

Behaviour Tree PiCar-V

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1 Behaviour Tree PiCar Daemon	1
1.1 Installation:	1
1.2 View Logs	1
2 Raspberry Pi Daemon	3
2.1 Install Raspberry Pi Daemon	3
2.2 Enable / Disable Daemon to run on startup	3
2.3 Start / Stop / Restart Daemon	3
2.4 View Logs	3
2.5 Clear Past Logs	3
2.6 Reload Daemon	3
2.7 Change Config	4
2.8 Uninstall Raspberry Pi Daemon	4
2.9 Speedrun	4
3 Raspberry Pi	5
3.1 Main Technologies	5
3.2 Setting up Raspberry Pi	5
4 Behaviour Tree PiCar-V Setup	7
5 Raspberry Pi	9
5.1 Installation	9
5.2 Main Technologies	9
5.3 Setting up Raspberry Pi	9
6 Namespace Index	11
6.1 Namespace List	11
7 Hierarchical Index	13
7.1 Class Hierarchy	13
8 Class Index	15
8.1 Class List	15
9 File Index	17
9.1 File List	17
10 Namespace Documentation	19
10.1 behaviour_tree Namespace Reference	19
10.2 car Namespace Reference	19
10.3 car::configuration Namespace Reference	19
10.4 car::display Namespace Reference	19
10.5 car::display::console Namespace Reference	20
10.6 car::display::console::component Namespace Reference	20
10.7 car::display::console::component::debug Namespace Reference	20

10.8 car::display::console::component::main Namespace Reference	20
10.9 car::display::console::component::settings Namespace Reference	20
10.10 car::display::console::screen Namespace Reference	21
10.11 car::plugin Namespace Reference	21
10.12 car::system Namespace Reference	21
10.13 car::system::device Namespace Reference	21
10.14 car::system::device::lidar Namespace Reference	21
10.15 car::system::logging Namespace Reference	22
10.15.1 Typedef Documentation	22
10.15.1.1 vector_sink_mt	22
10.16 car::system::messaging Namespace Reference	22
10.17 car::system::movement Namespace Reference	22
10.18 car::system::movement::controller Namespace Reference	22
11 Class Documentation	23
11.1 car::system::movement::controller::AbstractMovementController Class Reference	23
11.1.1 Member Function Documentation	23
11.1.1.1 initialize()	24
11.1.1.2 setCameraServo1Angle()	24
11.1.1.3 setCameraServo2Angle()	24
11.1.1.4 setFrontWheelsAngle()	24
11.1.1.5 setRearLeftWheelDirectionToBackward()	24
11.1.1.6 setRearLeftWheelDirectionToForward()	25
11.1.1.7 setRearLeftWheelSpeed()	25
11.1.1.8 setRearRightWheelDirectionToBackward()	25
11.1.1.9 setRearRightWheelDirectionToForward()	25
11.1.1.10 setRearRightWheelSpeed()	25
11.1.1.11 setRearWheelsDirectionToBackward()	26
11.1.1.12 setRearWheelsDirectionToForward()	26
11.1.1.13 setRearWheelsSpeed()	26
11.1.1.14 stop()	26
11.1.1.15 terminate()	26
11.2 BackWheels Class Reference	27
11.2.1 Constructor & Destructor Documentation	27
11.2.1.1 BackWheels()	27
11.2.2 Member Function Documentation	27
11.2.2.1 backward()	27
11.2.2.2 calibration()	28
11.2.2.3 caliLeft()	28
11.2.2.4 caliOK()	28
11.2.2.5 caliRight()	28
11.2.2.6 forward()	28

11.2.2.7 getSpeed()	28
11.2.2.8 ready()	28
11.2.2.9 setSpeed()	28
11.2.2.10 stop()	29
11.2.3 Member Data Documentation	29
11.2.3.1 cali_forward_A	29
11.2.3.2 cali_forward_B	29
11.2.3.3 forward_A	29
11.2.3.4 forward_B	29
11.2.3.5 left_wheel	29
11.2.3.6 pca9685	29
11.2.3.7 right_wheel	30
11.2.3.8 speed	30
11.3 behaviour_tree::BehaviourTreeHandler Class Reference	30
11.3.1 Member Function Documentation	31
11.3.1.1 _setBehaviourTree()	31
11.3.1.2 getName()	31
11.3.1.3 handleCommand()	31
11.3.1.4 initialize()	31
11.3.1.5 setBehaviourTree()	31
11.3.1.6 startBehaviourTree()	32
11.3.1.7 stop()	32
11.3.1.8 stopBehaviourTree()	32
11.3.1.9 update()	32
11.3.2 Member Data Documentation	32
11.3.2.1 behaviour_tree	32
11.3.2.2 car_system	32
11.3.2.3 context	33
11.3.2.4 last_connected	33
11.3.2.5 tick_count	33
11.4 car::system::device::CameraDevice Class Reference	33
11.4.1 Constructor & Destructor Documentation	34
11.4.1.1 CameraDevice() [1/3]	34
11.4.1.2 CameraDevice() [2/3]	34
11.4.1.3 CameraDevice() [3/3]	34
11.4.1.4 ~CameraDevice()	34
11.4.2 Member Function Documentation	34
11.4.2.1 create()	35
11.4.2.2 disconnect()	35
11.4.2.3 getFrameBuffer()	35
11.4.2.4 operator=() [1/2]	35
11.4.2.5 operator=() [2/2]	35

11.4.2.6 start()	35
11.4.2.7 stop()	35
11.4.2.8 terminate()	36
11.4.2.9 update()	36
11.4.3 Friends And Related Function Documentation	36
11.4.3.1 DeviceManager	36
11.4.4 Member Data Documentation	36
11.4.4.1 camera_	36
11.4.4.2 camera_mutex_	36
11.4.4.3 configuration	36
11.4.4.4 connected_	37
11.4.4.5 frame_buffer_	37
11.4.4.6 last	37
11.5 car::display::console::CarConsole Class Reference	37
11.5.1 Constructor & Destructor Documentation	37
11.5.1.1 CarConsole()	38
11.5.2 Member Function Documentation	38
11.5.2.1 initialize()	38
11.5.2.2 run()	38
11.5.2.3 terminate()	38
11.5.3 Member Data Documentation	38
11.5.3.1 car_system	38
11.5.3.2 json_configuration	38
11.5.3.3 vector_sink	39
11.6 behaviour_tree::CarContext Class Reference	39
11.6.1 Constructor & Destructor Documentation	39
11.6.1.1 CarContext()	39
11.6.2 Member Function Documentation	39
11.6.2.1 _()	40
11.6.2.2 getCarSystem()	40
11.6.3 Member Data Documentation	40
11.6.3.1 car_system	40
11.7 car::system::CarSystem Class Reference	40
11.7.1 Constructor & Destructor Documentation	41
11.7.1.1 CarSystem()	41
11.7.2 Member Function Documentation	41
11.7.2.1 disconnect()	41
11.7.2.2 getConfiguration()	41
11.7.2.3 getDeviceManager()	42
11.7.2.4 getMessagingSystem()	42
11.7.2.5 getMovementSystem()	42
11.7.2.6 getPlugin()	42

11.7.2.7 initialize()	42
11.7.2.8 reload()	42
11.7.2.9 sendData()	42
11.7.2.10 setConfiguration()	43
11.7.2.11 start()	43
11.7.2.12 stop()	43
11.7.2.13 terminate()	43
11.7.2.14 tryConnect()	43
11.7.2.15 update()	43
11.7.3 Member Data Documentation	43
11.7.3.1 configuration_	43
11.7.3.2 device_manager_	44
11.7.3.3 initialized	44
11.7.3.4 messaging_system_	44
11.7.3.5 movement_system_	44
11.7.3.6 plugin_manager_	44
11.7.3.7 started	44
11.8 car::configuration::Configuration Struct Reference	44
11.8.1 Member Function Documentation	45
11.8.1.1 getCameraFpsInterval()	45
11.8.1.2 setCameraFps()	45
11.8.2 Member Data Documentation	45
11.8.2.1 behaviour_tree_update_ms_interval	45
11.8.2.2 camera_fps	46
11.8.2.3 camera_fps_interval	46
11.8.2.4 camera_index	46
11.8.2.5 host	46
11.8.2.6 lidar_port	46
11.8.2.7 use_camera	46
11.8.2.8 use_lidar	46
11.9 car::display::console::component::main::ConnectButton Class Reference	47
11.9.1 Constructor & Destructor Documentation	47
11.9.1.1 ConnectButton()	47
11.9.2 Member Function Documentation	47
11.9.2.1 element()	47
11.9.3 Member Data Documentation	47
11.9.3.1 button_pressed	48
11.9.3.2 car_system	48
11.9.3.3 main_button	48
11.9.3.4 main_button_text	48
11.9.3.5 main_debounce	48
11.9.3.6 on_connect_failure	48

11.10 car::display::console::component::debug::DebugEnabler Class Reference	48
11.10.1 Member Function Documentation	49
11.10.1.1 getCheckbox()	49
11.10.1.2 getWarningModal()	49
11.10.1.3 isEnabled()	49
11.10.2 Member Data Documentation	49
11.10.2.1 checkbox_value	49
11.10.2.2 component	50
11.10.2.3 debounce	50
11.10.2.4 DEBUG_ENABLE_WARNING_MESSAGE	50
11.10.2.5 DEBUG_MODE_DISABLED_MESSAGE	50
11.10.2.6 DEBUG_MODE_ENABLED_MESSAGE	50
11.10.2.7 DEBUG_MODE_WAIT_MESSAGE	50
11.10.2.8 display_warn_debug_modal	50
11.10.2.9 enabled	51
11.10.2.10 status	51
11.11 car::display::console::component::debug::DebugLidarCheckbox Class Reference	51
11.11.1 Constructor & Destructor Documentation	51
11.11.1.1 DebugLidarCheckbox()	51
11.11.2 Member Function Documentation	52
11.11.2.1 element()	52
11.11.2.2 getLidarMotorSignal()	52
11.11.3 Member Data Documentation	52
11.11.3.1 lidar_motor_checkbox_component	52
11.11.3.2 LIDAR_MOTOR_DISABLED_MESSAGE	52
11.11.3.3 lidar_motor_enabled	52
11.11.3.4 LIDAR_MOTOR_ENABLED_MESSAGE	52
11.11.3.5 lidar_motor_loading_debounce	53
11.11.3.6 lidar_motor_signal	53
11.11.3.7 lidar_motor_status	53
11.12 car::display::console::component::debug::DebugMessagingTextbox Class Reference	53
11.12.1 Constructor & Destructor Documentation	53
11.12.1.1 DebugMessagingTextbox()	54
11.12.2 Member Function Documentation	54
11.12.2.1 element()	54
11.12.3 Member Data Documentation	54
11.12.3.1 message	54
11.12.3.2 message_signal	54
11.12.3.3 messaging_container	54
11.12.3.4 messaging_textbox	54
11.12.3.5 messaging_title	55
11.13 car::display::console::component::debug::DebugMovementRenderer Class Reference	55

11.13.1 Constructor & Destructor Documentation	56
11.13.1.1 DebugMovementRenderer()	56
11.13.2 Member Function Documentation	56
11.13.2.1 element()	56
11.13.2.2 getCameraServo1AngleSliderValue()	56
11.13.2.3 getCameraServo2AngleSliderValue()	56
11.13.2.4 getFrontWheelsAngleSliderValue()	57
11.13.2.5 getRearLeftWheelSpeedSliderValue()	57
11.13.2.6 getRearRightWheelSpeedSliderValue()	57
11.13.2.7 getRearWheelDirectionSignal()	57
11.13.2.8 updateCameraServo1()	57
11.13.2.9 updateCameraServo2()	57
11.13.2.10 updateFrontWheels()	57
11.13.2.11 updateRearWheels()	58
11.13.3 Member Data Documentation	58
11.13.3.1 camera_servo_1_angle_slider	58
11.13.3.2 camera_servo_1_angle_slider_angle	58
11.13.3.3 camera_servo_2_angle_slider	58
11.13.3.4 camera_servo_2_angle_slider_angle	58
11.13.3.5 DEFAULT_FRONT_WHEEL_ANGLE	58
11.13.3.6 DEFAULT_REAR_WHEEL_SPEED	59
11.13.3.7 front_wheels_angle_slider	59
11.13.3.8 front_wheels_angle_slider_value	59
11.13.3.9 previous_camera_servo_1_angle_slider_angle	59
11.13.3.10 previous_camera_servo_2_angle_slider_angle	59
11.13.3.11 previous_front_wheels_angle_slider_value	59
11.13.3.12 previous_rear_left_wheel_speed_slider_value	59
11.13.3.13 previous_rear_right_wheel_speed_slider_value	60
11.13.3.14 previous_rear_wheels_speed_slider_value	60
11.13.3.15 rear_left_wheel_speed_slider	60
11.13.3.16 rear_left_wheel_speed_slider_value	60
11.13.3.17 rear_right_wheel_speed_slider	60
11.13.3.18 rear_right_wheel_speed_slider_value	60
11.13.3.19 rear_wheel_direction	60
11.13.3.20 REAR_WHEEL_DIRECTION_BACKWARD_MESSAGE	61
11.13.3.21 rear_wheel_direction_checkbox_component	61
11.13.3.22 rear_wheel_direction_debounce	61
11.13.3.23 REAR_WHEEL_DIRECTION_FORWARD_MESSAGE	61
11.13.3.24 rear_wheel_direction_signal	61
11.13.3.25 rear_wheel_direction_status	61
11.13.3.26 rear_wheel_menu_entry	61
11.13.3.27 rear_wheel_speed_slider	62

11.13.3.28 rear_wheels_speed_slider_value	62
11.13.3.29 servo_menu_entry	62
11.13.3.30 slider_container	62
11.14 car::system::device::DeviceManager Class Reference	62
11.14.1 Constructor & Destructor Documentation	63
11.14.1.1 DeviceManager()	63
11.14.2 Member Function Documentation	63
11.14.2.1 create()	63
11.14.2.2 getCameraDevice()	63
11.14.2.3 getLidarDevice()	63
11.14.2.4 initialize()	64
11.14.2.5 isRunning()	64
11.14.2.6 start()	64
11.14.2.7 stop()	64
11.14.2.8 terminate()	64
11.14.2.9 update()	64
11.14.3 Member Data Documentation	64
11.14.3.1 camera_device_	64
11.14.3.2 car_system	65
11.14.3.3 is_initialized_	65
11.14.3.4 is_running_	65
11.14.3.5 lidar_device_	65
11.15 car::system::movement::controller::DummyMovementController Class Reference	65
11.15.1 Member Function Documentation	66
11.15.1.1 initialize()	66
11.15.1.2 setCameraServo1Angle()	66
11.15.1.3 setCameraServo2Angle()	66
11.15.1.4 setFrontWheelsAngle()	67
11.15.1.5 setRearLeftWheelDirectionToBackward()	67
11.15.1.6 setRearLeftWheelDirectionToForward()	67
11.15.1.7 setRearLeftWheelSpeed()	67
11.15.1.8 setRearRightWheelDirectionToBackward()	67
11.15.1.9 setRearRightWheelDirectionToForward()	67
11.15.1.10 setRearRightWheelSpeed()	68
11.15.1.11 setRearWheelsDirectionToBackward()	68
11.15.1.12 setRearWheelsDirectionToForward()	68
11.15.1.13 setRearWheelsSpeed()	68
11.15.1.14 stop()	68
11.15.1.15 terminate()	69
11.16 car::system::messaging::MessagingSystem::FirstMessageStruct Struct Reference	69
11.16.1 Member Data Documentation	69
11.16.1.1 condition	69

11.16.1.2 error_message	69
11.16.1.3 uuid	69
11.17 car::configuration::JsonConfiguration Class Reference	70
11.17.1 Constructor & Destructor Documentation	70
11.17.1.1 JsonConfiguration()	70
11.17.2 Member Function Documentation	70
11.17.2.1 getConfigFilePath()	70
11.17.2.2 loadConfiguration()	70
11.17.2.3 setConfigFilePath()	70
11.17.3 Member Data Documentation	71
11.17.3.1 config_file_path	71
11.17.3.2 exe_dir	71
11.18 car::system::device::lidar::LidarDevice Class Reference	71
11.18.1 Member Function Documentation	72
11.18.1.1 disconnect()	72
11.18.1.2 getScanData()	72
11.18.1.3 initialize()	72
11.18.1.4 setScanData()	72
11.18.1.5 start()	72
11.18.1.6 stop()	73
11.18.1.7 terminate()	73
11.18.1.8 update()	73
11.18.2 Friends And Related Function Documentation	73
11.18.2.1 DeviceManager	73
11.18.3 Member Data Documentation	73
11.18.3.1 scan_data_	73
11.19 car::system::device::lidar::LidarDummy Class Reference	74
11.19.1 Constructor & Destructor Documentation	74
11.19.1.1 LidarDummy()	74
11.19.2 Member Function Documentation	74
11.19.2.1 disconnect()	74
11.19.2.2 initialize()	75
11.19.2.3 start()	75
11.19.2.4 stop()	75
11.19.2.5 terminate()	75
11.19.2.6 update()	75
11.20 car::system::device::lidar::LidarScanner Class Reference	76
11.20.1 Constructor & Destructor Documentation	76
11.20.1.1 LidarScanner()	76
11.20.2 Member Function Documentation	77
11.20.2.1 create()	77
11.20.2.2 disconnect()	77

11.20.2.3 initialize()	77
11.20.2.4 start()	77
11.20.2.5 stop()	77
11.20.2.6 terminate()	78
11.20.2.7 update()	78
11.20.3 Member Data Documentation	78
11.20.3.1 configuration_	78
11.20.3.2 lidar_	78
11.20.3.3 running	78
11.20.3.4 scan_data_	78
11.20.3.5 scan_data_mutex_	79
11.20.3.6 scan_generator_	79
11.21 car::display::console::screen::LoggingScreen Class Reference	79
11.21.1 Constructor & Destructor Documentation	79
11.21.1.1 LoggingScreen()	79
11.21.2 Member Function Documentation	79
11.21.2.1 element()	80
11.21.3 Member Data Documentation	80
11.21.3.1 line_elements	80
11.21.3.2 menu	80
11.21.3.3 my_custom_menu	80
11.21.3.4 selected_line	80
11.21.3.5 vector_sink	80
11.22 car::display::console::component::main::MainErrorModal Class Reference	81
11.22.1 Constructor & Destructor Documentation	81
11.22.1.1 MainErrorModal()	81
11.22.2 Member Function Documentation	81
11.22.2.1 element()	81
11.22.2.2 setErrorMessage()	81
11.22.3 Member Data Documentation	81
11.22.3.1 error_element	82
11.22.3.2 error_modal_shown	82
11.22.3.3 main_error_modal	82
11.23 car::display::console::component::main::MainExitModal Class Reference	82
11.23.1 Constructor & Destructor Documentation	82
11.23.1.1 MainExitModal()	82
11.23.2 Member Function Documentation	83
11.23.2.1 element()	83
11.23.3 Member Data Documentation	83
11.23.3.1 exit	83
11.23.3.2 exit_modal_shown	83
11.23.3.3 main_exit_modal	83

