Requirement : #1 **Requirement Type:** Nonfunctional **Use Case:** #5

Introduction: The first action that has to be performed is turning on Cruise Control System. It is necessary for all other functions that Cruise Control System has.

Rationale: The cruise control function allows the driver of a car to maintain speed without pressing the accelerator pedal. It is necessary to ensure that CSS affects the car only if the system is turned on.

Author: Dovile Vitonyte, Marek Strelec

Inputs:

- Speed sensor
- Brake pedal sensor
- Engine sensor
- Throttle value
- Dashboard
- Accelerator pedal sensor

Requirement Description:

- The driver shall be able to turn on the CCS
- The CCS shall switch on only if:

1. Engine is running
    1. A sensor connected to the engine sends signal every second about the engine state
2. The speed is at least 40 km/h
    1. A speed sensor that measures the actual speed of the car every second. Speed of the car shall be between 0 and 250 km/h.
3. The brake pedal is not depressed
    1. Brake pedal sensor sends signal every second to indicate if the pedal is pressed or released

- If the CCS is switched on, then it shall maintain the measured speed within a margin of 1.5 km/h of the desired speed.

Outputs: The system is switched on and all related functions are ready to use.

Persistent Changes: None

User Satisfaction: 5 **User Dissatisfaction:** 5

Related Requirements: None

Conflicts: None

Support Materials: None

Requirement: #2 **Requirement Type:** Functional **Use Case:** #5

Introduction: The driver can use this function to turn on the CSS with the speed set before it was switched off.

Rationale: It is more comfortable for the driver to use only Resume button. He does not have to remember the previous speed and in a case of interruption, the driver can easily continue driving.

Author: Dovile Vitonyte, Marek Strelec

Inputs:

- Cruising speed data
- Speed sensor
- Brake pedal sensor
- Engine sensor
- Throttle value
- Dashboard
- Accelerator pedal sensor

Requirement Description:

- The driver shall be able to select Resume Speed function
- The Resume Speed function shall be available if and only if:

1. The engine is running
    a. Sensor connected to the engine sends signal every second
2. The brake pedal is released
    a. The sensor connected to the brake sends signal every second
3. Current car speed is at least 40 km/h
    a. Speed sensor sends signal every second and the speed shall be between 0 and 250 km/h

- If the previous desired speed is greater than the current speed, then the CCS shall accelerate the car
- If the previous desired speed is less than the current speed, then the CCS shall decelerate the car
- If no previous speed data available, the the CCS shall record current speed as desired speed

Outputs: Value for the engine throttle setting

Persistent Changes: None

User Satisfaction: 5 **User Dissatisfaction:** 5

Related Requirements: #4

Conflicts: None

Support Materials: Any documents, graphs, etc., that are related to this requirement.

Test Cases: TBD

Requirement: #3 **Requirements Type:** Functional **Use Case:** #4

Introduction: Stop Cruising function allows driver to control the speed of the car manually. This is one of the main functions of this system. It absolutely necessary that it works without problems.

Rationale: The driver must be able to switch off the CSS at any time. This is mainly because of security.

Author: Dovile Vitonyte, Marek Strelec

Inputs:

- Speed sensor
- Brake pedal sensor
- Engine sensor
- Throttle value
- Dashboard
- Accelerator pedal sensor

Requirement Description:

- The driver shall be able to switch off the CSS
- When Cruise Control System is switched off by the driver, throttle shall be closed in a smooth manner at (diff/5) * 4 m/s^2 where engine throttle setting *(diff)* shall be set at value between 0 and 5
- When CCS is switched off by the engine or by the brake pedal, throttle shall close itself completely immediately

Outputs: The throttle value

Persistent Changes: The current measured speed is saved to the system

User Satisfaction: 5 **User Dissatisfaction:** 5

Related Requirements: #1

Conflicts: None

Support Materials: None

Test Cases: TBD

Requirement #: 4 Requirements Type: Functional Use Case: #4

Introduction: Storing Cruising Speed function allows the driver to perform Speed Resume function as well as to perform Accelerating using Cruise Control System

Rationale: Storing Cruising Speed function writes all speed data to the system so that this data could be used for Resume Cruising function as well as for Start Accelerating function

Author: Dovile Vitonyte, Marek Strelec

Inputs:

- Speed sensor
- Brake pedal sensor
- Engine sensor
- Throttle value
- Dashboard
- Accelerator pedal sensor

Requirement Description:

