Speed) && (Time_Gap >= Set_Gap)]	Transition
[(LeadVehicle_Detected==1) && (DriveVehicle_Speed == Set_Speed) && (LeadVehicle_Speed >= Set_Speed) && (Time_Gap >= Set_Gap)]	Transition
[(LeadVehicle_Detected == 1) && (LeadVehicle_Speed < Set_Speed) || (Time_Gap < Set_Gap)]	Transition
[(LeadVehicle_Detected == 1) && (LeadVehicle_Speed < Set_Speed) || (Time_Gap < Set_Gap)]	Transition
[(LeadVehicle_Detected == 0) && (DriveVehicle_Speed == Set_Speed)]	Transition
[((LeadVehicle_Speed*1.25>=DriveVehicle_Speed) && (LeadVehicle_Speed * 0.75<=DriveVehicle_Speed)) && (DriveVehicle_Speed < Set_Speed) && ((Time_Gap<=1.25*Set_Gap) && (Time_Gap >=0.75*Set_Gap))]	Transition
[(LeadVehicle_Speed<Set_Speed) && (LeadVehicle_Speed<DriveVehicle_Speed) || (Time_Gap == 0.75*Set_Gap)]	Transition

Chapter 7. Systems in "ACC_System" that have no links to requirements

Table 7.1. Systems and subsystem blocks in "ACC_System" that have no links to requirements

Model or subsystem block	Children with links
ACC_System	None
ACC_System/Subsystem	3 out of 17