11.24 car::display::console::screen::MainScreen Class Reference	83
11.24.1 Constructor & Destructor Documentation	84
11.24.1.1 MainScreen()	84
11.24.2 Member Function Documentation	84
11.24.2.1 element()	84
11.24.3 Member Data Documentation	84
11.24.3.1 box	84
11.24.3.2 car_system	84
11.24.3.3 connect_button	85
11.24.3.4 info	85
11.24.3.5 main_component	85
11.24.3.6 main_error_modal	85
11.24.3.7 main_exit_modal	85
11.24.3.8 main_screen	85
11.25 car::system::messaging::MessagingSystem Class Reference	85
11.25.1 Constructor & Destructor Documentation	86
11.25.1.1 MessagingSystem()	87
11.25.2 Member Function Documentation	87
11.25.2.1 getCommandSignal()	87
11.25.2.2 getDisconnectSignal()	87
11.25.2.3 getFirstMessage()	87
11.25.2.4 getMessageSignal()	87
11.25.2.5 getSelectionSignal()	87
11.25.2.6 getUUID()	88
11.25.2.7 handleMessage()	88
11.25.2.8 initialize()	88
11.25.2.9 initializeWebSocket()	88
11.25.2.10 isConnected()	88
11.25.2.11 onDisconnect()	89
11.25.2.12 onFirstMessage()	89
11.25.2.13 onMessageCallback()	89
11.25.2.14 sendMessage()	89
11.25.2.15 setConfiguration()	89
11.25.2.16 stop()	89
11.25.2.17 terminate()	90
11.25.2.18 tryConnect()	90
11.25.3 Member Data Documentation	90
11.25.3.1 command_signal_	90
11.25.3.2 configuration_	90
11.25.3.3 connected_	90
11.25.3.4 message_signal_	90
11.25.3.5 on_disconnect_signal_	91

11.25.3.6 selection_signal_	91
11.25.3.7 uuid_	91
11.25.3.8 websocket_	91
11.25.3.9 websocket_url_	91
11.26 car::system::movement::MovementSystem Class Reference	91
11.26.1 Constructor & Destructor Documentation	92
11.26.1.1 MovementSystem()	92
11.26.1.2 ~MovementSystem()	92
11.26.2 Member Function Documentation	92
11.26.2.1 initialize()	92
11.26.2.2 setCameraServo1Angle()	93
11.26.2.3 setCameraServo2Angle()	93
11.26.2.4 setFrontWheelsAngle()	93
11.26.2.5 setRearLeftWheelDirectionToBackward()	93
11.26.2.6 setRearLeftWheelDirectionToForward()	93
11.26.2.7 setRearLeftWheelSpeed()	93
11.26.2.8 setRearRightWheelDirectionToBackward()	93
11.26.2.9 setRearRightWheelDirectionToForward()	94
11.26.2.10 setRearRightWheelSpeed()	94
11.26.2.11 setRearWheelsDirectionToBackward()	94
11.26.2.12 setRearWheelsDirectionToForward()	94
11.26.2.13 setRearWheelsSpeed()	94
11.26.2.14 start()	94
11.26.2.15 stop()	94
11.26.2.16 terminate()	95
11.26.3 Member Data Documentation	95
11.26.3.1 movement_controller	95
11.27 car::plugin::Plugin Class Reference	95
11.27.1 Member Function Documentation	95
11.27.1.1 getName()	95
11.27.1.2 initialize()	96
11.27.1.3 stop()	96
11.27.1.4 update()	96
11.28 car::plugin::PluginManager Class Reference	96
11.28.1 Member Function Documentation	97
11.28.1.1 addPlugin()	97
11.28.1.2 getPlugin()	97
11.28.1.3 initialize()	97
11.28.1.4 stop()	97
11.28.1.5 terminate()	97
11.28.1.6 update()	97
11.28.2 Member Data Documentation	97

11.28.2.1 plugins	98
11.29 rpi_daemon Class Reference	98
11.29.1 Member Function Documentation	98
11.29.1.1 connect()	98
11.29.1.2 on_reload()	99
11.29.1.3 on_start()	99
11.29.1.4 on_stop()	99
11.29.1.5 on_update()	99
11.29.1.6 update()	99
11.29.2 Member Data Documentation	99
11.29.2.1 any_configuration_empty	99
11.29.2.2 attempted_to_reconnect	99
11.29.2.3 car_system	100
11.29.2.4 connection_ms_interval	100
11.29.2.5 last_connected	100
11.30 car::display::console::component::settings::SettingsEditConfig Class Reference	100
11.30.1 Constructor & Destructor Documentation	100
11.30.1.1 SettingsEditConfig()	101
11.30.2 Member Function Documentation	101
11.30.2.1 element()	101
11.30.3 Member Data Documentation	101
11.30.3.1 car_system	101
11.30.3.2 input_settings_file_path	101
11.30.3.3 json_configuration	101
11.30.3.4 load_button	101
11.30.3.5 placeholder	102
11.30.3.6 settings_file_path	102
11.31 car::display::console::screen::SettingsScreen Class Reference	102
11.31.1 Constructor & Destructor Documentation	102
11.31.1.1 SettingsScreen()	102
11.31.2 Member Function Documentation	103
11.31.2.1 element()	103
11.31.2.2 update()	103
11.31.3 Member Data Documentation	103
11.31.3.1 car_system	103
11.31.3.2 debug_enabler	103
11.31.3.3 debug_lidar_checkbox	103
11.31.3.4 debug_messaging_text_box	103
11.31.3.5 debug_movement_renderer	104
11.31.3.6 settings_edit_config	104
11.32 TB6612 Class Reference	104
11.32.1 Constructor & Destructor Documentation	104

11.32.1.1 TB6612()	104
11.32.2 Member Function Documentation	105
11.32.2.1 backward()	105
11.32.2.2 forward()	105
11.32.2.3 getMotorPin()	105
11.32.2.4 getPWMPin()	105
11.32.2.5 setOffset()	105
11.32.2.6 setPWM()	105
11.32.2.7 stop()	105
11.32.3 Member Data Documentation	106
11.32.3.1 motor_pin	106
11.32.3.2 offset	106
11.32.3.3 pwm_pin	106
11.33 car::system::logging::VectorSink< Mutex > Class Template Reference	106
11.33.1 Constructor & Destructor Documentation	107
11.33.1.1 VectorSink()	107
11.33.2 Member Function Documentation	107
11.33.2.1 flush_()	107
11.33.2.2 get_log_messages()	107
11.33.2.3 sink_it_()	107
11.33.3 Member Data Documentation	107
11.33.3.1 log_messages	108
11.33.3.2 max_lines	108
12 File Documentation	109
12.1 behaviour_tree/src/main.cpp File Reference	109
12.1.1 Function Documentation	109
12.1.1.1 kbhit()	109
12.1.1.2 main()	110
12.2 daemon/src/main.cpp File Reference	110
12.2.1 Function Documentation	110
12.2.1.1 getLidarDevice()	110
12.2.1.2 getMovementController()	111
12.2.1.3 main()	111
12.2.1.4 terminate_handler()	111
12.3 tui/src/main.cpp File Reference	111
12.3.1 Function Documentation	111
12.3.1.1 getLidarDevice()	112
12.3.1.2 getMovementController()	112
12.3.1.3 main()	112
12.4 common/include/behaviour_tree/BehaviourTreeHandler.hpp File Reference	112
12.5 BehaviourTreeHandler.hpp	113

12.6 common/include/behaviour_tree/CarContext.hpp File Reference	115
12.7 CarContext.hpp	115
12.8 common/include/car/configuration/Configuration.h File Reference	116
12.9 Configuration.h	116
12.10 common/include/car/plugin/Plugin.h File Reference	116
12.11 Plugin.h	117
12.12 common/include/car/plugin/PluginManager.h File Reference	117
12.13 PluginManager.h	118
12.14 common/include/car/system/CarSystem.h File Reference	119
12.15 CarSystem.h	119
12.16 common/include/car/system/device/CameraDevice.h File Reference	120
12.17 CameraDevice.h	121
12.18 common/include/car/system/device/DeviceManager.h File Reference	121
12.19 DeviceManager.h	122
12.20 common/include/car/system/device/lidar/LidarDevice.h File Reference	123
12.21 LidarDevice.h	123
12.22 common/include/car/system/device/lidar/LidarDummy.h File Reference	124
12.23 LidarDummy.h	124
12.24 common/include/car/system/device/lidar/LidarScanner.h File Reference	124
12.25 LidarScanner.h	125
12.26 common/include/car/system/logging/VectorSink.h File Reference	126
12.27 VectorSink.h	127
12.28 common/include/car/system/messaging/MessagingSystem.h File Reference	127
12.29 MessagingSystem.h	128
12.30 common/include/car/system/messaging/StreamType.h File Reference	129
12.30.1 Enumeration Type Documentation	129
12.30.1.1 StreamType	129
12.31 StreamType.h	130
12.32 common/include/car/system/movement/controller/AbstractMovementController.h File Reference	130
12.33 AbstractMovementController.h	130
12.34 common/include/car/system/movement/controller/DeviceMovementController.h File Reference	131
12.35 DeviceMovementController.h	131
12.36 common/include/car/system/movement/controller/DummyMovementController.h File Reference	132
12.37 DummyMovementController.h	132
12.38 common/include/car/system/movement/devices/RearWheel.h File Reference	133
12.39 RearWheel.h	133
12.40 common/include/car/system/movement/devices/Servo.h File Reference	133
12.41 Servo.h	133
12.42 common/include/car/system/movement/MovementSystem.h File Reference	134
12.43 MovementSystem.h	134
12.44 common/src/car/system/CarSystem.cpp File Reference	136
12.45 common/src/car/system/device/CameraDevice.cpp File Reference	136

12.46 common/src/car/system/device/DeviceManager.cpp File Reference	136
12.47 common/src/car/system/messaging/MessagingSystem.cpp File Reference	137
12.48 common/src/car/system/movement/controller/DeviceMovementController.cpp File Reference	137
12.49 common/src/car/system/movement/controller/DummyMovementController.cpp File Reference	137
12.50 common/src/car/system/movement/devices/RearWheel.cpp File Reference	138
12.51 common/src/car/system/movement/devices/Servo.cpp File Reference	138
12.52 common/tests/pca9685/test_front_wheels.cpp File Reference	138
12.52.1 Function Documentation	138
12.52.1.1 main()	138
12.52.1.2 map()	138
12.52.1.3 setAngle()	139
12.52.1.4 setAngleToAnalog()	139
12.52.2 Variable Documentation	139
12.52.2.1 offset	139
12.53 common/tests/tb6612/test_rear_wheels.cpp File Reference	139
12.53.1 Function Documentation	139
12.53.1.1 main()	140
12.53.1.2 test()	140
12.54 daemon/install/README.md File Reference	140
12.55 daemon/README.md File Reference	140
12.56 README.md File Reference	140
12.57 tui/README.md File Reference	140
12.58 repository/packages/t/tb6612/tb6612/include/TB6612.h File Reference	140
12.59 TB6612.h	140
12.60 repository/packages/t/tb6612/tb6612/src/TB6612.cpp File Reference	141
12.61 SETUP.md File Reference	141
12.62 tui/src/car/configuration/JsonConfiguration.cxx File Reference	141
12.62.1 Macro Definition Documentation	142
12.62.1.1 JSONCONFIGURATION_CXX	142
12.63 tui/src/car/display/console/CarConsole.cpp File Reference	142
12.64 tui/src/car/display/console/CarConsole.h File Reference	142
12.65 CarConsole.h	143
12.66 tui/src/car/display/console/component/debug/DebugEnabler.cxx File Reference	143
12.66.1 Macro Definition Documentation	144
12.66.1.1 DEBUGENABLER_CXX	144
12.67 tui/src/car/display/console/component/debug/DebugLidarCheckbox.cxx File Reference	144
12.67.1 Macro Definition Documentation	144
12.67.1.1 DEBUGLIDARCHECKBOX_CXX	144
12.68 tui/src/car/display/console/component/debug/DebugMessagingTextbox.cxx File Reference	145
12.68.1 Macro Definition Documentation	145
12.68.1.1 DEBUGMESSAGINGTEXTBOX_CXX	145
12.69 tui/src/car/display/console/component/debug/DebugMovementRenderer.cxx File Reference	145

12.69.1 Macro Definition Documentation	146
12.69.1.1 DEBUGMOVEMENTRENDERER_CXX	146
12.70 tui/src/car/display/console/component/main/ConnectButton.cxx File Reference	146
12.70.1 Macro Definition Documentation	147
12.70.1.1 CONNECTBUTTON_CXX	147
12.71 tui/src/car/display/console/component/main/MainErrorModal.cxx File Reference	147
12.71.1 Macro Definition Documentation	147
12.71.1.1 MAINERRORMODAL_CXX	147
12.72 tui/src/car/display/console/component/main/MainExitModal.cxx File Reference	148
12.72.1 Macro Definition Documentation	148
12.72.1.1 MAINEXITMODAL_CXX	148
12.73 tui/src/car/display/console/component/settings/SettingsEditConfig.cxx File Reference	148
12.73.1 Macro Definition Documentation	149
12.73.1.1 SETTINGSEITCONFIG_CXX	149
12.74 tui/src/car/display/console/screen/LoggingScreen.cxx File Reference	149
12.74.1 Macro Definition Documentation	150
12.74.1.1 LOGGINGSCREEN_CXX	150
12.75 tui/src/car/display/console/screen/MainScreen.cxx File Reference	150
12.75.1 Macro Definition Documentation	150
12.75.1.1 MAINSCREEN_CXX	150
12.76 tui/src/car/display/console/screen/SettingsScreen.cxx File Reference	151
12.76.1 Macro Definition Documentation	151
12.76.1.1 SETTINGSSCREEN_CXX	151
Index	153

Chapter 1

Behaviour Tree PiCar Daemon

1.1 Installation:

Run the follow commands to install the Daemon:

```
sudo chmod +x ./install_script.sh # Grant permission to install_script to run as exe
systemctl stop rpi_daemon # Stop any previous rpi_daemon
sudo ./install_script.sh install # Install the Daemon
sudo systemctl daemon-reload # Reload the Daemon if there was any previous
sudo systemctl start rpi_daemon # Start the new Daemon
```

Or use the single command:

```
sudo chmod +x ./install_script.sh && systemctl stop rpi_daemon && sudo ./install_script.sh install && sudo
systemctl daemon-reload && sudo systemctl start rpi_daemon
```

1.2 View Logs

```
systemctl status rpi_daemon.service journalctl -u rpi\_daemon
```


Chapter 2

Raspberry Pi Daemon

This will only work for Linux.

2.1 Install Raspberry Pi Daemon

```
xmake install --admin rpi_daemon
```

2.2 Enable / Disable Daemon to run on startup

```
sudo systemctl [enable|disable] rpi_daemon
```

2.3 Start / Stop / Restart Daemon

```
sudo systemctl [start/stop/restart] rpi_daemon
```

2.4 View Logs

```
systemctl status rpi_daemon.service journalctl -u rpi_daemon
```

2.5 Clear Past Logs

```
sudo journalctl -m --vacuum-time=1s
```

2.6 Reload Daemon

```
sudo systemctl reload rpi_daemon
```

2.7 Change Config

```
sudo nano /etc/rpi_daemon/rpi_daemon.conf
```

2.8 Uninstall Raspberry Pi Daemon

```
xmake uninstall --admin rpi_daemon
```

2.9 Speedrun

```
sudo systemctl stop rpi_daemon && xmake && xmake install --admin rpi_daemon  
&& sudo systemctl daemon-reload && sudo systemctl start rpi_daemon
```


Chapter 3

Raspberry Pi

This sub-project contains three other sub-projects:

- common - Main functionality is stored here
- daemon - Daemon Application for seamless startup and termination
- tui - Terminal User Interface

3.1 Main Technologies

- C++17
- `ixwebsocket`
- `ftxui`
- `rapidjson`

3.2 Setting up Raspberry Pi

If you want to setup the raspberry pi, you can go to [SETUP.md](#)

Chapter 4

Behaviour Tree PiCar-V Setup

Set up the following first:

- Wifi - Use the Mobile Hotspot feature of your device
- SSH - Enable
- I2C - Enable

See if Wifi does not connect: [Raspberrypi Stackexchange](#)

Now connect to the Raspberry Pi with SSH

Run the following commands to get the raspberry pi running:

```
sudo apt-get install build-essential
curl -fsSL https://xmake.io/shget.text | bash
source ~/.xmake/profile
```

Run the following commands before cross compilation:

```
sudo apt update
sudo apt upgrade
sudo apt dist-upgrade
```

or `sudo apt update && sudo apt upgrade && sudo apt dist-upgrade`

Chapter 5

Raspberry Pi

This sub-project handles all the logic of the Sunfounder PiCar.

The system is broken down to 3 sub systems:

- lidar - Handles the lidar scanner of the Raspberry Pi
- messaging - Handles the websocket of the Raspberry Pi
- movement - Handles the movement of the Sunfounder PiCar

The system is then displayed by the `CarConsole`.

5.1 Installation

Run the following command to build the sub-project:

```
xmake build raspberry_pi
```

To connect the Raspberry Pi to the backend, you would need the `IPv4 Address` of your Computer/Server and change the host to the value in `IPv4 Address`.

If this doesn't work, you may need to restart your Computer/Server.

