Requirements and Test Cases from Use Cases 6 and 9

These are copied from VALU3S deliverable D1.2.

Use Case 6 (Agriculture)

Requirements

Taken from Table 2.6

Requirement ID	Corresponding evaluation scenario ID(s)	Textual Description	Supporting information
UC6_R_1	VALU3S_WP1_Agriculture_1	The system shall check GPS connection before switching to parallel guidance	Safety
UC6_R_2	VALU3S_WP1_Agriculture_1	The system shall check IMU connection before switching to parallel guidance	Safety
UC6_R_3	VALU3S_WP1_Agriculture_1	Vehicle shall stop in case of any not recoverable error	Safety
UC6_R_4	VALU3S_WP1_Agriculture_1	System shall be robust against sporadic errors (e.g. invalid GPS positions, wrong heading angle)	Safety
UC6_R_5	VALU3S_WP1_Agriculture_1	The driving cycle shall be 9 hours	Safety, Performance
UC6_R_6	VALU3S_WP1_Agriculture_1	System shall detect and drop unwanted requests to switch to parallel guidance	Cybersecurity, Safety
UC6_R_7	VALU3S_WP1_Agriculture_1	Assessment of the risk level of this operation should be performed	Safety
UC6_R_8	VALU3S_WP1_Agriculture_1	the control shall be performed every 200ms	Performance, Safety

Requirement ID	Corresponding evaluation scenario ID(s)	Textual Description	Supporting information
UC6_R_9	VALU3S_WP1_Agriculture_3	The vehicle shall detect disconnection from the remote control	Safety
UC6_R_10	VALU3S_WP1_Agriculture_3	The communication shall be protected with EndToEnd CRC	Privacy
UC6_R_11	VALU3S_WP1_Agriculture_3	Authentication procedure shall be performed before starting the communication	Privacy
UC6_R_12	VALU3S_WP1_Agriculture_3	Only one remote control shall be supported at the same time	Functional
UC6_R_13	VALU3S_WP1_Agriculture_3	Assessment of the risk level of this threat should be performed	safety
UC6_R_14	VALU3S_WP1_Agriculture_2	The vehicle shall stop before switching to manual mode	Functional
UC6_R_15	VALU3S_WP1_Agriculture_2	Vehicle shall verify the identity of the remote controller before it accepts command after switching to manual mode	Cybersecurity, Safety
UC6_R_16	VALU3S_WP1_Agriculture_2	System shall detect and drop unwanted requests to switch to manual mode	Cybersecurity, Safety
UC6_R_17	VALU3S_WP1_Agriculture_2	Assessment of the risk level of this operation should be performed	safety
UC6_R_18	VALU3S_WP1_Agriculture_4	The communication shall be protected with EndToEnd CRC	Privacy

Requirement ID	Corresponding evaluation scenario ID(s)	Textual Description	Supporting information
UC6_R_19	VALU3S_WP1_Agriculture_4	The vehicle shall detect disconnection from the IMU	Safety
UC6_R_20	VALU3S_WP1_Agriculture_4	The vehicle shall stop if the IMU fails	Safety
UC6_R_21	VALU3S_WP1_Agriculture_4	Assessment of the risk level of this threat should be performed	Safety

Test Cases

Taken from Table 2.7

Test case ID	Corresponding requirement ID(s)	Textual Description	Supporting information
UC6_TC_1	UC6_R_1	* Preconditions: The system shall be in manual mode and the GPS receiver shall be switched off * Input conditions / steps: send a request to change the operating mode to parallel guidance * Expected results: the vehicle shall ignore the request to change the operating mode to parallel guidance	Safety
UC6_TC_2	UC6_R_1, UC6_R_2	* Preconditions: The system shall be in manual mode and both the GPS receiver and the IMU shall be switched on * Input conditions / steps: send a request to change the operating mode to parallel guidance * Expected results: the vehicle shall change the operating mode to parallel guidance	Safety

Test case ID	Corresponding requirement ID(s)	Textual Description	Supporting information
UC6_TC_3	UC6_R_2	* Preconditions: The system shall be in manual mode and the IMU shall be switched off * Input conditions / steps: send a request to change the operating mode to parallel guidance * Expected results: the vehicle shall change the operating mode to parallel guidance	Safety
UC6_TC_4	UC6_R_3	* Preconditions: The vehicle is in parallel guidance * Input conditions / steps: Move the GPS base station to cause an unexpected behaviour of the GPS system * Expected results: The vehicle stops in safe state	Safety
UC6_TC_5	UC6_R_4	* Preconditions: The vehicle is in parallel guidance * Input conditions / steps: Inject a fault GPS position to cause a sporadic error * Expected results: The vehicle shall ignore the injected position	Safety
UC6_TC_6	UC6_R_9	* Preconditions: The vehicle is in parallel guidance * Input conditions / steps: Switch off the remote controller * Expected results: The vehicle stops in safe state	Safety
UC6_TC_7	UC6_R_10	* Preconditions: The vehicle is in parallel guidance * Input conditions / steps: send a request to change the operating mode to manual mode with an invalid CRC * Expected results: The vehicle shall ignore the request	Privacy