- The Cruise Control System shall store the speed of the car whenever it is switched on

1. When the driver switches on the CCS, it shall store current car speed as desired speed
    a. The speed sensor sends a signal every second
2. When the driver starts accelerating by the CCS, it should store desired speed as the speed was achieved just before stopping accelerating
3. When the driver starts accelerating manually by the accelerator pedal, the CCS shall store the desired speed as the speed before acceleration was started
4. When the driver stops cruising, the CCS shall store the latest cruising speed as the desired speed
5. The latest desired speed should be available as an initial speed if the drive uses the resume function

- The data about cruising speed shall be available whenever the CCS is running

Outputs: None

Persistent Changes: The current measured speed is updated in the system

User Satisfaction: 5 **User Dissatisfaction:** 5

Related Requirements: #1, #5, #6

Conflicts: None

Support Materials: None

Test Cases: TBD

Requirement: #5 **Requirements Type:** Functional **Use Case:** #2

Introduction: Accelerating function in the Cruise Control System allows the driver accelerate the car automatically by using Cruise Control System without pressing accelerator pedal

Rationale: It is convenient for the driver to accelerate the vehicle without using accelerator pedal, only with the use of Cruising Control

Author: Dovile Vitonyte, Marek Strelec

Inputs:

- Speed sensor
- Brake pedal sensor
- Engine sensor
- Throttle value
- Dashboard
- Accelerator pedal sensor

Requirement Description:

- The driver shall be able to accelerate the car without pressing accelerator pedal, only within the use of CCS.
    1. The CCS shall accelerate the car with acceleration at 2 m/s^2 if the accelerating command was given and if the CCS is on
- When CCS is on, the driver also shall be able to accelerate by pushing acceleration pedal
    1. When driver accelerates by pedal, sensor connected to the accelerator also gives the engine throttle set by accelerator.
    2. If the driver depresses accelerator pedal while Accelerate by Button function selected, then throttle value is set to the higher value corresponding to the speed or to the accelerator pedal position.
    3. If the driver releases accelerator after depressing it during automatic acceleration by CCS, the throttle position should be set to the corresponding current speed and CCS will still accelerate the car.
- When the driver releases the accelerator pedal, speed shall be returned to the most recent speed that was achieved by automatic CCS acceleration

Outputs: Value for the engine throttle setting

Persistent Changes: None

User Satisfaction: 5 **User Dissatisfaction:** 5

Related Requirements: Requirement #1

Conflicts: None

Support Materials: None

Test Cases: TBD

Requirement: #6 Requirements Type: Functional Use Case: #3

Introduction: Stop Acceleration function allow the driver to start controlling car speed by pressing accelerator pedal

Rationale: It is highly desirable to implement this functionality. This function complements requirement #5

Author: Dovile Vitonyte, Marek Strelec

Inputs:

- Speed sensor
- Brake pedal sensor
- Engine sensor
- Throttle value
- Dashboard
- Accelerator pedal sensor

Requirement Description:

- The driver shall be able to stop automatic CCS acceleration
- After automatic CCS acceleration is stopped, the CCS shall maintain current speed achieved before stopping accelerating

Outputs: The throttle value

Persistent Changes: None

User Satisfaction: 5 **User Dissatisfaction:** 5

Related Requirements: #1

Conflicts: None

Support Materials: None

Test Cases: TBD

Requirement: #7 **Requirements Type:** Functional **Use Case:** #3

Introduction: It is convenient for the driver to accelerate the vehicle by the accelerator pedal while Cruise Control System is turned on

Rationale: It is highly desirable for the driver to accelerate the vehicle with the accelerator pedal for a desired moment without disabling CCS

Author: Dovile Vitonyte, Marek Strelec

Inputs:

- Speed sensor
- Brake pedal sensor
- Accelerator pedal sensor
- Engine sensor
- Throttle value
- Dashboard

Requirement Description:

- The driver shall be able to accelerate the car by the pedal while CCS is currently running
    1. When the driver depresses accelerator pedal, the throttle value is set to the highest value corresponding to the current vehicle speed or to the position of accelerator pedal.
    2. When the driver releases the accelerator pedal, throttle position is set to the previous position that was achieved before accelerating by pedal

Outputs: The throttle value

Persistent Changes: None

User Satisfaction: 5 **User Dissatisfaction:** 5

Related Requirements: #1

Conflicts: None

Support Materials: None

Test Cases: TBD