5.2 Main Technologies

- C++17
- `ixwebsocket`
- `ftxui`
- `nlohmann_json`

5.3 Setting up Raspberry Pi

If you want to setup the raspberry pi, you can go to [SETUP.md](#)

Chapter 6

Namespace Index

6.1 Namespace List

Here is a list of all namespaces with brief descriptions:

behaviour_tree	19
car	19
car::configuration	19
car::display	19
car::display::console	20
car::display::console::component	20
car::display::console::component::debug	20
car::display::console::component::main	20
car::display::console::component::settings	20
car::display::console::screen	21
car::plugin	21
car::system	21
car::system::device	21
car::system::device::lidar	21
car::system::logging	22
car::system::messaging	22
car::system::movement	22
car::system::movement::controller	22

Chapter 7

Hierarchical Index

7.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

car::system::movement::controller::AbstractMovementController	23
car::system::movement::controller::DummyMovementController	65
BackWheels	27
spdlog::sinks::base_sink	
car::system::logging::VectorSink< Mutex >	106
car::system::device::CameraDevice	33
car::display::console::CarConsole	37
car::configuration::Configuration	44
car::display::console::component::main::ConnectButton	47
Context	
behaviour_tree::CarContext	39
daemon	
rpi_daemon	98
car::display::console::component::debug::DebugEnabler	48
car::display::console::component::debug::DebugLidarCheckbox	51
car::display::console::component::debug::DebugMessagingTextbox	53
car::display::console::component::debug::DebugMovementRenderer	55
car::system::device::DeviceManager	62
std::enable_shared_from_this	
car::system::CarSystem	40
car::system::messaging::MessagingSystem::FirstMessageStruct	69
car::configuration::JsonConfiguration	70
car::system::device::lidar::LidarDevice	71
car::system::device::lidar::LidarDummy	74
car::system::device::lidar::LidarScanner	76
car::display::console::screen::LoggingScreen	79
car::display::console::component::main::MainErrorModal	81
car::display::console::component::main::MainExitModal	82
car::display::console::screen::MainScreen	83
car::system::messaging::MessagingSystem	85
car::system::movement::MovementSystem	91
car::plugin::Plugin	95
behaviour_tree::BehaviourTreeHandler	30
car::plugin::PluginManager	96
car::display::console::component::settings::SettingsEditConfig	100
car::display::console::screen::SettingsScreen	102
TB6612	104

Chapter 8

Class Index

8.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

car::system::movement::controller::AbstractMovementController	23
BackWheels	27
behaviour_tree::BehaviourTreeHandler	30
car::system::device::CameraDevice	33
car::display::console::CarConsole	37
behaviour_tree::CarContext	39
car::system::CarSystem	40
car::configuration::Configuration	44
car::display::console::component::main::ConnectButton	47
car::display::console::component::debug::DebugEnabler	48
car::display::console::component::debug::DebugLidarCheckbox	51
car::display::console::component::debug::DebugMessagingTextbox	53
car::display::console::component::debug::DebugMovementRenderer	55
car::system::device::DeviceManager	62
car::system::movement::controller::DummyMovementController	65
car::system::messaging::MessagingSystem::FirstMessageStruct	69
car::configuration::JsonConfiguration	70
car::system::device::lidar::LidarDevice	71
car::system::device::lidar::LidarDummy	74
car::system::device::lidar::LidarScanner	76
car::display::console::screen::LoggingScreen	79
car::display::console::component::main::MainErrorModal	81
car::display::console::component::main::MainExitModal	82
car::display::console::screen::MainScreen	83
car::system::messaging::MessagingSystem	85
car::system::movement::MovementSystem	91
car::plugin::Plugin	95
car::plugin::PluginManager	96
rpi_daemon	98
car::display::console::component::settings::SettingsEditConfig	100
car::display::console::screen::SettingsScreen	102
TB6612	104
car::system::logging::VectorSink< Mutex >	106

Chapter 9

File Index

9.1 File List

Here is a list of all files with brief descriptions:

behaviour_tree/src/main.cpp	109
common/include/behaviour_tree/BehaviourTreeHandler.hpp	112
common/include/behaviour_tree/CarContext.hpp	115
common/include/car/configuration/Configuration.h	116
common/include/car/plugin/Plugin.h	116
common/include/car/plugin/PluginManager.h	117
common/include/car/system/CarSystem.h	119
common/include/car/system/device/CameraDevice.h	120
common/include/car/system/device/DeviceManager.h	121
common/include/car/system/device/lidar/LidarDevice.h	123
common/include/car/system/device/lidar/LidarDummy.h	124
common/include/car/system/device/lidar/LidarScanner.h	124
common/include/car/system/logging/VectorSink.h	126
common/include/car/system/messaging/MessagingSystem.h	127
common/include/car/system/messaging/StreamType.h	129
common/include/car/system/movement/MovementSystem.h	134
common/include/car/system/movement/controller/AbstractMovementController.h	130
common/include/car/system/movement/controller/DeviceMovementController.h	131
common/include/car/system/movement/controller/DummyMovementController.h	132
common/include/car/system/movement/devices/RearWheel.h	133
common/include/car/system/movement/devices/Servo.h	133
common/src/car/system/CarSystem.cpp	136
common/src/car/system/device/CameraDevice.cpp	136
common/src/car/system/device/DeviceManager.cpp	136
common/src/car/system/messaging/MessagingSystem.cpp	137
common/src/car/system/movement/controller/DeviceMovementController.cpp	137
common/src/car/system/movement/controller/DummyMovementController.cpp	137
common/src/car/system/movement/devices/RearWheel.cpp	138
common/src/car/system/movement/devices/Servo.cpp	138
common/tests/pca9685/test_front_wheels.cpp	138
common/tests/tb6612/test_rear_wheels.cpp	139
daemon/src/main.cpp	110
repository/packages/t/tb6612/tb6612/include/TB6612.h	140
repository/packages/t/tb6612/tb6612/src/TB6612.cpp	141
tui/src/main.cpp	111

tui/src/car/configuration/JsonConfiguration.cxx	141
tui/src/car/display/console/CarConsole.cpp	142
tui/src/car/display/console/CarConsole.h	142
tui/src/car/display/console/component/debug/DebugEnabler.cxx	143
tui/src/car/display/console/component/debug/DebugLidarCheckbox.cxx	144
tui/src/car/display/console/component/debug/DebugMessagingTextbox.cxx	145
tui/src/car/display/console/component/debug/DebugMovementRenderer.cxx	145
tui/src/car/display/console/component/main/ConnectButton.cxx	146
tui/src/car/display/console/component/main/MainErrorModal.cxx	147
tui/src/car/display/console/component/main/MainExitModal.cxx	148
tui/src/car/display/console/component/settings/SettingsEditConfig.cxx	148
tui/src/car/display/console/screen/LoggingScreen.cxx	149
tui/src/car/display/console/screen/MainScreen.cxx	150
tui/src/car/display/console/screen/SettingsScreen.cxx	151

Chapter 10

Namespace Documentation

10.1 behaviour_tree Namespace Reference

Classes

- class [BehaviourTreeHandler](#)
- class [CarContext](#)

10.2 car Namespace Reference

Namespaces

- namespace [configuration](#)
- namespace [display](#)
- namespace [plugin](#)
- namespace [system](#)

10.3 car::configuration Namespace Reference

Classes

- struct [Configuration](#)
- class [JsonConfiguration](#)

10.4 car::display Namespace Reference

Namespaces

- namespace [console](#)

10.5 car::display::console Namespace Reference

Namespaces

- namespace [component](#)
- namespace [screen](#)

Classes

- class [CarConsole](#)

10.6 car::display::console::component Namespace Reference

Namespaces

- namespace [debug](#)
- namespace [main](#)
- namespace [settings](#)

10.7 car::display::console::component::debug Namespace Reference

Classes

- class [DebugEnabler](#)
- class [DebugLidarCheckbox](#)
- class [DebugMessagingTextbox](#)
- class [DebugMovementRenderer](#)

10.8 car::display::console::component::main Namespace Reference

Classes

- class [ConnectButton](#)
- class [MainErrorModal](#)
- class [MainExitModal](#)

10.9 car::display::console::component::settings Namespace Reference

Classes

- class [SettingsEditConfig](#)

10.10 car::display::console::screen Namespace Reference

Classes

- class [LoggingScreen](#)
- class [MainScreen](#)
- class [SettingsScreen](#)

10.11 car::plugin Namespace Reference

Classes

- class [Plugin](#)
- class [PluginManager](#)

10.12 car::system Namespace Reference

Namespaces

- namespace [device](#)
- namespace [logging](#)
- namespace [messaging](#)
- namespace [movement](#)

Classes

- class [CarSystem](#)

10.13 car::system::device Namespace Reference

Namespaces

- namespace [lidar](#)

Classes

- class [CameraDevice](#)
- class [DeviceManager](#)

10.14 car::system::device::lidar Namespace Reference

Classes

- class [LidarDevice](#)
- class [LidarDummy](#)
- class [LidarScanner](#)

10.15 car::system::logging Namespace Reference

Classes

- class [VectorSink](#)

Typedefs

- using [vector_sink_mt](#) = [VectorSink](#)< std::mutex >

10.15.1 Typedef Documentation

10.15.1.1 vector_sink_mt

using [car::system::logging::vector_sink_mt](#) = typedef [VectorSink](#)<std::mutex>

10.16 car::system::messaging Namespace Reference

Classes

- class [MessagingSystem](#)

10.17 car::system::movement Namespace Reference

Namespaces

- namespace [controller](#)

Classes

- class [MovementSystem](#)

10.18 car::system::movement::controller Namespace Reference

Classes

- class [AbstractMovementController](#)
- class [DummyMovementController](#)

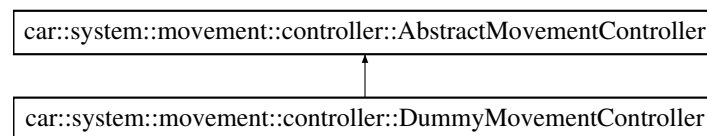
Chapter 11

Class Documentation

11.1 car::system::movement::controller::AbstractMovementController Class Reference

```
#include <AbstractMovementController.h>
```

Inheritance diagram for car::system::movement::controller::AbstractMovementController:



Public Member Functions

- virtual void [initialize](#) ()=0
- virtual void [stop](#) ()=0
- virtual void [terminate](#) ()=0
- virtual void [setRearWheelsSpeed](#) (const int speed)=0
- virtual void [setRearLeftWheelSpeed](#) (const int speed)=0
- virtual void [setRearRightWheelSpeed](#) (const int speed)=0
- virtual void [setFrontWheelsAngle](#) (const float angle)=0
- virtual void [setCameraServo1Angle](#) (const float angle)=0
- virtual void [setCameraServo2Angle](#) (const float angle)=0
- virtual void [setRearWheelsDirectionToForward](#) ()=0
- virtual void [setRearLeftWheelDirectionToForward](#) ()=0
- virtual void [setRearRightWheelDirectionToForward](#) ()=0
- virtual void [setRearWheelsDirectionToBackward](#) ()=0
- virtual void [setRearLeftWheelDirectionToBackward](#) ()=0
- virtual void [setRearRightWheelDirectionToBackward](#) ()=0

11.1.1 Member Function Documentation

11.1.1.1 initialize()

```
virtual void car::system::movement::controller::AbstractMovementController::initialize ( )  
[pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.2 setCameraServo1Angle()

```
virtual void car::system::movement::controller::AbstractMovementController::setCameraServo1↵  
Angle (   
        const float angle ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.3 setCameraServo2Angle()

```
virtual void car::system::movement::controller::AbstractMovementController::setCameraServo2↵  
Angle (   
        const float angle ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.4 setFrontWheelsAngle()

```
virtual void car::system::movement::controller::AbstractMovementController::setFrontWheels↵  
Angle (   
        const float angle ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.5 setRearLeftWheelDirectionToBackward()

```
virtual void car::system::movement::controller::AbstractMovementController::setRearLeftWheel↵  
DirectionToBackward ( ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.6 setRearLeftWheelDirectionToForward()

```
virtual void car::system::movement::controller::AbstractMovementController::setRearLeftWheel↵  
DirectionToForward ( ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.7 setRearLeftWheelSpeed()

```
virtual void car::system::movement::controller::AbstractMovementController::setRearLeftWheel↵  
Speed (   
        const int speed ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.8 setRearRightWheelDirectionToBackward()

```
virtual void car::system::movement::controller::AbstractMovementController::setRearRight↵  
WheelDirectionToBackward ( ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.9 setRearRightWheelDirectionToForward()

```
virtual void car::system::movement::controller::AbstractMovementController::setRearRight↵  
WheelDirectionToForward ( ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.10 setRearRightWheelSpeed()

```
virtual void car::system::movement::controller::AbstractMovementController::setRearRight↵  
WheelSpeed (   
        const int speed ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.11 `setRearWheelsDirectionToBackward()`

```
virtual void car::system::movement::controller::AbstractMovementController::setRearWheels↵  
DirectionToBackward ( ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.12 `setRearWheelsDirectionToForward()`

```
virtual void car::system::movement::controller::AbstractMovementController::setRearWheels↵  
DirectionToForward ( ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.13 `setRearWheelsSpeed()`

```
virtual void car::system::movement::controller::AbstractMovementController::setRearWheelsSpeed  
(  
    const int speed ) [pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.14 `stop()`

```
virtual void car::system::movement::controller::AbstractMovementController::stop ( ) [pure  
virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

11.1.1.15 `terminate()`

```
virtual void car::system::movement::controller::AbstractMovementController::terminate ( )  
[pure virtual]
```

Implemented in [car::system::movement::controller::DummyMovementController](#).

The documentation for this class was generated from the following file:

- [common/include/car/system/movement/controller/AbstractMovementController.h](#)

11.2 BackWheels Class Reference

Public Member Functions

- [BackWheels](#) (const int &bus_number=1)
- void [forward](#) ()
- void [backward](#) ()
- void [stop](#) ()
- int [getSpeed](#) () const
- void [setSpeed](#) (const int &speed)
- void [ready](#) ()
- void [calibration](#) ()
- void [caliLeft](#) ()
- void [caliRight](#) ()
- void [caliOK](#) ()

Public Attributes

- PCA9685 [pca9685](#)

Private Attributes

- std::unique_ptr< [TB6612](#) > [left_wheel](#)
- std::unique_ptr< [TB6612](#) > [right_wheel](#)
- int [forward_A](#)
- int [forward_B](#)
- int [cali_forward_A](#)
- int [cali_forward_B](#)
- int [speed](#)

11.2.1 Constructor & Destructor Documentation

11.2.1.1 BackWheels()

```
BackWheels::BackWheels (
    const int & bus_number = 1 ) [inline]
```

11.2.2 Member Function Documentation

11.2.2.1 backward()

```
void BackWheels::backward ( ) [inline]
```

11.2.2.2 calibration()

```
void BackWheels::calibration ( ) [inline]
```

11.2.2.3 caliLeft()

```
void BackWheels::caliLeft ( ) [inline]
```

11.2.2.4 caliOK()

```
void BackWheels::caliOK ( ) [inline]
```

11.2.2.5 caliRight()

```
void BackWheels::caliRight ( ) [inline]
```

11.2.2.6 forward()

```
void BackWheels::forward ( ) [inline]
```

11.2.2.7 getSpeed()

```
int BackWheels::getSpeed ( ) const [inline]
```

11.2.2.8 ready()

```
void BackWheels::ready ( ) [inline]
```

11.2.2.9 setSpeed()

```
void BackWheels::setSpeed (
    const int & speed ) [inline]
```


11.2.2.10 stop()

```
void BackWheels::stop ( ) [inline]
```

11.2.3 Member Data Documentation

11.2.3.1 cali_forward_A

```
int BackWheels::cali_forward_A [private]
```

11.2.3.2 cali_forward_B

```
int BackWheels::cali_forward_B [private]
```

11.2.3.3 forward_A

```
int BackWheels::forward_A [private]
```

11.2.3.4 forward_B

```
int BackWheels::forward_B [private]
```

11.2.3.5 left_wheel

```
std::unique_ptr<TB6612> BackWheels::left_wheel [private]
```

11.2.3.6 pca9685

```
PCA9685 BackWheels::pca9685
```

11.2.3.7 right_wheel

```
std::unique_ptr<TB6612> BackWheels::right_wheel [private]
```

11.2.3.8 speed

```
int BackWheels::speed [private]
```

The documentation for this class was generated from the following file:

- [common/tests/tb6612/test_rear_wheels.cpp](#)

11.3 behaviour_tree::BehaviourTreeHandler Class Reference

```
#include <BehaviourTreeHandler.hpp>
```

Inheritance diagram for behaviour_tree::BehaviourTreeHandler:



Public Member Functions

- void [initialize](#) (std::shared_ptr< [car::system::CarSystem](#) > [car_system](#)) final override
- void [handleCommand](#) (const std::string message, const rapidjson::Document &message_json)
- void [setBehaviourTree](#) (const rapidjson::Document &message_json)
- void [startBehaviourTree](#) ()
- void [stopBehaviourTree](#) ()
- void [update](#) () final override
- void [stop](#) () final override
- std::string [getName](#) () final override
- void [_setBehaviourTree](#) (std::shared_ptr< BehaviourTree > [behaviour_tree](#))

Private Attributes

- std::shared_ptr< [car::system::CarSystem](#) > [car_system](#)
- std::shared_ptr< BehaviourTree > [behaviour_tree](#)
- std::shared_ptr< Context > [context](#)
- int [tick_count](#) = 0
- std::chrono::time_point< std::chrono::steady_clock > [last_connected](#)

11.3.1 Member Function Documentation

11.3.1.1 `_setBehaviourTree()`

```
void behaviour_tree::BehaviourTreeHandler::_setBehaviourTree (  
    std::shared_ptr< BehaviourTree > behaviour_tree ) [inline]
```

11.3.1.2 `getName()`

```
std::string behaviour_tree::BehaviourTreeHandler::getName ( ) [inline], [final], [override],  
[virtual]
```

Implements [car::plugin::Plugin](#).

11.3.1.3 `handleCommand()`

```
void behaviour_tree::BehaviourTreeHandler::handleCommand (  
    const std::string message,  
    const rapidjson::Document & message_json ) [inline]
```

11.3.1.4 `initialize()`

```
void behaviour_tree::BehaviourTreeHandler::initialize (  
    std::shared_ptr< car::system::CarSystem > car_system ) [inline], [final], [override],  
[virtual]
```

Implements [car::plugin::Plugin](#).

11.3.1.5 `setBehaviourTree()`

```
void behaviour_tree::BehaviourTreeHandler::setBehaviourTree (  
    const rapidjson::Document & message_json ) [inline]
```

11.3.1.6 startBehaviourTree()

```
void behaviour_tree::BehaviourTreeHandler::startBehaviourTree ( ) [inline]
```

11.3.1.7 stop()

```
void behaviour_tree::BehaviourTreeHandler::stop ( ) [inline], [final], [override], [virtual]
```

Implements [car::plugin::Plugin](#).

11.3.1.8 stopBehaviourTree()

```
void behaviour_tree::BehaviourTreeHandler::stopBehaviourTree ( ) [inline]
```

11.3.1.9 update()

```
void behaviour_tree::BehaviourTreeHandler::update ( ) [inline], [final], [override], [virtual]
```

Implements [car::plugin::Plugin](#).