Test case ID	Corresponding requirement ID(s)	Textual Description	Supporting information
UC6_TC_8	UC6_R_12	* Preconditions: The vehicle is in parallel guidance * Input conditions / steps: send a request to change the operating mode to manual mode from a second remote controller * Expected results: The vehicle shall ignore the request	Functional
UC6_TC_9	UC6_R_14	* Preconditions: The vehicle is in parallel guidance * Input conditions / steps: send a request to change the operating mode to manual mode while the vehicle is moving * Expected results: The vehicle shall ignore the request	Functional
UC6_TC_10	UC6_R_14, UC6_R_12	* Preconditions: The vehicle is in parallel guidance * Input conditions / steps: send a request to change the operating mode to manual mode from a remote controller not authenticated * Expected results: The vehicle shall ignore the request	Functional
UC6_TC_11	UC6_R_18	* Preconditions: The system is in parallel guidance * Input conditions / steps: inject errors in the CRC of the IMU messages * Expected results: the vehicle shall detect the error in the communication and stops in safe state	Privacy
UC6_TC_12	UC6_R_19	* Preconditions: The system is in parallel guidance * Input conditions / steps: switch off the IMU * Expected results: the vehicle stops in safe state	Safety

Test case ID	Corresponding requirement ID(s)	Textual Description	Supporting information
UC6_TC_13	UC6_R_20	* Preconditions: The system is in parallel guidance * Input conditions / steps: inject errors in the IMU data * Expected results: the vehicle shall detect the IMU failure and stops in safe state	Safety

Use Case 9 (Railway)

Requirements

Taken from Table 2.30

Requirement ID	Corresponding evaluation scenario ID(s)	Textual Description	Supporting information
UC9_R_1	VALU3S_WP1_Railway_4	Validation tests must be executed under the following driving conditions: - daytime and sunny journeys / night time and clear journey. - daytime and cloudy journeys / night time and cloudy journey. - daytime and rainy journeys / night time and rainy journey. - daytime and snowy journeys / night time and snowy journey. - daytime and foggy journeys / night time and foggy journey. Several daytime journeys, made at different times during the day, will be considered for each daytime combination. Tests must also include light signals occlusions. Test design should allow to set different states for the light signals in a route in order to test all the different states in which a light signal can be found.	Safety
UC9_R_2	VALU3S_WP1_Railway_4	The framework must provide tools to prepare the datasets for the validation tests in a semi-automatic way.	
UC9_R_3	VALU3S_WP1_Railway_4	Information about all objects detected by the system during the execution of a validation test must be recorded (in a file) for further analysis.	

Requirement ID	Corresponding evaluation scenario ID(s)	Textual Description	Supporting information
UC9_R_4	VALU3S_WP1_Railway_4	Evidence of the execution of validation tests for light signals detection must be recorded.	Safety
UC9_R_5	VALU3S_WP1_Railway_4	Accuracy metrics must be calculated for each test execution, comparing the test execution results and the expected results, defined by the ground truth for the journey.	Safety
UC9_R_6	VALU3S_WP1_Railway_5	Validation tests must be executed under the following driving conditions: - daytime and sunny journeys / night time and clear journey. - daytime and cloudy journeys / night time and cloudy journey. - daytime and rainy journeys / night time and rainy journey. - daytime and snowy journeys / night time and snowy journey. - daytime and foggy journeys / night time and foggy journey. Several daytime journeys, made at different times during the day, will be considered for each daytime combination. Tests must also include speed restriction signs occlusions.	Safety
UC9_R_7	VALU3S_WP1_Railway_5	The framework must provide tools to prepare the datasets for the validation tests in a semi-automatic way.	

Requirement ID	Corresponding evaluation scenario ID(s)	Textual Description	Supporting information
UC9_R_8	VALU3S_WP1_Railway_5	Information about all objects detected by the system during the execution of a validation test must be recorded (in a file) for further analysis.	
UC9_R_9	VALU3S_WP1_Railway_5	Accuracy metrics must be calculated for each test execution, comparing the test execution results and the expected results, defined by the ground truth for each journey.	Safety
UC9_R_10	VALU3S_WP1_Railway_6	An analysis of the results obtained during the tests carried out for a set of validation tests shall provide information to determine the conditions for a safe operation of the system.	Safety

Test Cases

Taken from Table 2.31

Test case ID	Corresponding requirement ID(s)	Textual Description	Supporting information
UC9_TC_1	UC9_R_1, UC9_R_2, UC9_R_6, UC9_R_7	Record datasets selecting different visibility conditions in the virtual environment	* Precondition: Route for validation is ready in the virtual environment * Steps and input condition: - Select visibility conditions - Activate frame capturing subsystem - Execute journey in the virtual environment * Expected results: A frameset for validation is generated

Test case ID	Corresponding requirement ID(s)	Textual Description	Supporting information
UC9_TC_2	UC9_R_3, UC9_R_4, UC9_R_8	Execute validation and check that detection file and test execution file are generated.	* Precondition: A validation dataset exists * Steps and input condition: - Set Polaris system ready for validation - Select a dataset as input - Run test execution * Expected results: - Output file containing detected elements information is generated - Output file containing the evidences of the executed test is generated
UC9_TC_3	UC9_R_5, UC9_R_9	Analyse results of a test execution.	* Precondition: - Ground truth for validation dataset exists - File containing detected elements information exists * Steps and input condition: Execute accuracy metric calculation * Expected results: Accuracy metrics are calculated and file containing these metrics is generated
UC9_TC_4	UC9_R_10	Analyse results obtained under different visibility conditions for the same journey.	* Precondition: Files containing detected elements information, obtained from several executions for the same journey under different visibility conditions are available *Steps and input condition: Execute validation analysis* Expected results: A summary of the validation by comparing the results obtained in different test executions is generated