11.3.2 Member Data Documentation

11.3.2.1 behaviour_tree

```
std::shared_ptr<BehaviourTree> behaviour_tree::BehaviourTreeHandler::behaviour_tree [private]
```

11.3.2.2 car_system

```
std::shared_ptr<car::system::CarSystem> behaviour_tree::BehaviourTreeHandler::car_system  
[private]
```

11.3.2.3 context

```
std::shared_ptr<Context> behaviour_tree::BehaviourTreeHandler::context [private]
```

11.3.2.4 last_connected

```
std::chrono::time_point<std::chrono::steady_clock> behaviour_tree::BehaviourTreeHandler↵
::last_connected [private]
```

11.3.2.5 tick_count

```
int behaviour_tree::BehaviourTreeHandler::tick_count = 0 [private]
```

The documentation for this class was generated from the following file:

- common/include/behaviour_tree/[BehaviourTreeHandler.hpp](#)

11.4 car::system::device::CameraDevice Class Reference

```
#include <CameraDevice.h>
```

Public Member Functions

- [CameraDevice](#) (std::shared_ptr< [configuration::Configuration](#) > [configuration](#))
- [CameraDevice](#) (const [CameraDevice](#) &)=delete
- [CameraDevice](#) & operator= (const [CameraDevice](#) &)=delete
- [CameraDevice](#) ([CameraDevice](#) &&)=delete
- [CameraDevice](#) & operator= ([CameraDevice](#) &&)=delete
- [~CameraDevice](#) ()=default
- std::string [getFrameBuffer](#) () const

Static Public Member Functions

- static tl::expected< std::unique_ptr< [CameraDevice](#) >, std::string > [create](#) (std::shared_ptr< [configuration::Configuration](#) > [configuration](#))

Protected Member Functions

- void [start](#) ()
- void [update](#) ()
- void [stop](#) ()
- void [disconnect](#) ()
- void [terminate](#) ()

Private Attributes

- `std::shared_ptr< configuration::Configuration > configuration`
- `std::unique_ptr< cv::VideoCapture > camera_`
- `bool connected_ = false`
- `std::string frame_buffer_`
- `std::mutex camera_mutex_`
- `std::chrono::steady_clock::time_point last`

Friends

- class [DeviceManager](#)

11.4.1 Constructor & Destructor Documentation

11.4.1.1 CameraDevice() [1/3]

```
car::system::device::CameraDevice::CameraDevice (
    std::shared_ptr< configuration::Configuration > configuration ) [inline]
```

11.4.1.2 CameraDevice() [2/3]

```
car::system::device::CameraDevice::CameraDevice (
    const CameraDevice & ) [delete]
```

11.4.1.3 CameraDevice() [3/3]

```
car::system::device::CameraDevice::CameraDevice (
    CameraDevice && ) [delete]
```

11.4.1.4 ~CameraDevice()

```
car::system::device::CameraDevice::~~CameraDevice ( ) [default]
```

11.4.2 Member Function Documentation

11.4.2.1 create()

```
tl::expected< std::unique_ptr< CameraDevice >, std::string > car::system::device::CameraDevice::create (
    std::shared_ptr< configuration::Configuration > configuration ) [static]
```

11.4.2.2 disconnect()

```
void car::system::device::CameraDevice::disconnect ( ) [protected]
```

11.4.2.3 getFrameBuffer()

```
std::string car::system::device::CameraDevice::getFrameBuffer ( ) const
```

11.4.2.4 operator=() [1/2]

```
CameraDevice & car::system::device::CameraDevice::operator= (
    CameraDevice && ) [delete]
```

11.4.2.5 operator=() [2/2]

```
CameraDevice & car::system::device::CameraDevice::operator= (
    const CameraDevice & ) [delete]
```

11.4.2.6 start()

```
void car::system::device::CameraDevice::start ( ) [protected]
```

11.4.2.7 stop()

```
void car::system::device::CameraDevice::stop ( ) [protected]
```

11.4.2.8 terminate()

```
void car::system::device::CameraDevice::terminate ( ) [protected]
```

11.4.2.9 update()

```
void car::system::device::CameraDevice::update ( ) [protected]
```

11.4.3 Friends And Related Function Documentation

11.4.3.1 DeviceManager

```
friend class DeviceManager [friend]
```

11.4.4 Member Data Documentation

11.4.4.1 camera_

```
std::unique_ptr<cv::VideoCapture> car::system::device::CameraDevice::camera_ [private]
```

11.4.4.2 camera_mutex_

```
std::mutex car::system::device::CameraDevice::camera_mutex_ [private]
```

11.4.4.3 configuration

```
std::shared_ptr<configuration::Configuration> car::system::device::CameraDevice::configuration  
[private]
```


11.4.4.4 connected_

```
bool car::system::device::CameraDevice::connected_ = false [private]
```

11.4.4.5 frame_buffer_

```
std::string car::system::device::CameraDevice::frame_buffer_ [private]
```

11.4.4.6 last

```
std::chrono::steady_clock::time_point car::system::device::CameraDevice::last [private]
```

The documentation for this class was generated from the following files:

- common/include/car/system/device/[CameraDevice.h](#)
- common/src/car/system/device/[CameraDevice.cpp](#)

11.5 car::display::console::CarConsole Class Reference

```
#include <CarConsole.h>
```

Public Member Functions

- [CarConsole](#) (std::shared_ptr< [CarSystem](#) > car_system, std::shared_ptr< [JsonConfiguration](#) > json_configuration, std::shared_ptr< [logging::vector_sink_mt](#) > vector_sink)
- void [initialize](#) ()
- void [run](#) ()
- void [terminate](#) ()

Private Attributes

- std::shared_ptr< [CarSystem](#) > car_system
- std::shared_ptr< [JsonConfiguration](#) > json_configuration
- std::shared_ptr< [logging::vector_sink_mt](#) > vector_sink

11.5.1 Constructor & Destructor Documentation

11.5.1.1 CarConsole()

```
car::display::console::CarConsole::CarConsole (
    std::shared_ptr< CarSystem > car_system,
    std::shared_ptr< JsonConfiguration > json_configuration,
    std::shared_ptr< logging::vector_sink_mt > vector_sink )
```

11.5.2 Member Function Documentation

11.5.2.1 initialize()

```
void car::display::console::CarConsole::initialize ( )
```

11.5.2.2 run()

```
void car::display::console::CarConsole::run ( )
```

11.5.2.3 terminate()

```
void car::display::console::CarConsole::terminate ( )
```

11.5.3 Member Data Documentation

11.5.3.1 car_system

```
std::shared_ptr<CarSystem> car::display::console::CarConsole::car_system [private]
```

11.5.3.2 json_configuration

```
std::shared_ptr<JsonConfiguration> car::display::console::CarConsole::json_configuration
[private]
```

11.5.3.3 vector_sink

```
std::shared_ptr<logging::vector_sink_mt> car::display::console::CarConsole::vector_sink [private]
```

The documentation for this class was generated from the following files:

- [tui/src/car/display/console/CarConsole.h](#)
- [tui/src/car/display/console/CarConsole.cpp](#)

11.6 behaviour_tree::CarContext Class Reference

```
#include <CarContext.hpp>
```

Inheritance diagram for behaviour_tree::CarContext:



Public Member Functions

- [CarContext](#) (std::shared_ptr< BehaviourTree > behaviour_tree, std::shared_ptr< [car::system::CarSystem](#) > [car_system](#))
- std::shared_ptr< [car::system::CarSystem](#) > [getCarSystem](#) () const
- void [_](#) () override

Private Attributes

- std::shared_ptr< [car::system::CarSystem](#) > [car_system](#)

11.6.1 Constructor & Destructor Documentation

11.6.1.1 CarContext()

```
behaviour_tree::CarContext::CarContext (
    std::shared_ptr< BehaviourTree > behaviour_tree,
    std::shared_ptr< car::system::CarSystem > car_system ) [inline]
```

11.6.2 Member Function Documentation

11.6.2.1 _()

```
void behaviour_tree::CarContext::_ ( ) [inline], [override]
```

11.6.2.2 getCarSystem()

```
std::shared_ptr< car::system::CarSystem > behaviour_tree::CarContext::getCarSystem ( ) const  
[inline]
```

11.6.3 Member Data Documentation

11.6.3.1 car_system

```
std::shared_ptr<car::system::CarSystem> behaviour_tree::CarContext::car_system [private]
```

The documentation for this class was generated from the following file:

- common/include/behaviour_tree/[CarContext.hpp](#)

11.7 car::system::CarSystem Class Reference

```
#include <CarSystem.h>
```

Inheritance diagram for car::system::CarSystem:



Public Member Functions

- [CarSystem](#) (std::shared_ptr< [Configuration](#) > configuration, std::unique_ptr< [DeviceManager](#) > device_↵ manager, std::unique_ptr< [MessagingSystem](#) > messaging_system, std::unique_ptr< [MovementSystem](#) > movement_system, std::unique_ptr< [PluginManager](#) > plugin_manager)
 - void [initialize](#) ()
 - void [reload](#) ()
 - void [start](#) ()
 - void [stop](#) ()
 - tl::expected< nullptr_t, std::string > [tryConnect](#) ()
 - void [disconnect](#) ()
 - void [terminate](#) ()
- Only devices should be terminated here since destructor does not work when the program is terminated by the user.*
- void [update](#) ()
 - const std::shared_ptr< [Configuration](#) > [getConfiguration](#) () const
 - void [setConfiguration](#) (std::shared_ptr< [Configuration](#) > configuration)
 - [DeviceManager](#) * [getDeviceManager](#) () const
 - [MessagingSystem](#) * [getMessagingSystem](#) () const
 - [MovementSystem](#) * [getMovementSystem](#) () const
 - template<typename T >
const std::shared_ptr< T > [getPlugin](#) () const

Private Member Functions

- void [sendData](#) ()

Private Attributes

- std::shared_ptr< [Configuration](#) > [configuration_](#)
- const std::unique_ptr< [DeviceManager](#) > [device_manager_](#)
- const std::unique_ptr< [MessagingSystem](#) > [messaging_system_](#)
- const std::unique_ptr< [MovementSystem](#) > [movement_system_](#)
- const std::unique_ptr< [PluginManager](#) > [plugin_manager_](#)
- bool [initialized](#) = false
- bool [started](#) = false

11.7.1 Constructor & Destructor Documentation

11.7.1.1 CarSystem()

```
car::system::CarSystem::CarSystem (
    std::shared_ptr< Configuration > configuration,
    std::unique_ptr< DeviceManager > device\_manager,
    std::unique_ptr< MessagingSystem > messaging\_system,
    std::unique_ptr< MovementSystem > movement\_system,
    std::unique_ptr< PluginManager > plugin\_manager )
```

11.7.2 Member Function Documentation

11.7.2.1 disconnect()

```
void car::system::CarSystem::disconnect ( )
```

11.7.2.2 getConfiguration()

```
const std::shared_ptr< Configuration > car::system::CarSystem::getConfiguration ( ) const
[inline]
```

11.7.2.3 getDeviceManager()

```
DeviceManager * car::system::CarSystem::getDeviceManager ( ) const [inline]
```

11.7.2.4 getMessagingSystem()

```
MessagingSystem * car::system::CarSystem::getMessagingSystem ( ) const [inline]
```

11.7.2.5 getMovementSystem()

```
MovementSystem * car::system::CarSystem::getMovementSystem ( ) const [inline]
```

11.7.2.6 getPlugin()

```
template<typename T >  
const std::shared_ptr< T > car::system::CarSystem::getPlugin ( ) const [inline]
```

11.7.2.7 initialize()

```
void car::system::CarSystem::initialize ( )
```

11.7.2.8 reload()

```
void car::system::CarSystem::reload ( )
```

11.7.2.9 sendData()

```
void car::system::CarSystem::sendData ( ) [private]
```

11.7.2.10 setConfiguration()

```
void car::system::CarSystem::setConfiguration (
    std::shared_ptr< Configuration > configuration )
```

11.7.2.11 start()

```
void car::system::CarSystem::start ( )
```

11.7.2.12 stop()

```
void car::system::CarSystem::stop ( )
```

11.7.2.13 terminate()

```
void car::system::CarSystem::terminate ( )
```

Only devices should be terminated here since destructor does not work when the program is terminated by the user.

11.7.2.14 tryConnect()

```
tl::expected< nullptr_t, std::string > car::system::CarSystem::tryConnect ( )
```

11.7.2.15 update()

```
void car::system::CarSystem::update ( )
```

11.7.3 Member Data Documentation

11.7.3.1 configuration_

```
std::shared_ptr<Configuration> car::system::CarSystem::configuration_ [private]
```

11.7.3.2 device_manager_

```
const std::unique_ptr<DeviceManager> car::system::CarSystem::device_manager_ [private]
```

11.7.3.3 initialized

```
bool car::system::CarSystem::initialized = false [private]
```

11.7.3.4 messaging_system_

```
const std::unique_ptr<MessagingSystem> car::system::CarSystem::messaging_system_ [private]
```

11.7.3.5 movement_system_

```
const std::unique_ptr<MovementSystem> car::system::CarSystem::movement_system_ [private]
```

11.7.3.6 plugin_manager_

```
const std::unique_ptr<PluginManager> car::system::CarSystem::plugin_manager_ [private]
```

11.7.3.7 started

```
bool car::system::CarSystem::started = false [private]
```

The documentation for this class was generated from the following files:

- [common/include/car/system/CarSystem.h](#)
- [common/src/car/system/CarSystem.cpp](#)

11.8 car::configuration::Configuration Struct Reference

```
#include <Configuration.h>
```


Public Member Functions

- void [setCameraFps](#) (const int [camera_fps](#))
- const int [getCameraFpsInterval](#) ()

Public Attributes

- std::string [host](#) = "127.0.0.1:3000"
- int [camera_index](#) = 0
- bool [use_camera](#) = true
- std::string [lidar_port](#) = ""
- bool [use_lidar](#) = true
- std::chrono::milliseconds [behaviour_tree_update_ms_interval](#) = std::chrono::milliseconds(100)

Private Attributes

- int [camera_fps](#) = 60
- int [camera_fps_interval](#) = 1000

11.8.1 Member Function Documentation

11.8.1.1 [getCameraFpsInterval\(\)](#)

```
const int car::configuration::Configuration::getCameraFpsInterval ( ) [inline]
```

11.8.1.2 [setCameraFps\(\)](#)

```
void car::configuration::Configuration::setCameraFps (
    const int camera_fps ) [inline]
```

11.8.2 Member Data Documentation

11.8.2.1 [behaviour_tree_update_ms_interval](#)

```
std::chrono::milliseconds car::configuration::Configuration::behaviour_tree_update_ms_interval
= std::chrono::milliseconds(100)
```

11.8.2.2 camera_fps

```
int car::configuration::Configuration::camera_fps = 60 [private]
```

11.8.2.3 camera_fps_interval

```
int car::configuration::Configuration::camera_fps_interval = 1000 [private]
```

11.8.2.4 camera_index

```
int car::configuration::Configuration::camera_index = 0
```

11.8.2.5 host

```
std::string car::configuration::Configuration::host = "127.0.0.1:3000"
```

11.8.2.6 lidar_port

```
std::string car::configuration::Configuration::lidar_port = ""
```

11.8.2.7 use_camera

```
bool car::configuration::Configuration::use_camera = true
```

11.8.2.8 use_lidar

```
bool car::configuration::Configuration::use_lidar = true
```

The documentation for this struct was generated from the following file:

- [common/include/car/configuration/Configuration.h](#)

11.9 car::display::console::component::main::ConnectButton Class Reference

Public Member Functions

- [ConnectButton](#) (std::shared_ptr< [CarSystem](#) > *car_system*, Box &box)
- Component [element](#) ()

Public Attributes

- std::function< void(std::string)> [on_connect_failure](#) = [] (std::string _) {}

Private Attributes

- std::shared_ptr< [CarSystem](#) > *car_system*
- bool [main_debounce](#) = false
- bool [button_pressed](#) = false
- std::string [main_button_text](#) = "Start Car Application"
- Component [main_button](#)

11.9.1 Constructor & Destructor Documentation

11.9.1.1 ConnectButton()

```
car::display::console::component::main::ConnectButton::ConnectButton (
    std::shared_ptr< CarSystem > car_system,
    Box & box )    [inline]
```

11.9.2 Member Function Documentation

11.9.2.1 element()

```
Component car::display::console::component::main::ConnectButton::element ( )    [inline]
```

11.9.3 Member Data Documentation

11.9.3.1 button_pressed

```
bool car::display::console::component::main::ConnectButton::button_pressed = false [private]
```

11.9.3.2 car_system

```
std::shared_ptr<CarSystem> car::display::console::component::main::ConnectButton::car_system  
[private]
```

11.9.3.3 main_button

```
Component car::display::console::component::main::ConnectButton::main_button [private]
```

11.9.3.4 main_button_text

```
std::string car::display::console::component::main::ConnectButton::main_button_text = "Start  
Car Application" [private]
```

11.9.3.5 main_debounce

```
bool car::display::console::component::main::ConnectButton::main_debounce = false [private]
```

11.9.3.6 on_connect_failure

```
std::function<void(std::string)> car::display::console::component::main::ConnectButton::on_↵  
connect_failure = [] (std::string _) {}
```

The documentation for this class was generated from the following file:

- tui/src/car/display/console/component/main/[ConnectButton.cxx](#)

11.10 car::display::console::component::debug::DebugEnableder Class Reference

Public Member Functions

- Component [getCheckbox](#) ()
- ComponentDecorator [getWarningModal](#) ()
- const bool & [isEnabled](#) () const

Private Attributes

- bool `debounce` = false
- bool `enabled` = false
- bool `checkbox_value` = false
- bool `display_warn_debug_modal` = false
- std::string `status` = `DEBUG_MODE_DISABLED_MESSAGE`
- Component `component`

Static Private Attributes

- static constexpr auto `DEBUG_ENABLE_WARNING_MESSAGE` = "Enabling debug mode temporarily disables connecting to online. Are you sure you want to do this?"
- static constexpr auto `DEBUG_MODE_ENABLED_MESSAGE` = "Debug Status: Enabled"
- static constexpr auto `DEBUG_MODE_DISABLED_MESSAGE` = "Debug Status: Disabled"
- static constexpr auto `DEBUG_MODE_WAIT_MESSAGE` = "Debug Status: Waiting for user input..."

11.10.1 Member Function Documentation

11.10.1.1 getCheckbox()

Component car::display::console::component::debug::DebugEnabler::getCheckbox () [inline]

11.10.1.2 getWarningModal()

ComponentDecorator car::display::console::component::debug::DebugEnabler::getWarningModal () [inline]

11.10.1.3 isEnabled()

const bool & car::display::console::component::debug::DebugEnabler::isEnabled () const [inline]

11.10.2 Member Data Documentation

11.10.2.1 checkbox_value

bool car::display::console::component::debug::DebugEnabler::checkbox_value = false [private]

11.10.2.2 component

```
Component car::display::console::component::debug::DebugEnabler::component [private]
```

11.10.2.3 debounce

```
bool car::display::console::component::debug::DebugEnabler::debounce = false [private]
```

11.10.2.4 DEBUG_ENABLE_WARNING_MESSAGE

```
constexpr auto car::display::console::component::debug::DebugEnabler::DEBUG_ENABLE_WARNING_↵  
_MESSAGE = "Enabling debug mode temporarily disables connecting to online. Are you sure you  
want to do this?" [static], [constexpr], [private]
```

11.10.2.5 DEBUG_MODE_DISABLED_MESSAGE

```
constexpr auto car::display::console::component::debug::DebugEnabler::DEBUG_MODE_DISABLED_↵  
MESSAGE = "Debug Status: Disabled" [static], [constexpr], [private]
```

11.10.2.6 DEBUG_MODE_ENABLED_MESSAGE

```
constexpr auto car::display::console::component::debug::DebugEnabler::DEBUG_MODE_ENABLED_↵  
MESSAGE = "Debug Status: Enabled" [static], [constexpr], [private]
```

11.10.2.7 DEBUG_MODE_WAIT_MESSAGE

```
constexpr auto car::display::console::component::debug::DebugEnabler::DEBUG_MODE_WAIT_MESSAGE  
= "Debug Status: Waiting for user input..." [static], [constexpr], [private]
```

11.10.2.8 display_warn_debug_modal

```
bool car::display::console::component::debug::DebugEnabler::display_warn_debug_modal = false  
[private]
```

11.10.2.9 enabled

```
bool car::display::console::component::debug::DebugEnabler::enabled = false [private]
```

11.10.2.10 status

```
std::string car::display::console::component::debug::DebugEnabler::status = DEBUG_MODE_DISABLED_MESSAGE [private]
```

The documentation for this class was generated from the following file:

- tui/src/car/display/console/component/debug/[DebugEnabler.cxx](#)

11.11 car::display::console::component::debug::DebugLidarCheckbox Class Reference

Public Member Functions

- [DebugLidarCheckbox](#) ()
- Component [element](#) ()
- nod::signal< void(bool)> & [getLidarMotorSignal](#) ()

Private Attributes

- nod::signal< void(bool)> [lidar_motor_signal](#)
- std::string [lidar_motor_status](#) = LIDAR_MOTOR_DISABLED_MESSAGE
- bool [lidar_motor_loading_debounce](#) = false
- bool [lidar_motor_enabled](#) = false
- Component [lidar_motor_checkbox_component](#)

Static Private Attributes

- static constexpr auto [LIDAR_MOTOR_ENABLED_MESSAGE](#) = "Lidar Motor Status: Enabled"
- static constexpr auto [LIDAR_MOTOR_DISABLED_MESSAGE](#) = "Lidar Motor Status: Disconnected"

11.11.1 Constructor & Destructor Documentation

11.11.1.1 DebugLidarCheckbox()

```
car::display::console::component::debug::DebugLidarCheckbox::DebugLidarCheckbox ( ) [inline]
```

11.11.2 Member Function Documentation

11.11.2.1 element()

```
Component car::display::console::component::debug::DebugLidarCheckbox::element ( ) [inline]
```

11.11.2.2 getLidarMotorSignal()

```
nod::signal< void(bool)> & car::display::console::component::debug::DebugLidarCheckbox::get↵  
LidarMotorSignal ( ) [inline]
```

11.11.3 Member Data Documentation

11.11.3.1 lidar_motor_checkbox_component

```
Component car::display::console::component::debug::DebugLidarCheckbox::lidar_motor_checkbox_↵  
component [private]
```

11.11.3.2 LIDAR_MOTOR_DISABLED_MESSAGE

```
constexpr auto car::display::console::component::debug::DebugLidarCheckbox::LIDAR_MOTOR_↵  
DISABLED_MESSAGE = "Lidar Motor Status: Disconnected" [static], [constexpr], [private]
```

11.11.3.3 lidar_motor_enabled

```
bool car::display::console::component::debug::DebugLidarCheckbox::lidar_motor_enabled = false  
[private]
```

11.11.3.4 LIDAR_MOTOR_ENABLED_MESSAGE

```
constexpr auto car::display::console::component::debug::DebugLidarCheckbox::LIDAR_MOTOR_↵  
ENABLED_MESSAGE = "Lidar Motor Status: Enabled" [static], [constexpr], [private]
```


11.11.3.5 lidar_motor_loading_debounce

```
bool car::display::console::component::debug::DebugLidarCheckbox::lidar_motor_loading_debounce
= false [private]
```

11.11.3.6 lidar_motor_signal

```
nod::signal<void(bool)> car::display::console::component::debug::DebugLidarCheckbox::lidar_↵
motor_signal [private]
```

11.11.3.7 lidar_motor_status

```
std::string car::display::console::component::debug::DebugLidarCheckbox::lidar_motor_status =
LIDAR_MOTOR_DISABLED_MESSAGE [private]
```

The documentation for this class was generated from the following file:

- tui/src/car/display/console/component/debug/[DebugLidarCheckbox.cxx](#)

11.12 car::display::console::component::debug::DebugMessaging↵ Textbox Class Reference

Public Member Functions

- [DebugMessagingTextbox](#) (nod::signal< void(const std::string)> &[message_signal](#))
- ftxui::Component [element](#) ()

Private Attributes

- std::string [message](#)
- Component [messaging_title](#)
- Component [messaging_textbox](#)
- Component [messaging_container](#)
- nod::signal< void(const std::string)> & [message_signal](#)

11.12.1 Constructor & Destructor Documentation

11.12.1.1 DebugMessagingTextbox()

```
car::display::console::component::debug::DebugMessagingTextbox::DebugMessagingTextbox (
    nod::signal< void(const std::string)> & message_signal ) [inline]
```

11.12.2 Member Function Documentation

11.12.2.1 element()

```
ftxui::Component car::display::console::component::debug::DebugMessagingTextbox::element ( )
[inline]
```

11.12.3 Member Data Documentation

11.12.3.1 message

```
std::string car::display::console::component::debug::DebugMessagingTextbox::message [private]
```

11.12.3.2 message_signal

```
nod::signal<void(const std::string)>& car::display::console::component::debug::DebugMessaging←
Textbox::message_signal [private]
```

11.12.3.3 messaging_container

```
Component car::display::console::component::debug::DebugMessagingTextbox::messaging_container
[private]
```

11.12.3.4 messaging_textbox

```
Component car::display::console::component::debug::DebugMessagingTextbox::messaging_textbox
[private]
```

11.12.3.5 messaging_title

Component car::display::console::component::debug::DebugMessagingTextbox::messaging_title
[private]

The documentation for this class was generated from the following file:

- [tui/src/car/display/console/component/debug/DebugMessagingTextbox.cxx](#)

11.13 car::display::console::component::debug::DebugMovementRenderer Class Reference

Public Member Functions

- [DebugMovementRenderer](#) ()
- [ftxui::Component element](#) ()
- [bool updateFrontWheels](#) ()
- [bool updateCameraServo1](#) ()
- [bool updateCameraServo2](#) ()
- [bool updateRearWheels](#) ()
- [nod::signal< void\(bool\)> & getRearWheelDirectionSignal](#) ()
- [const int getFrontWheelsAngleSliderValue](#) () const
- [const int getCameraServo1AngleSliderValue](#) () const
- [const int getCameraServo2AngleSliderValue](#) () const
- [const int getRearLeftWheelSpeedSliderValue](#) () const
- [const int getRearRightWheelSpeedSliderValue](#) () const

Private Attributes

- [nod::signal< void\(bool\)> rear_wheel_direction_signal](#)
- [int previous_rear_wheels_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED](#)
- [int rear_wheels_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED](#)
- [int previous_rear_left_wheel_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED](#)
- [int rear_left_wheel_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED](#)
- [int previous_rear_right_wheel_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED](#)
- [int rear_right_wheel_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED](#)
- [int previous_front_wheels_angle_slider_value = DEFAULT_FRONT_WHEEL_ANGLE](#)
- [int front_wheels_angle_slider_value = DEFAULT_FRONT_WHEEL_ANGLE](#)
- [int previous_camera_servo_1_angle_slider_angle = DEFAULT_FRONT_WHEEL_ANGLE](#)
- [int camera_servo_1_angle_slider_angle = DEFAULT_FRONT_WHEEL_ANGLE](#)
- [int previous_camera_servo_2_angle_slider_angle = DEFAULT_FRONT_WHEEL_ANGLE](#)
- [int camera_servo_2_angle_slider_angle = DEFAULT_FRONT_WHEEL_ANGLE](#)
- [bool rear_wheel_direction_debounce = false](#)
- [std::string rear_wheel_direction_status = REAR_WHEEL_DIRECTION_FORWARD_MESSAGE](#)
- [bool rear_wheel_direction = true](#)
- [Component rear_wheel_speed_slider](#)
- [Component rear_left_wheel_speed_slider](#)
- [Component rear_right_wheel_speed_slider](#)
- [Component rear_wheel_direction_checkbox_component](#)
- [Component front_wheels_angle_slider](#)
- [Component camera_servo_1_angle_slider](#)
- [Component camera_servo_2_angle_slider](#)
- [Component rear_wheel_menu_entry](#)
- [Component servo_menu_entry](#)
- [Component slider_container](#)

Static Private Attributes

- static constexpr int [DEFAULT_REAR_WHEEL_SPEED](#) = 0
- static constexpr int [DEFAULT_FRONT_WHEEL_ANGLE](#) = 90
- static constexpr auto [REAR_WHEEL_DIRECTION_FORWARD_MESSAGE](#) = "Rear Wheel Direction: Forward"
- static constexpr auto [REAR_WHEEL_DIRECTION_BACKWARD_MESSAGE](#) = "Rear Wheel Direction: Backward"

11.13.1 Constructor & Destructor Documentation

11.13.1.1 DebugMovementRenderer()

```
car::display::console::component::debug::DebugMovementRenderer::DebugMovementRenderer ( )
[inline]
```

11.13.2 Member Function Documentation

11.13.2.1 element()

```
ftxui::Component car::display::console::component::debug::DebugMovementRenderer::element ( )
[inline]
```

11.13.2.2 getCameraServo1AngleSliderValue()

```
const int car::display::console::component::debug::DebugMovementRenderer::getCameraServo1↔
AngleSliderValue ( ) const [inline]
```

11.13.2.3 getCameraServo2AngleSliderValue()

```
const int car::display::console::component::debug::DebugMovementRenderer::getCameraServo2↔
AngleSliderValue ( ) const [inline]
```

11.13.2.4 getFrontWheelsAngleSliderValue()

```
const int car::display::console::component::debug::DebugMovementRenderer::getFrontWheels↵  
AngleSliderValue ( ) const [inline]
```

11.13.2.5 getRearLeftWheelSpeedSliderValue()

```
const int car::display::console::component::debug::DebugMovementRenderer::getRearLeftWheel↵  
SpeedSliderValue ( ) const [inline]
```

11.13.2.6 getRearRightWheelSpeedSliderValue()

```
const int car::display::console::component::debug::DebugMovementRenderer::getRearRightWheel↵  
SpeedSliderValue ( ) const [inline]
```

11.13.2.7 getRearWheelDirectionSignal()

```
nod::signal< void(bool)> & car::display::console::component::debug::DebugMovementRenderer↵  
::getRearWheelDirectionSignal ( ) [inline]
```

11.13.2.8 updateCameraServo1()

```
bool car::display::console::component::debug::DebugMovementRenderer::updateCameraServo1 ( )  
[inline]
```

11.13.2.9 updateCameraServo2()

```
bool car::display::console::component::debug::DebugMovementRenderer::updateCameraServo2 ( )  
[inline]
```

11.13.2.10 updateFrontWheels()

```
bool car::display::console::component::debug::DebugMovementRenderer::updateFrontWheels ( )  
[inline]
```

11.13.2.11 updateRearWheels()

```
bool car::display::console::component::debug::DebugMovementRenderer::updateRearWheels ( )  
[inline]
```

11.13.3 Member Data Documentation

11.13.3.1 camera_servo_1_angle_slider

```
Component car::display::console::component::debug::DebugMovementRenderer::camera_servo_1_↔  
angle_slider [private]
```

11.13.3.2 camera_servo_1_angle_slider_angle

```
int car::display::console::component::debug::DebugMovementRenderer::camera_servo_1_angle_↔  
slider_angle = DEFAULT_FRONT_WHEEL_ANGLE [private]
```

11.13.3.3 camera_servo_2_angle_slider

```
Component car::display::console::component::debug::DebugMovementRenderer::camera_servo_2_↔  
angle_slider [private]
```

11.13.3.4 camera_servo_2_angle_slider_angle

```
int car::display::console::component::debug::DebugMovementRenderer::camera_servo_2_angle_↔  
slider_angle = DEFAULT_FRONT_WHEEL_ANGLE [private]
```

11.13.3.5 DEFAULT_FRONT_WHEEL_ANGLE

```
constexpr int car::display::console::component::debug::DebugMovementRenderer::DEFAULT_FRONT_↔  
WHEEL_ANGLE = 90 [static], [constexpr], [private]
```

11.13.3.6 DEFAULT_REAR_WHEEL_SPEED

```
constexpr int car::display::console::component::debug::DebugMovementRenderer::DEFAULT_REAR_WHEEL_SPEED = 0 [static], [constexpr], [private]
```

11.13.3.7 front_wheels_angle_slider

```
Component car::display::console::component::debug::DebugMovementRenderer::front_wheels_angle_slider [private]
```

11.13.3.8 front_wheels_angle_slider_value

```
int car::display::console::component::debug::DebugMovementRenderer::front_wheels_angle_slider_value = DEFAULT_FRONT_WHEEL_ANGLE [private]
```

11.13.3.9 previous_camera_servo_1_angle_slider_angle

```
int car::display::console::component::debug::DebugMovementRenderer::previous_camera_servo_1_angle_slider_angle = DEFAULT_FRONT_WHEEL_ANGLE [private]
```

11.13.3.10 previous_camera_servo_2_angle_slider_angle

```
int car::display::console::component::debug::DebugMovementRenderer::previous_camera_servo_2_angle_slider_angle = DEFAULT_FRONT_WHEEL_ANGLE [private]
```

11.13.3.11 previous_front_wheels_angle_slider_value

```
int car::display::console::component::debug::DebugMovementRenderer::previous_front_wheels_angle_slider_value = DEFAULT_FRONT_WHEEL_ANGLE [private]
```

11.13.3.12 previous_rear_left_wheel_speed_slider_value

```
int car::display::console::component::debug::DebugMovementRenderer::previous_rear_left_wheel_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED [private]
```

11.13.3.13 previous_rear_right_wheel_speed_slider_value

```
int car::display::console::component::debug::DebugMovementRenderer::previous_rear_right_↵  
wheel_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED [private]
```

11.13.3.14 previous_rear_wheels_speed_slider_value

```
int car::display::console::component::debug::DebugMovementRenderer::previous_rear_wheels_↵  
speed_slider_value = DEFAULT_REAR_WHEEL_SPEED [private]
```

11.13.3.15 rear_left_wheel_speed_slider

```
Component car::display::console::component::debug::DebugMovementRenderer::rear_left_wheel_↵  
speed_slider [private]
```

11.13.3.16 rear_left_wheel_speed_slider_value

```
int car::display::console::component::debug::DebugMovementRenderer::rear_left_wheel_speed_↵  
slider_value = DEFAULT_REAR_WHEEL_SPEED [private]
```

11.13.3.17 rear_right_wheel_speed_slider

```
Component car::display::console::component::debug::DebugMovementRenderer::rear_right_wheel_↵  
speed_slider [private]
```

11.13.3.18 rear_right_wheel_speed_slider_value

```
int car::display::console::component::debug::DebugMovementRenderer::rear_right_wheel_speed_↵  
slider_value = DEFAULT_REAR_WHEEL_SPEED [private]
```

11.13.3.19 rear_wheel_direction

```
bool car::display::console::component::debug::DebugMovementRenderer::rear_wheel_direction =  
true [private]
```


11.13.3.20 REAR_WHEEL_DIRECTION_BACKWARD_MESSAGE

```
constexpr auto car::display::console::component::debug::DebugMovementRenderer::REAR_WHEEL_↵  
DIRECTION_BACKWARD_MESSAGE = "Rear Wheel Direction: Backward" [static], [constexpr], [private]
```

11.13.3.21 rear_wheel_direction_checkbox_component

```
Component car::display::console::component::debug::DebugMovementRenderer::rear_wheel_direction_↵  
_checkbox_component [private]
```

11.13.3.22 rear_wheel_direction_debounce

```
bool car::display::console::component::debug::DebugMovementRenderer::rear_wheel_direction_↵  
debounce = false [private]
```

11.13.3.23 REAR_WHEEL_DIRECTION_FORWARD_MESSAGE

```
constexpr auto car::display::console::component::debug::DebugMovementRenderer::REAR_WHEEL_↵  
DIRECTION_FORWARD_MESSAGE = "Rear Wheel Direction: Forward" [static], [constexpr], [private]
```

11.13.3.24 rear_wheel_direction_signal

```
nod::signal<void(bool)> car::display::console::component::debug::DebugMovementRenderer::rear_↵  
_wheel_direction_signal [private]
```

11.13.3.25 rear_wheel_direction_status

```
std::string car::display::console::component::debug::DebugMovementRenderer::rear_wheel_↵  
direction_status = REAR_WHEEL_DIRECTION_FORWARD_MESSAGE [private]
```

11.13.3.26 rear_wheel_menu_entry

```
Component car::display::console::component::debug::DebugMovementRenderer::rear_wheel_menu_↵  
entry [private]
```

11.13.3.27 rear_wheel_speed_slider

```
Component car::display::console::component::debug::DebugMovementRenderer::rear_wheel_speed_slider [private]
```

11.13.3.28 rear_wheels_speed_slider_value

```
int car::display::console::component::debug::DebugMovementRenderer::rear_wheels_speed_slider_value = DEFAULT_REAR_WHEEL_SPEED [private]
```

11.13.3.29 servo_menu_entry

```
Component car::display::console::component::debug::DebugMovementRenderer::servo_menu_entry [private]
```

11.13.3.30 slider_container

```
Component car::display::console::component::debug::DebugMovementRenderer::slider_container [private]
```

The documentation for this class was generated from the following file:

- tui/src/car/display/console/component/debug/[DebugMovementRenderer.cxx](#)

11.14 car::system::device::DeviceManager Class Reference

```
#include <DeviceManager.h>
```

Public Member Functions

- [DeviceManager](#) (std::unique_ptr< [CameraDevice](#) > camera_device, std::unique_ptr< [lidar::LidarDevice](#) > lidar_device)
- [CameraDevice](#) * [getCameraDevice](#) ()
- [lidar::LidarDevice](#) * [getLidarDevice](#) ()
- const bool [isRunning](#) () const
- void [initialize](#) (std::shared_ptr< [system::CarSystem](#) > car_system)
- void [start](#) ()
- void [update](#) ()
- void [stop](#) ()
- void [terminate](#) ()

Static Public Member Functions

- static tl::expected< std::unique_ptr< [DeviceManager](#) >, std::string > [create](#) (std::shared_ptr< [Configuration](#) > configuration)

Private Attributes

- std::shared_ptr< [car::system::CarSystem](#) > [car_system](#)
- bool [is_initialized_](#) = false
- bool [is_running_](#) = false
- std::unique_ptr< [lidar::LidarDevice](#) > [lidar_device_](#)
- std::unique_ptr< [CameraDevice](#) > [camera_device_](#)

11.14.1 Constructor & Destructor Documentation

11.14.1.1 DeviceManager()

```
car::system::device::DeviceManager::DeviceManager (
    std::unique_ptr< CameraDevice > camera\_device,
    std::unique_ptr< lidar::LidarDevice > lidar\_device ) [inline]
```

11.14.2 Member Function Documentation

11.14.2.1 create()

```
tl::expected< std::unique_ptr< DeviceManager >, std::string > car::system::device::DeviceManager::create (
    std::shared_ptr< Configuration > configuration ) [static]
```

11.14.2.2 getCameraDevice()

```
CameraDevice * car::system::device::DeviceManager::getCameraDevice ( ) [inline]
```

11.14.2.3 getLidarDevice()

```
lidar::LidarDevice * car::system::device::DeviceManager::getLidarDevice ( ) [inline]
```

11.14.2.4 initialize()

```
void car::system::device::DeviceManager::initialize (
    std::shared_ptr< system::CarSystem > car_system )
```

11.14.2.5 isRunning()

```
const bool car::system::device::DeviceManager::isRunning ( ) const [inline]
```

11.14.2.6 start()

```
void car::system::device::DeviceManager::start ( )
```

11.14.2.7 stop()

```
void car::system::device::DeviceManager::stop ( )
```

11.14.2.8 terminate()

```
void car::system::device::DeviceManager::terminate ( )
```

11.14.2.9 update()

```
void car::system::device::DeviceManager::update ( )
```

11.14.3 Member Data Documentation

11.14.3.1 camera_device_

```
std::unique_ptr<CameraDevice> car::system::device::DeviceManager::camera_device_ [private]
```

11.14.3.2 car_system

```
std::shared_ptr<car::system::CarSystem> car::system::device::DeviceManager::car_system [private]
```

11.14.3.3 is_initialized_

```
bool car::system::device::DeviceManager::is_initialized_ = false [private]
```

11.14.3.4 is_running_

```
bool car::system::device::DeviceManager::is_running_ = false [private]
```

11.14.3.5 lidar_device_

```
std::unique_ptr<lidar::LidarDevice> car::system::device::DeviceManager::lidar_device_ [private]
```

The documentation for this class was generated from the following files:

- common/include/car/system/device/[DeviceManager.h](#)
- common/src/car/system/device/[DeviceManager.cpp](#)

11.15 car::system::movement::controller::DummyMovementController Class Reference

```
#include <DummyMovementController.h>
```

Inheritance diagram for car::system::movement::controller::DummyMovementController:



Public Member Functions

- void [initialize](#) () final override
- void [stop](#) () final override
- void [terminate](#) () final override
- void [setRearWheelsSpeed](#) (const int speed) final override
- void [setRearLeftWheelSpeed](#) (const int speed) final override
- void [setRearRightWheelSpeed](#) (const int speed) final override
- void [setFrontWheelsAngle](#) (const float angle) final override
- void [setCameraServo1Angle](#) (const float angle) final override
- void [setCameraServo2Angle](#) (const float angle) final override
- void [setRearWheelsDirectionToForward](#) () final override
- void [setRearLeftWheelDirectionToForward](#) () final override
- void [setRearRightWheelDirectionToForward](#) () final override
- void [setRearWheelsDirectionToBackward](#) () final override
- void [setRearLeftWheelDirectionToBackward](#) () final override
- void [setRearRightWheelDirectionToBackward](#) () final override

11.15.1 Member Function Documentation

11.15.1.1 [initialize\(\)](#)

```
void car::system::movement::controller::DummyMovementController::initialize ( ) [inline],  
[final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.2 [setCameraServo1Angle\(\)](#)

```
void car::system::movement::controller::DummyMovementController::setCameraServo1Angle (   
    const float angle ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.3 [setCameraServo2Angle\(\)](#)

```
void car::system::movement::controller::DummyMovementController::setCameraServo2Angle (   
    const float angle ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.4 setFrontWheelsAngle()

```
void car::system::movement::controller::DummyMovementController::setFrontWheelsAngle (
    const float angle ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.5 setRearLeftWheelDirectionToBackward()

```
void car::system::movement::controller::DummyMovementController::setRearLeftWheelDirectionTo←
Backward ( ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.6 setRearLeftWheelDirectionToForward()

```
void car::system::movement::controller::DummyMovementController::setRearLeftWheelDirectionTo←
Forward ( ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.7 setRearLeftWheelSpeed()

```
void car::system::movement::controller::DummyMovementController::setRearLeftWheelSpeed (
    const int speed ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.8 setRearRightWheelDirectionToBackward()

```
void car::system::movement::controller::DummyMovementController::setRearRightWheelDirection←
ToBackward ( ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.9 setRearRightWheelDirectionToForward()

```
void car::system::movement::controller::DummyMovementController::setRearRightWheelDirection←
ToForward ( ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.10 setRearRightWheelSpeed()

```
void car::system::movement::controller::DummyMovementController::setRearRightWheelSpeed (
    const int speed ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.11 setRearWheelsDirectionToBackward()

```
void car::system::movement::controller::DummyMovementController::setRearWheelsDirectionTo↵
Backward ( ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.12 setRearWheelsDirectionToForward()

```
void car::system::movement::controller::DummyMovementController::setRearWheelsDirectionTo↵
Forward ( ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.13 setRearWheelsSpeed()

```
void car::system::movement::controller::DummyMovementController::setRearWheelsSpeed (
    const int speed ) [final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.14 stop()

```
void car::system::movement::controller::DummyMovementController::stop ( ) [final], [override],
[virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

11.15.1.15 terminate()

```
void car::system::movement::controller::DummyMovementController::terminate ( ) [inline],  
[final], [override], [virtual]
```

Implements [car::system::movement::controller::AbstractMovementController](#).

The documentation for this class was generated from the following files:

- common/include/car/system/movement/controller/[DummyMovementController.h](#)
- common/src/car/system/movement/controller/[DummyMovementController.cpp](#)

11.16 car::system::messaging::MessagingSystem::FirstMessageStruct Struct Reference

```
#include <MessagingSystem.h>
```

Public Attributes

- std::string [error_message](#)
- std::string [uuid](#)
- std::condition_variable [condition](#)

11.16.1 Member Data Documentation

11.16.1.1 condition

```
std::condition_variable car::system::messaging::MessagingSystem::FirstMessageStruct::condition
```

11.16.1.2 error_message

```
std::string car::system::messaging::MessagingSystem::FirstMessageStruct::error_message
```

11.16.1.3 uuid

```
std::string car::system::messaging::MessagingSystem::FirstMessageStruct::uuid
```

The documentation for this struct was generated from the following file:

- common/include/car/system/messaging/[MessagingSystem.h](#)

11.17 car::configuration::JsonConfiguration Class Reference

Public Member Functions

- [JsonConfiguration](#) (std::string [exe_dir](#))
- void [setConfigFilePath](#) (std::string [config_file_path](#))
- const std::string & [getConfigFilePath](#) () const
- tl::expected< [Configuration](#), std::string > [loadConfiguration](#) ()

Private Attributes

- const std::string [exe_dir](#)
- std::string [config_file_path](#)

11.17.1 Constructor & Destructor Documentation

11.17.1.1 JsonConfiguration()

```
car::configuration::JsonConfiguration::JsonConfiguration (  
    std::string exe_dir ) [inline]
```

11.17.2 Member Function Documentation

11.17.2.1 getConfigFilePath()

```
const std::string & car::configuration::JsonConfiguration::getConfigFilePath ( ) const [inline]
```

11.17.2.2 loadConfiguration()

```
tl::expected< Configuration, std::string > car::configuration::JsonConfiguration::loadConfiguration  
( ) [inline]
```

11.17.2.3 setConfigFilePath()

```
void car::configuration::JsonConfiguration::setConfigFilePath (  
    std::string config_file_path ) [inline]
```

11.17.3 Member Data Documentation

11.17.3.1 config_file_path

```
std::string car::configuration::JsonConfiguration::config_file_path [private]
```

11.17.3.2 exe_dir

```
const std::string car::configuration::JsonConfiguration::exe_dir [private]
```

The documentation for this class was generated from the following file:

- tui/src/car/configuration/[JsonConfiguration.cxx](#)

11.18 car::system::device::lidar::LidarDevice Class Reference

```
#include <LidarDevice.h>
```

Inheritance diagram for car::system::device::lidar::LidarDevice:



Public Member Functions

- std::vector< Measure > [getScanData](#) () const
- virtual void [start](#) ()=0
- virtual void [update](#) ()=0
- virtual void [stop](#) ()=0
- virtual void [initialize](#) ()=0
- virtual void [terminate](#) ()=0
- virtual void [disconnect](#) ()=0

Protected Member Functions

- void [setScanData](#) (const std::vector< Measure > &scan_data)

Protected Attributes

- std::vector< Measure > [scan_data_](#)

Friends

- class [DeviceManager](#)

11.18.1 Member Function Documentation

11.18.1.1 disconnect()

```
virtual void car::system::device::lidar::LidarDevice::disconnect ( ) [pure virtual]
```

Implemented in [car::system::device::lidar::LidarDummy](#), and [car::system::device::lidar::LidarScanner](#).

11.18.1.2 getScanData()

```
std::vector< Measure > car::system::device::lidar::LidarDevice::getScanData ( ) const [inline]
```

11.18.1.3 initialize()

```
virtual void car::system::device::lidar::LidarDevice::initialize ( ) [pure virtual]
```

Implemented in [car::system::device::lidar::LidarDummy](#), and [car::system::device::lidar::LidarScanner](#).

11.18.1.4 setScanData()

```
void car::system::device::lidar::LidarDevice::setScanData (
    const std::vector< Measure > & scan_data ) [inline], [protected]
```

11.18.1.5 start()

```
virtual void car::system::device::lidar::LidarDevice::start ( ) [pure virtual]
```

Implemented in [car::system::device::lidar::LidarDummy](#), and [car::system::device::lidar::LidarScanner](#).

11.18.1.6 stop()

```
virtual void car::system::device::lidar::LidarDevice::stop ( ) [pure virtual]
```

Implemented in [car::system::device::lidar::LidarDummy](#), and [car::system::device::lidar::LidarScanner](#).

11.18.1.7 terminate()

```
virtual void car::system::device::lidar::LidarDevice::terminate ( ) [pure virtual]
```

Implemented in [car::system::device::lidar::LidarDummy](#), and [car::system::device::lidar::LidarScanner](#).

11.18.1.8 update()

```
virtual void car::system::device::lidar::LidarDevice::update ( ) [pure virtual]
```

Implemented in [car::system::device::lidar::LidarDummy](#), and [car::system::device::lidar::LidarScanner](#).

11.18.2 Friends And Related Function Documentation

11.18.2.1 DeviceManager

```
friend class DeviceManager [friend]
```

11.18.3 Member Data Documentation

11.18.3.1 scan_data_

```
std::vector<Measure> car::system::device::lidar::LidarDevice::scan_data_ [protected]
```

The documentation for this class was generated from the following file:

- [common/include/car/system/device/lidar/LidarDevice.h](#)

11.19 car::system::device::lidar::LidarDummy Class Reference

```
#include <LidarDummy.h>
```

Inheritance diagram for car::system::device::lidar::LidarDummy:



Public Member Functions

- [LidarDummy](#) ()
- void [start](#) () final override
- void [update](#) () final override
- void [stop](#) () final override
- void [initialize](#) () final override
- void [terminate](#) () final override
- void [disconnect](#) () final override

Additional Inherited Members

11.19.1 Constructor & Destructor Documentation

11.19.1.1 LidarDummy()

```
car::system::device::lidar::LidarDummy::LidarDummy ( ) [inline]
```

11.19.2 Member Function Documentation

11.19.2.1 disconnect()

```
void car::system::device::lidar::LidarDummy::disconnect ( ) [inline], [final], [override],  
[virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.19.2.2 initialize()

```
void car::system::device::lidar::LidarDummy::initialize ( ) [inline], [final], [override],  
[virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.19.2.3 start()

```
void car::system::device::lidar::LidarDummy::start ( ) [inline], [final], [override], [virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.19.2.4 stop()

```
void car::system::device::lidar::LidarDummy::stop ( ) [inline], [final], [override], [virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.19.2.5 terminate()

```
void car::system::device::lidar::LidarDummy::terminate ( ) [inline], [final], [override],  
[virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.19.2.6 update()

```
void car::system::device::lidar::LidarDummy::update ( ) [inline], [final], [override], [virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

The documentation for this class was generated from the following file:

- [common/include/car/system/device/lidar/LidarDummy.h](#)

11.20 car::system::device::lidar::LidarScanner Class Reference

```
#include <LidarScanner.h>
```

Inheritance diagram for car::system::device::lidar::LidarScanner:



Public Member Functions

- [LidarScanner](#) (std::shared_ptr< [configuration::Configuration](#) > configuration, std::unique_ptr< RPLidar > lidar)
- void [start](#) () final override
- void [update](#) () final override
- void [stop](#) () final override
- void [initialize](#) () final override
- void [disconnect](#) () final override
- void [terminate](#) () final override

Static Public Member Functions

- static tl::expected< std::unique_ptr< [LidarScanner](#) >, std::string > [create](#) (std::shared_ptr< [configuration::Configuration](#) > configuration) noexcept

Private Attributes

- std::atomic_bool [running](#) = false
- std::shared_ptr< [configuration::Configuration](#) > [configuration_](#)
- std::vector< Measure > [scan_data_](#)
- std::unique_ptr< RPLidar > [lidar_](#)
- std::variant< std::function< std::vector< Measure >()>, nullptr_t > [scan_generator_](#) = nullptr
- std::mutex [scan_data_mutex_](#)

Additional Inherited Members

11.20.1 Constructor & Destructor Documentation

11.20.1.1 LidarScanner()

```
car::system::device::lidar::LidarScanner::LidarScanner (
    std::shared_ptr< configuration::Configuration > configuration,
    std::unique_ptr< RPLidar > lidar ) [inline]
```


11.20.2 Member Function Documentation

11.20.2.1 create()

```
static tl::expected< std::unique_ptr< LidarScanner >, std::string > car::system::device↵  
::lidar::LidarScanner::create (   
    std::shared_ptr< configuration::Configuration > configuration ) [inline], [static],  
[noexcept]
```

11.20.2.2 disconnect()

```
void car::system::device::lidar::LidarScanner::disconnect ( ) [inline], [final], [override],  
[virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.20.2.3 initialize()

```
void car::system::device::lidar::LidarScanner::initialize ( ) [inline], [final], [override],  
[virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.20.2.4 start()

```
void car::system::device::lidar::LidarScanner::start ( ) [inline], [final], [override], [virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.20.2.5 stop()

```
void car::system::device::lidar::LidarScanner::stop ( ) [inline], [final], [override], [virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.20.2.6 terminate()

```
void car::system::device::lidar::LidarScanner::terminate ( ) [inline], [final], [override],  
[virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.20.2.7 update()

```
void car::system::device::lidar::LidarScanner::update ( ) [inline], [final], [override],  
[virtual]
```

Implements [car::system::device::lidar::LidarDevice](#).

11.20.3 Member Data Documentation

11.20.3.1 configuration_

```
std::shared_ptr<configuration::Configuration> car::system::device::lidar::LidarScanner::configuration←  
_ [private]
```

11.20.3.2 lidar_

```
std::unique_ptr<RPLidar> car::system::device::lidar::LidarScanner::lidar_ [private]
```

11.20.3.3 running

```
std::atomic_bool car::system::device::lidar::LidarScanner::running = false [private]
```

11.20.3.4 scan_data_

```
std::vector<Measure> car::system::device::lidar::LidarScanner::scan_data_ [private]
```

11.20.3.5 scan_data_mutex_

```
std::mutex car::system::device::lidar::LidarScanner::scan_data_mutex_ [private]
```

11.20.3.6 scan_generator_

```
std::variant<std::function<std::vector<Measure>()>, nullptr_t> car::system::device::lidar↔  
::LidarScanner::scan_generator_ = nullptr [private]
```

The documentation for this class was generated from the following file:

- common/include/car/system/device/lidar/[LidarScanner.h](#)

11.21 car::display::console::screen::LoggingScreen Class Reference

Public Member Functions

- [LoggingScreen](#) (std::shared_ptr< [logging::vector_sink_mt](#) > [vector_sink](#))
- Component [element](#) ()

Private Attributes

- int [selected_line](#) = 0
- std::shared_ptr< [logging::vector_sink_mt](#) > [vector_sink](#)
- Component [menu](#)
- Component [my_custom_menu](#)
- ftxui::Elements [line_elements](#)

11.21.1 Constructor & Destructor Documentation

11.21.1.1 LoggingScreen()

```
car::display::console::screen::LoggingScreen::LoggingScreen (
    std::shared_ptr< logging::vector\_sink\_mt > vector\_sink ) [inline]
```

11.21.2 Member Function Documentation

11.21.2.1 element()

```
Component car::display::console::screen::LoggingScreen::element ( ) [inline]
```

11.21.3 Member Data Documentation

11.21.3.1 line_elements

```
ftxui::Elements car::display::console::screen::LoggingScreen::line_elements [private]
```

11.21.3.2 menu

```
Component car::display::console::screen::LoggingScreen::menu [private]
```

11.21.3.3 my_custom_menu

```
Component car::display::console::screen::LoggingScreen::my_custom_menu [private]
```

11.21.3.4 selected_line

```
int car::display::console::screen::LoggingScreen::selected_line = 0 [private]
```

11.21.3.5 vector_sink

```
std::shared_ptr<logging::vector_sink_mt> car::display::console::screen::LoggingScreen::vector←  
_sink [private]
```

The documentation for this class was generated from the following file:

- [tui/src/car/display/console/screen/LoggingScreen.cxx](#)

11.22 car::display::console::component::main::MainErrorModal Class Reference

Public Member Functions

- [MainErrorModal](#) ()
- Component [element](#) ()
- void [setErrorMessage](#) (std::string message)

Public Attributes

- bool [error_modal_shown](#) = false

Private Attributes

- Component [main_error_modal](#)
- Element [error_element](#)

11.22.1 Constructor & Destructor Documentation

11.22.1.1 MainErrorModal()

```
car::display::console::component::main::MainErrorModal::MainErrorModal ( ) [inline]
```

11.22.2 Member Function Documentation

11.22.2.1 element()

```
Component car::display::console::component::main::MainErrorModal::element ( ) [inline]
```

11.22.2.2 setErrorMessage()

```
void car::display::console::component::main::MainErrorModal::setErrorMessage (
    std::string message ) [inline]
```

11.22.3 Member Data Documentation

11.22.3.1 error_element

Element car::display::console::component::main::MainErrorModal::error_element [private]

11.22.3.2 error_modal_shown

bool car::display::console::component::main::MainErrorModal::error_modal_shown = false

11.22.3.3 main_error_modal

Component car::display::console::component::main::MainErrorModal::main_error_modal [private]

The documentation for this class was generated from the following file:

- tui/src/car/display/console/component/main/[MainErrorModal.cxx](#)

11.23 car::display::console::component::main::MainExitModal Class Reference

Public Member Functions

- [MainExitModal](#) (std::function< void()> [exit](#))
- Component [element](#) ()

Public Attributes

- bool [exit_modal_shown](#) = false

Private Attributes

- std::function< void()> [exit](#)
- Component [main_exit_modal](#)

11.23.1 Constructor & Destructor Documentation

11.23.1.1 MainExitModal()

```
car::display::console::component::main::MainExitModal::MainExitModal (
    std::function< void()> exit ) [inline]
```

11.23.2 Member Function Documentation

11.23.2.1 element()

Component car::display::console::component::main::MainExitModal::element () [inline]

11.23.3 Member Data Documentation

11.23.3.1 exit

std::function<void()> car::display::console::component::main::MainExitModal::exit [private]

11.23.3.2 exit_modal_shown

bool car::display::console::component::main::MainExitModal::exit_modal_shown = false

11.23.3.3 main_exit_modal

Component car::display::console::component::main::MainExitModal::main_exit_modal [private]

The documentation for this class was generated from the following file:

- tui/src/car/display/console/component/main/[MainExitModal.cxx](#)

11.24 car::display::console::screen::MainScreen Class Reference

Public Member Functions

- [MainScreen](#) (std::shared_ptr< [CarSystem](#) > car_system, std::function< void()> exit)
- Component [element](#) ()

Private Attributes

- `std::shared_ptr< CarSystem > car_system`
- `Box box`
- `ConnectButton connect_button`
- `MainExitModal main_exit_modal`
- `MainErrorModal main_error_modal`
- `Component info`
- `Component main_screen`
- `Component main_component`

11.24.1 Constructor & Destructor Documentation

11.24.1.1 MainScreen()

```
car::display::console::screen::MainScreen::MainScreen (  
    std::shared_ptr< CarSystem > car_system,  
    std::function< void()> exit ) [inline]
```

11.24.2 Member Function Documentation

11.24.2.1 element()

```
Component car::display::console::screen::MainScreen::element ( ) [inline]
```

11.24.3 Member Data Documentation

11.24.3.1 box

```
Box car::display::console::screen::MainScreen::box [private]
```

11.24.3.2 car_system

```
std::shared_ptr<CarSystem> car::display::console::screen::MainScreen::car_system [private]
```


11.24.3.3 connect_button

`ConnectButton` car::display::console::screen::MainScreen::connect_button [private]

11.24.3.4 info

`Component` car::display::console::screen::MainScreen::info [private]

11.24.3.5 main_component

`Component` car::display::console::screen::MainScreen::main_component [private]

11.24.3.6 main_error_modal

`MainErrorModal` car::display::console::screen::MainScreen::main_error_modal [private]

11.24.3.7 main_exit_modal

`MainExitModal` car::display::console::screen::MainScreen::main_exit_modal [private]

11.24.3.8 main_screen

`Component` car::display::console::screen::MainScreen::main_screen [private]

The documentation for this class was generated from the following file:

- tui/src/car/display/console/screen/[MainScreen.cxx](#)

11.25 car::system::messaging::MessagingSystem Class Reference

```
#include <MessagingSystem.h>
```

Classes

- struct [FirstMessageStruct](#)

Public Member Functions

- [MessagingSystem](#) ()
- void [initialize](#) (std::shared_ptr< [configuration::Configuration](#) > configuration)
Initializes the use of Websockets and initializes the Signals.
- void [initializeWebSocket](#) ()
Creates a new WebSocket object for use.
- const tl::expected< nullptr_t, std::string > [tryConnect](#) ()
Attempts to connect to the WebSocket server and retrieves the first message from the WebSocket (Should be UUID)
- void [stop](#) ()
- void [terminate](#) ()
- void [setConfiguration](#) (std::shared_ptr< [configuration::Configuration](#) > configuration)
- nod::signal< void(const std::string, const rapidjson::Document &)> & [getCommandSignal](#) ()
- nod::signal< void(const std::string, const rapidjson::Document &)> & [getSelectionSignal](#) ()
- nod::signal< void(const std::string)> & [getMessageSignal](#) ()
- nod::signal< void(const std::string)> & [getDisconnectSignal](#) ()
- void [onMessageCallback](#) (const ix::WebSocketMessagePtr &msg) const
- void [onDisconnect](#) (const std::string)
- const std::string [getUUID](#) () const
- void [handleMessage](#) (const std::string &message) const
Sends out signals depending on the type of message.
- void [sendMessage](#) (const std::string &message)
- void [onFirstMessage](#) (const ix::WebSocketMessagePtr &msg, [FirstMessageStruct](#) &first_message_struct)
Actually retrieves the First Message from the WebSocket to put into [FirstMessageStruct](#).
- const bool [isConnected](#) () const

Public Attributes

- nod::signal< void(std::string)> [on_disconnect_signal_](#)
- nod::signal< void(const std::string)> [message_signal_](#)
- nod::signal< void(const std::string, const rapidjson::Document &)> [command_signal_](#)
- nod::signal< void(const std::string, const rapidjson::Document &)> [selection_signal_](#)

Private Member Functions

- tl::expected< std::string, std::string > [getFirstMessage](#) ()
Waits and retrieves the first message when connecting to a websocket.

Private Attributes

- std::shared_ptr< [configuration::Configuration](#) > [configuration_](#)
- std::unique_ptr< ix::WebSocket > [websocket_](#)
- std::string [websocket_url_](#)
- std::string [uuid_](#)
- bool [connected_](#) = false

11.25.1 Constructor & Destructor Documentation

11.25.1.1 MessagingSystem()

```
car::system::messaging::MessagingSystem::MessagingSystem ( )
```

11.25.2 Member Function Documentation

11.25.2.1 getCommandSignal()

```
nod::signal< void(const std::string, const rapidjson::Document &)> & car::system::messaging↵  
::MessagingSystem::getCommandSignal ( ) [inline]
```

11.25.2.2 getDisconnectSignal()

```
nod::signal< void(const std::string)> & car::system::messaging::MessagingSystem::getDisconnect↵  
Signal ( ) [inline]
```

11.25.2.3 getFirstMessage()

```
tl::expected< std::string, std::string > car::system::messaging::MessagingSystem::getFirst↵  
Message ( ) [private]
```

Waits and retrieves the first message when connecting to a websocket.

Returns

tl::expected<std::string, std::string>

11.25.2.4 getMessageSignal()

```
nod::signal< void(const std::string)> & car::system::messaging::MessagingSystem::getMessage↵  
Signal ( ) [inline]
```

11.25.2.5 getSelectionSignal()

```
nod::signal< void(const std::string, const rapidjson::Document &)> & car::system::messaging↵  
::MessagingSystem::getSelectionSignal ( ) [inline]
```

11.25.2.6 getUUID()

```
const std::string car::system::messaging::MessagingSystem::getUUID ( ) const [inline]
```

11.25.2.7 handleMessage()

```
void car::system::messaging::MessagingSystem::handleMessage (
    const std::string & message ) const
```

Sends out signals depending on the type of message.

Parameters

<i>message</i>	
----------------	--

11.25.2.8 initialize()

```
void car::system::messaging::MessagingSystem::initialize (
    std::shared_ptr< configuration::Configuration > configuration )
```

Initializes the use of Websockets and initializes the Signals.

Parameters

<i>configuration</i>	
----------------------	--

11.25.2.9 initializeWebSocket()

```
void car::system::messaging::MessagingSystem::initializeWebSocket ( )
```

Creates a new WebSocket object for use.

11.25.2.10 isConnected()

```
const bool car::system::messaging::MessagingSystem::isConnected ( ) const [inline]
```

11.25.2.11 onDisconnect()

```
void car::system::messaging::MessagingSystem::onDisconnect (
    const std::string message )
```

11.25.2.12 onFirstMessage()

```
void car::system::messaging::MessagingSystem::onFirstMessage (
    const ix::WebSocketMessagePtr & msg,
    FirstMessageStruct & first_message_struct )
```

Actually retrieves the First Message from the Websocket to put into [FirstMessageStruct](#).

Parameters

<i>msg</i>	
<i>first_message_struct</i>	

11.25.2.13 onMessageCallback()

```
void car::system::messaging::MessagingSystem::onMessageCallback (
    const ix::WebSocketMessagePtr & msg ) const
```

11.25.2.14 sendMessage()

```
void car::system::messaging::MessagingSystem::sendMessage (
    const std::string & message )
```

11.25.2.15 setConfiguration()

```
void car::system::messaging::MessagingSystem::setConfiguration (
    std::shared_ptr< configuration::Configuration > configuration )
```

11.25.2.16 stop()

```
void car::system::messaging::MessagingSystem::stop ( )
```

11.25.2.17 terminate()

```
void car::system::messaging::MessagingSystem::terminate ( )
```

11.25.2.18 tryConnect()

```
const tl::expected< nullptr_t, std::string > car::system::messaging::MessagingSystem::try↵
Connect ( )
```

Attempts to connect to the Websocket server and retrieves the first message from the Websocket (Should be UUID)

Returns

```
const tl::expected<nullptr_t, std::string>
```

11.25.3 Member Data Documentation**11.25.3.1 command_signal_**

```
nod::signal<void(const std::string, const rapidjson::Document&)> car::system::messaging::↵
MessagingSystem::command_signal_
```

11.25.3.2 configuration_

```
std::shared_ptr<configuration::Configuration> car::system::messaging::MessagingSystem::configuration↵
_ [private]
```

11.25.3.3 connected_

```
bool car::system::messaging::MessagingSystem::connected_ = false [private]
```

11.25.3.4 message_signal_

```
nod::signal<void(const std::string)> car::system::messaging::MessagingSystem::message_signal_↵
—
```

11.25.3.5 on_disconnect_signal_

```
nod::signal<void(std::string)> car::system::messaging::MessagingSystem::on_disconnect_signal_↵  
_
```

11.25.3.6 selection_signal_

```
nod::signal<void(const std::string, const rapidjson::Document&)> car::system::messaging::↵  
MessagingSystem::selection_signal_
```

11.25.3.7 uuid_

```
std::string car::system::messaging::MessagingSystem::uuid_ [private]
```

11.25.3.8 websocket_

```
std::unique_ptr<ix::WebSocket> car::system::messaging::MessagingSystem::websocket_ [private]
```

11.25.3.9 websocket_url_

```
std::string car::system::messaging::MessagingSystem::websocket_url_ [private]
```

The documentation for this class was generated from the following files:

- common/include/car/system/messaging/[MessagingSystem.h](#)
- common/src/car/system/messaging/[MessagingSystem.cpp](#)

11.26 car::system::movement::MovementSystem Class Reference

```
#include <MovementSystem.h>
```

Public Member Functions

- [MovementSystem](#) (std::unique_ptr< [AbstractMovementController](#) > [movement_controller](#))
- void [initialize](#) ()
- void [start](#) ()
- void [stop](#) ()
- void [terminate](#) ()
- void [setRearWheelsSpeed](#) (const int speed) const
- void [setRearLeftWheelSpeed](#) (const int speed) const
- void [setRearRightWheelSpeed](#) (const int speed) const
- void [setFrontWheelsAngle](#) (const float angle) const
- void [setCameraServo1Angle](#) (const float angle) const
- void [setCameraServo2Angle](#) (const float angle) const
- void [setRearWheelsDirectionToForward](#) () const
- void [setRearLeftWheelDirectionToForward](#) () const
- void [setRearRightWheelDirectionToForward](#) () const
- void [setRearWheelsDirectionToBackward](#) () const
- void [setRearLeftWheelDirectionToBackward](#) () const
- void [setRearRightWheelDirectionToBackward](#) () const
- [~MovementSystem](#) ()

Private Attributes

- std::unique_ptr< [AbstractMovementController](#) > [movement_controller](#)

11.26.1 Constructor & Destructor Documentation

11.26.1.1 MovementSystem()

```
car::system::movement::MovementSystem::MovementSystem (
    std::unique_ptr< AbstractMovementController > movement\_controller ) [inline]
```

11.26.1.2 ~MovementSystem()

```
car::system::movement::MovementSystem::~MovementSystem ( ) [inline]
```

11.26.2 Member Function Documentation

11.26.2.1 initialize()

```
void car::system::movement::MovementSystem::initialize ( ) [inline]
```


11.26.2.2 setCameraServo1Angle()

```
void car::system::movement::MovementSystem::setCameraServo1Angle (
    const float angle ) const [inline]
```

11.26.2.3 setCameraServo2Angle()

```
void car::system::movement::MovementSystem::setCameraServo2Angle (
    const float angle ) const [inline]
```

11.26.2.4 setFrontWheelsAngle()

```
void car::system::movement::MovementSystem::setFrontWheelsAngle (
    const float angle ) const [inline]
```

11.26.2.5 setRearLeftWheelDirectionToBackward()

```
void car::system::movement::MovementSystem::setRearLeftWheelDirectionToBackward ( ) const
[inline]
```

11.26.2.6 setRearLeftWheelDirectionToForward()

```
void car::system::movement::MovementSystem::setRearLeftWheelDirectionToForward ( ) const [inline]
```

11.26.2.7 setRearLeftWheelSpeed()

```
void car::system::movement::MovementSystem::setRearLeftWheelSpeed (
    const int speed ) const [inline]
```

11.26.2.8 setRearRightWheelDirectionToBackward()

```
void car::system::movement::MovementSystem::setRearRightWheelDirectionToBackward ( ) const
[inline]
```

11.26.2.9 setRearRightWheelDirectionToForward()

```
void car::system::movement::MovementSystem::setRearRightWheelDirectionToForward ( ) const  
[inline]
```

11.26.2.10 setRearRightWheelSpeed()

```
void car::system::movement::MovementSystem::setRearRightWheelSpeed (   
    const int speed ) const [inline]
```

11.26.2.11 setRearWheelsDirectionToBackward()

```
void car::system::movement::MovementSystem::setRearWheelsDirectionToBackward ( ) const [inline]
```

11.26.2.12 setRearWheelsDirectionToForward()

```
void car::system::movement::MovementSystem::setRearWheelsDirectionToForward ( ) const [inline]
```

11.26.2.13 setRearWheelsSpeed()

```
void car::system::movement::MovementSystem::setRearWheelsSpeed (   
    const int speed ) const [inline]
```

11.26.2.14 start()

```
void car::system::movement::MovementSystem::start ( ) [inline]
```

11.26.2.15 stop()

```
void car::system::movement::MovementSystem::stop ( ) [inline]
```

11.26.2.16 terminate()

```
void car::system::movement::MovementSystem::terminate ( ) [inline]
```

11.26.3 Member Data Documentation

11.26.3.1 movement_controller

```
std::unique_ptr<AbstractMovementController> car::system::movement::MovementSystem::movement_↵
controller [private]
```

The documentation for this class was generated from the following file:

- common/include/car/system/movement/[MovementSystem.h](#)

11.27 car::plugin::Plugin Class Reference

```
#include <Plugin.h>
```

Inheritance diagram for car::plugin::Plugin:



Public Member Functions

- virtual void [initialize](#) (std::shared_ptr< [car::system::CarSystem](#) > car_system)=0
- virtual void [update](#) ()=0
- virtual void [stop](#) ()=0
- virtual std::string [getName](#) ()=0

11.27.1 Member Function Documentation

11.27.1.1 getName()

```
virtual std::string car::plugin::Plugin::getName ( ) [pure virtual]
```

Implemented in [behaviour_tree::BehaviourTreeHandler](#).

11.27.1.2 initialize()

```
virtual void car::plugin::Plugin::initialize (
    std::shared_ptr< car::system::CarSystem > car_system ) [pure virtual]
```

Implemented in [behaviour_tree::BehaviourTreeHandler](#).

11.27.1.3 stop()

```
virtual void car::plugin::Plugin::stop ( ) [pure virtual]
```

Implemented in [behaviour_tree::BehaviourTreeHandler](#).

11.27.1.4 update()

```
virtual void car::plugin::Plugin::update ( ) [pure virtual]
```

Implemented in [behaviour_tree::BehaviourTreeHandler](#).

The documentation for this class was generated from the following file:

- common/include/car/plugin/[Plugin.h](#)

11.28 car::plugin::PluginManager Class Reference

```
#include <PluginManager.h>
```

Public Member Functions

- void [initialize](#) (std::shared_ptr< [system::CarSystem](#) > car_system)
- void [update](#) ()
- void [stop](#) ()
- void [terminate](#) ()
- void [addPlugin](#) (std::shared_ptr< [Plugin](#) > plugin)
- template<typename T >
std::shared_ptr< T > [getPlugin](#) ()

Private Attributes

- std::vector< std::shared_ptr< [Plugin](#) > > [plugins](#)

11.28.1 Member Function Documentation

11.28.1.1 addPlugin()

```
void car::plugin::PluginManager::addPlugin (
    std::shared_ptr< Plugin > plugin ) [inline]
```

11.28.1.2 getPlugin()

```
template<typename T >
std::shared_ptr< T > car::plugin::PluginManager::getPlugin ( ) [inline]
```

11.28.1.3 initialize()

```
void car::plugin::PluginManager::initialize (
    std::shared_ptr< system::CarSystem > car_system ) [inline]
```

11.28.1.4 stop()

```
void car::plugin::PluginManager::stop ( ) [inline]
```

11.28.1.5 terminate()

```
void car::plugin::PluginManager::terminate ( ) [inline]
```

11.28.1.6 update()

```
void car::plugin::PluginManager::update ( ) [inline]
```

11.28.2 Member Data Documentation

11.28.2.1 plugins

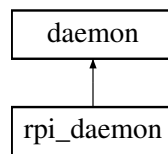
```
std::vector<std::shared_ptr<Plugin> > car::plugin::PluginManager::plugins [private]
```

The documentation for this class was generated from the following file:

- common/include/car/plugin/[PluginManager.h](#)

11.29 rpi_daemon Class Reference

Inheritance diagram for rpi_daemon:



Public Member Functions

- void [on_start](#) (const INIReader reader) override
- void [update](#) ()
- void [connect](#) (const std::chrono::time_point< std::chrono::steady_clock > &now)
- void [on_update](#) () override
- void [on_stop](#) () override
- void [on_reload](#) (const INIReader reader) override

Private Attributes

- std::shared_ptr< [CarSystem](#) > [car_system](#)
- bool [any_configuration_empty](#) = false
- bool [attempted_to_reconnect](#) = false
- std::chrono::milliseconds [connection_ms_interval](#) = std::chrono::milliseconds(1000)
- std::chrono::time_point< std::chrono::steady_clock > [last_connected](#)

11.29.1 Member Function Documentation

11.29.1.1 connect()

```
void rpi_daemon::connect (
    const std::chrono::time_point< std::chrono::steady_clock > & now ) [inline]
```

11.29.1.2 on_reload()

```
void rpi_daemon::on_reload (
    const INIReader reader ) [inline], [override]
```

11.29.1.3 on_start()

```
void rpi_daemon::on_start (
    const INIReader reader ) [inline], [override]
```

11.29.1.4 on_stop()

```
void rpi_daemon::on_stop ( ) [inline], [override]
```

11.29.1.5 on_update()

```
void rpi_daemon::on_update ( ) [inline], [override]
```

11.29.1.6 update()

```
void rpi_daemon::update ( ) [inline]
```

11.29.2 Member Data Documentation

11.29.2.1 any_configuration_empty

```
bool rpi_daemon::any_configuration_empty = false [private]
```

11.29.2.2 attempted_to_reconnect

```
bool rpi_daemon::attempted_to_reconnect = false [private]
```

11.29.2.3 car_system

```
std::shared_ptr<CarSystem> rpi_daemon::car_system [private]
```

11.29.2.4 connection_ms_interval

```
std::chrono::milliseconds rpi_daemon::connection_ms_interval = std::chrono::milliseconds(1000)
[private]
```

11.29.2.5 last_connected

```
std::chrono::time_point<std::chrono::steady_clock> rpi_daemon::last_connected [private]
```

The documentation for this class was generated from the following file:

- daemon/src/main.cpp

11.30 car::display::console::component::settings::SettingsEditConfig Class Reference

Public Member Functions

- [SettingsEditConfig](#) (std::shared_ptr< [system::CarSystem](#) > [car_system](#), std::shared_ptr< [JsonConfiguration](#) > [json_configuration](#))
- Component [element](#) ()

Private Attributes

- std::shared_ptr< [system::CarSystem](#) > [car_system](#)
- std::shared_ptr< [configuration::JsonConfiguration](#) > [json_configuration](#)
- std::string [placeholder](#) = "settings/config.jsonc"
- std::string [settings_file_path](#) = "settings/config.jsonc"
- Component [input_settings_file_path](#)
- Component [load_button](#)

11.30.1 Constructor & Destructor Documentation

11.30.1.1 SettingsEditConfig()

```
car::display::console::component::settings::SettingsEditConfig::SettingsEditConfig (
    std::shared_ptr< system::CarSystem > car_system,
    std::shared_ptr< JsonConfiguration > json_configuration ) [inline]
```

11.30.2 Member Function Documentation

11.30.2.1 element()

```
Component car::display::console::component::settings::SettingsEditConfig::element ( ) [inline]
```

11.30.3 Member Data Documentation

11.30.3.1 car_system

```
std::shared_ptr<system::CarSystem> car::display::console::component::settings::SettingsEdit↔
Config::car_system [private]
```

11.30.3.2 input_settings_file_path

```
Component car::display::console::component::settings::SettingsEditConfig::input_settings↔
file_path [private]
```

11.30.3.3 json_configuration

```
std::shared_ptr<configuration::JsonConfiguration> car::display::console::component::settings↔
::SettingsEditConfig::json_configuration [private]
```

11.30.3.4 load_button

```
Component car::display::console::component::settings::SettingsEditConfig::load_button [private]
```

11.30.3.5 placeholder

```
std::string car::display::console::component::settings::SettingsEditConfig::placeholder =
"settings/config.jsonc" [private]
```

11.30.3.6 settings_file_path

```
std::string car::display::console::component::settings::SettingsEditConfig::settings_file_path
= "settings/config.jsonc" [private]
```

The documentation for this class was generated from the following file:

- tui/src/car/display/console/component/settings/[SettingsEditConfig.cxx](#)

11.31 car::display::console::screen::SettingsScreen Class Reference

Public Member Functions

- [SettingsScreen](#) (std::shared_ptr< [CarSystem](#) > car_system, std::shared_ptr< [JsonConfiguration](#) > json_configuration)
- Component [element](#) ()
- void [update](#) ()

Private Attributes

- std::shared_ptr< [CarSystem](#) > car_system
- [SettingsEditConfig](#) settings_edit_config
- [DebugEnabler](#) debug_enabler
- [DebugLidarCheckbox](#) debug_lidar_checkbox
- [DebugMovementRenderer](#) debug_movement_renderer
- [DebugMessagingTextbox](#) debug_messaging_text_box

11.31.1 Constructor & Destructor Documentation

11.31.1.1 SettingsScreen()

```
car::display::console::screen::SettingsScreen::SettingsScreen (
    std::shared_ptr< CarSystem > car_system,
    std::shared_ptr< JsonConfiguration > json_configuration ) [inline]
```

11.31.2 Member Function Documentation

11.31.2.1 element()

Component car::display::console::screen::SettingsScreen::element () [inline]

11.31.2.2 update()

void car::display::console::screen::SettingsScreen::update () [inline]

11.31.3 Member Data Documentation

11.31.3.1 car_system

std::shared_ptr<CarSystem> car::display::console::screen::SettingsScreen::car_system [private]

11.31.3.2 debug_enabler

DebugEnabler car::display::console::screen::SettingsScreen::debug_enabler [private]

11.31.3.3 debug_lidar_checkbox

DebugLidarCheckbox car::display::console::screen::SettingsScreen::debug_lidar_checkbox [private]

11.31.3.4 debug_messaging_text_box

DebugMessagingTextbox car::display::console::screen::SettingsScreen::debug_messaging_text_box
[private]

11.31.3.5 debug_movement_renderer

```
DebugMovementRenderer car::display::console::screen::SettingsScreen::debug_movement_renderer
[private]
```

11.31.3.6 settings_edit_config

```
SettingsEditConfig car::display::console::screen::SettingsScreen::settings_edit_config [private]
```

The documentation for this class was generated from the following file:

- tui/src/car/display/console/screen/[SettingsScreen.cxx](#)

11.32 TB6612 Class Reference

```
#include <TB6612.h>
```

Public Member Functions

- [TB6612](#) (int [motor_pin](#), int [pwm_pin](#))
- void [setPWM](#) (int value)
- void [forward](#) ()
- void [backward](#) ()
- void [stop](#) ()
- void [setOffset](#) (bool [offset](#))
- const int & [getMotorPin](#) () const
- const int & [getPWMPin](#) () const

Private Attributes

- const int [motor_pin](#)
- const int [pwm_pin](#)
- bool [offset](#) = true

11.32.1 Constructor & Destructor Documentation

11.32.1.1 TB6612()

```
TB6612::TB6612 (
    int motor_pin,
    int pwm_pin )
```

11.32.2 Member Function Documentation

11.32.2.1 backward()

```
void TB6612::backward ( )
```

11.32.2.2 forward()

```
void TB6612::forward ( )
```

11.32.2.3 getMotorPin()

```
const int & TB6612::getMotorPin ( ) const
```

11.32.2.4 getPWMPin()

```
const int & TB6612::getPWMPin ( ) const
```

11.32.2.5 setOffset()

```
void TB6612::setOffset (
    bool offset )
```

11.32.2.6 setPWM()

```
void TB6612::setPWM (
    int value )
```

11.32.2.7 stop()

```
void TB6612::stop ( )
```

11.32.3 Member Data Documentation

11.32.3.1 motor_pin

```
const int TB6612::motor_pin [private]
```

11.32.3.2 offset

```
bool TB6612::offset = true [private]
```

11.32.3.3 pwm_pin

```
const int TB6612::pwm_pin [private]
```

The documentation for this class was generated from the following files:

- repository/packages/t/tb6612/tb6612/include/TB6612.h
- repository/packages/t/tb6612/tb6612/src/TB6612.cpp

11.33 car::system::logging::VectorSink< Mutex > Class Template Reference

```
#include <VectorSink.h>
```

Inheritance diagram for car::system::logging::VectorSink< Mutex >:



Public Member Functions

- [VectorSink](#) (int [max_lines](#))
- void [sink_it_](#) (const spdlog::details::log_msg &msg) override
- void [flush_](#) () override
- const std::vector< std::string > & [get_log_messages](#) () const

Private Attributes

- const int [max_lines](#)
- std::vector< std::string > [log_messages](#)

11.33.1 Constructor & Destructor Documentation

11.33.1.1 VectorSink()

```
template<typename Mutex >  
car::system::logging::VectorSink< Mutex >::VectorSink (  
    int max_lines )    [inline]
```

11.33.2 Member Function Documentation

11.33.2.1 flush_()

```
template<typename Mutex >  
void car::system::logging::VectorSink< Mutex >::flush_ ( )    [inline], [override]
```

11.33.2.2 get_log_messages()

```
template<typename Mutex >  
const std::vector< std::string > & car::system::logging::VectorSink< Mutex >::get_log_  
messages ( ) const    [inline]
```

11.33.2.3 sink_it_()

```
template<typename Mutex >  
void car::system::logging::VectorSink< Mutex >::sink_it_ (  
    const spdlog::details::log_msg & msg )    [inline], [override]
```

11.33.3 Member Data Documentation

11.33.3.1 log_messages

```
template<typename Mutex >  
std::vector<std::string> car::system::logging::VectorSink< Mutex >::log_messages [private]
```

11.33.3.2 max_lines

```
template<typename Mutex >  
const int car::system::logging::VectorSink< Mutex >::max_lines [private]
```

The documentation for this class was generated from the following file:

- [common/include/car/system/logging/VectorSink.h](#)

Chapter 12

File Documentation

12.1 behaviour_tree/src/main.cpp File Reference

```
#include <iostream>
#include <chrono>
#include <filesystem>
#include <memory>
#include <cxxopts.hpp>
#include "car/system/CarSystem.h"
#include "car/system/device/lidar/LidarScanner.h"
#include "car/system/device/lidar/LidarDummy.h"
#include "car/system/movement/controller/DummyMovementController.h"
#include "car/system/movement/controller/DeviceMovementController.h"
#include "car/plugin/PluginManager.h"
#include "behaviour_tree/BehaviourTreeParser.hpp"
#include "behaviour_tree/node/custom/CarCustomNodeParser.hpp"
#include "behaviour_tree/BehaviourTreeHandler.hpp"
#include <thread>
#include <unistd.h>
#include <termios.h>
```

Functions

- int [kbhit](#) (void)
- int [main](#) (int argc, const char *argv[])

12.1.1 Function Documentation

12.1.1.1 kbhit()

```
int kbhit (
    void )
```

12.1.1.2 main()

```
int main (
    int argc,
    const char * argv[] )
```

12.2 daemon/src/main.cpp File Reference

```
#include <iostream>
#include <chrono>
#include <filesystem>
#include <memory>
#include <daemonpp/daemon.hpp>
#include <cpptrace/cpptrace.hpp>
#include <fmt/format.h>
#include <spdlog/sinks/callback_sink.h>
#include "car/system/CarSystem.h"
#include "car/system/device/lidar/LidarScanner.h"
#include "car/system/device/lidar/LidarDummy.h"
#include "car/system/movement/controller/DummyMovementController.h"
#include "car/system/movement/controller/DeviceMovementController.h"
#include "behaviour_tree/BehaviourTreeHandler.hpp"
#include "car/plugin/PluginManager.h"
```

Classes

- class [rpi_daemon](#)

Functions

- `std::unique_ptr< LidarDevice > getLidarDevice (std::shared_ptr< Configuration > configuration)`
- `std::unique_ptr< AbstractMovementController > getMovementController ()`
- `void terminate_handler ()`
- `int main (int argc, const char *argv[])`

12.2.1 Function Documentation

12.2.1.1 getLidarDevice()

```
std::unique_ptr< lidar::LidarDevice > getLidarDevice (
    std::shared_ptr< Configuration > configuration )
```

12.2.1.2 getMovementController()

```
std::unique_ptr< AbstractMovementController > getMovementController ( )
```

12.2.1.3 main()

```
int main (
    int argc,
    const char * argv[] )
```

12.2.1.4 terminate_handler()

```
void terminate_handler ( )
```

12.3 tui/src/main.cpp File Reference

```
#include <optional>
#include <string>
#include <thread>
#include <chrono>
#include <fmt/format.h>
#include "car/display/console/CarConsole.h"
#include "car/configuration/JsonConfiguration.cxx"
#include "car/system/CarSystem.h"
#include "car/system/device/DeviceManager.h"
#include "car/system/device/lidar/LidarDevice.h"
#include "car/system/device/lidar/LidarDummy.h"
#include "car/system/device/lidar/LidarScanner.h"
#include "car/system/device/CameraDevice.h"
#include "car/system/movement/controller/DummyMovementController.h"
#include "car/system/movement/controller/DeviceMovementController.h"
#include "car/plugin/PluginManager.h"
#include "car/system/logging/VectorSink.h"
#include "behaviour_tree/BehaviourTreeHandler.hpp"
```

Functions

- `std::unique_ptr< LidarDevice > getLidarDevice (std::shared_ptr< Configuration > configuration)`
- `std::unique_ptr< AbstractMovementController > getMovementController ()`
- `int main (int argc, char *argv[])`

12.3.1 Function Documentation

12.3.1.1 `getLidarDevice()`

```
std::unique_ptr< LidarDevice > getLidarDevice (
    std::shared_ptr< Configuration > configuration )
```

12.3.1.2 `getMovementController()`

```
std::unique_ptr< AbstractMovementController > getMovementController ( )
```

12.3.1.3 `main()`

```
int main (
    int argc,
    char * argv[] )
```

12.4 `common/include/behaviour_tree/BehaviourTreeHandler.hpp` File Reference

```
#include <string>
#include <vector>
#include <nod/nod.hpp>
#include "utils/Utility.hpp"
#include "car/plugin/Plugin.h"
#include "behaviour_tree/BehaviourTreeParser.hpp"
#include "behaviour_tree/node/custom/CarCustomNodeParser.hpp"
#include "CarContext.hpp"
```

Classes

- class [behaviour_tree::BehaviourTreeHandler](#)

Namespaces

- namespace [behaviour_tree](#)

12.5 BehaviourTreeHandler.hpp

[Go to the documentation of this file.](#)

```

1  #ifndef BEHAVIOURTREEHANDLER_HPP
2  #define BEHAVIOURTREEHANDLER_HPP
3
4  #pragma once
5
6  #include <string>
7  #include <vector>
8
9  #include <nod/nod.hpp>
10
11 #include "utils/Utility.hpp"
12
13 #include "car/plugin/Plugin.h"
14
15 #include "behaviour_tree/BehaviourTreeParser.hpp"
16 #include "behaviour_tree/node/custom/CarCustomNodeParser.hpp"
17
18 #include "CarContext.hpp"
19
20 namespace behaviour_tree
21 {
22     class BehaviourTreeHandler : public car::plugin::Plugin
23     {
24     public:
25         void initialize(std::shared_ptr<car::system::CarSystem> car_system) final override
26         {
27             this->car_system = car_system;
28             // The BehaviourTreeParser does not come with a CustomNodeParser since each program can have
29             // a different set of Action nodes
30
31             BehaviourTreeParser::instance().setCustomNodeParser(std::make_shared<node::custom::CarCustomNodeParser>(CarCustomNodeParser));
32
33             this->car_system->getMessagingSystem()->getCommandSignal().connect(std::bind(&BehaviourTreeHandler::handleCommand,
34             this, std::placeholders::_1, std::placeholders::_2));
35         }
36
37         void handleCommand(const std::string message, const rapidjson::Document &message_json)
38         {
39             const std::string command = message_json["command"].GetString();
40             if (command != "behaviour_tree")
41             {
42                 spdlog::error(R"(The property "command" does not match "behaviour_tree", {})", command);
43                 return;
44             }
45             if (!message_json.HasMember("action") || !message_json["action"].IsString())
46             {
47                 spdlog::error(R"(The property "action" does not exist in the given json.)");
48                 return;
49             }
50             const std::string action = message_json["action"].GetString();
51             switch (utils::hash(action))
52             {
53             case utils::hash("set"):
54             {
55                 this->setBehaviourTree(message_json);
56                 break;
57             }
58             case utils::hash("start"):
59             {
60                 this->startBehaviourTree();
61                 break;
62             }
63             case utils::hash("stop"):
64             {
65                 this->stopBehaviourTree();
66                 break;
67             }
68             default:
69             {
70                 spdlog::error(R"(The property "action" does not match "set" or "start", {})", action);
71                 break;
72             }
73             };
74         }
75
76         void setBehaviourTree(const rapidjson::Document &message_json)
77         {
78             if (!message_json.HasMember("data") || !message_json["data"].IsString())
79             {
80                 spdlog::error(R"(The property "data" does not exist in the given json.)");
81                 return;
82             }
83             try
84             {
85

```

```

79         auto maybe_behaviour_tree =
BehaviourTreeParser::instance().parseXML(message_json["data"].GetString());
80         if (!maybe_behaviour_tree.has_value())
81         {
82             spdlog::error(R"(Unable to parse the given behaviour tree | {})",
maybe_behaviour_tree.error());
83             return;
84         }
85         auto &behaviour_tree = maybe_behaviour_tree.value();
86         spdlog::info("Behaviour tree parsed successfully | {}", behaviour_tree->toString());
87         this->_setBehaviourTree(behaviour_tree);
88     }
89     catch (std::exception &e)
90     {
91         spdlog::error("An error has occurred while parsing the given behaviour tree: {}",
e.what());
92     }
93 }
94
95 void startBehaviourTree()
96 {
97     assert(this->car_system != nullptr);
98     if (this->behaviour_tree == nullptr)
99     {
100         spdlog::error("The Behaviour tree has not been set");
101         return;
102     }
103     this->behaviour_tree->resetCycles();
104     this->tick_count = 0;
105     std::shared_ptr<Context> context = std::make_shared<CarContext>(this->behaviour_tree,
this->car_system);
106     this->context = context;
107     spdlog::info("Starting the given Behaviour tree");
108 }
109
110 void stopBehaviourTree()
111 {
112     assert(this->car_system != nullptr);
113     this->context = nullptr;
114     spdlog::info("Stopped any Behaviour Tree context");
115 }
116
117 void update() final override
118 {
119     if (this->context == nullptr)
120     {
121         return;
122     }
123     if (this->context->canRun())
124     {
125         const std::chrono::time_point<std::chrono::steady_clock> now =
std::chrono::steady_clock::now();
126         // TODO:
127         if (now - this->last_connected >=
this->car_system->getConfiguration()->behaviour_tree_update_ms_interval) {
128             this->context->update(this->tick_count);
129             this->tick_count++;
130             this->last_connected = now;
131         }
132     }
133     else
134     {
135         this->context = nullptr;
136     }
137 }
138
139 void stop() final override
140 {
141     this->context = nullptr;
142 }
143
144 std::string getName() final override
145 {
146     return "BehaviourTreeHandler";
147 }
148
149 void _setBehaviourTree(std::shared_ptr<BehaviourTree> behaviour_tree)
150 {
151     this->behaviour_tree = behaviour_tree;
152 }
153
154 private:
155     std::shared_ptr<car::system::CarSystem> car_system;
156
157     std::shared_ptr<BehaviourTree> behaviour_tree;
158     std::shared_ptr<Context> context;
159

```

```

160         int tick_count = 0;
161
162         // This is initialized as 0
163         std::chrono::time_point<std::chrono::steady_clock> last_connected;
164     };
165 } // namespace behaviour_tree
166
167 #endif

```

12.6 common/include/behaviour_tree/CarContext.hpp File Reference

```

#include "car/system/CarSystem.h"
#include "behaviour_tree/Context.h"

```

Classes

- class `behaviour_tree::CarContext`

Namespaces

- namespace `behaviour_tree`

12.7 CarContext.hpp

[Go to the documentation of this file.](#)

```

1 #ifndef BEHAVIOUR_TREE_CARCONTEXT_HPP
2 #define BEHAVIOUR_TREE_CARCONTEXT_HPP
3
4 #pragma once
5
6 #include "car/system/CarSystem.h"
7 #include "behaviour_tree/Context.h"
8
9 namespace behaviour_tree
10 {
11     class CarContext : public Context
12     {
13     public:
14         CarContext(std::shared_ptr<BehaviourTree> behaviour_tree, std::shared_ptr<car::system::CarSystem>
car_system) : Context(std::move(behaviour_tree)), car_system(std::move(car_system))
15         {
16         }
17
18         std::shared_ptr<car::system::CarSystem> getCarSystem() const
19         {
20             return this->car_system;
21         }
22
23         void _() override{};
24
25     private:
26         std::shared_ptr<car::system::CarSystem> car_system;
27     };
28 }
29
30 #endif

```

12.8 common/include/car/configuration/Configuration.h File Reference

```
#include <chrono>
#include <optional>
#include <string>
#include <tl/expected.hpp>
```

Classes

- struct [car::configuration::Configuration](#)

Namespaces

- namespace [car](#)
- namespace [car::configuration](#)

12.9 Configuration.h

[Go to the documentation of this file.](#)

```
1 #ifndef CONFIGURATION_H
2 #define CONFIGURATION_H
3
4 #pragma once
5
6 #include <chrono>
7 #include <optional>
8 #include <string>
9
10 #include <tl/expected.hpp>
11
12 namespace car::configuration
13 {
14     struct Configuration
15     {
16         std::string host = "127.0.0.1:3000";
17
18         int camera_index = 0;
19         void setCameraFps(const int camera_fps)
20         {
21             this->camera_fps = camera_fps;
22             this->camera_fps_interval = 1000 / camera_fps;
23         }
24         const int getCameraFpsInterval() { return this->camera_fps_interval; }
25         bool use_camera = true;
26
27         std::string lidar_port = "";
28         bool use_lidar = true;
29
30         std::chrono::milliseconds behaviour_tree_update_ms_interval = std::chrono::milliseconds(100);
31
32     private:
33         int camera_fps = 60;
34         int camera_fps_interval = 1000;
35     };
36 };
37
38 #endif
```

12.10 common/include/car/plugin/Plugin.h File Reference

```
#include <string>
#include <memory>
```


Classes

- class [car::plugin::Plugin](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::plugin](#)

12.11 Plugin.h

[Go to the documentation of this file.](#)

```
1 #ifndef PLUGIN_H
2 #define PLUGIN_H
3
4 #pragma once
5
6 #include <string>
7 #include <memory>
8
9 namespace car::system
10 {
11     class CarSystem;
12 }
13
14 namespace car::plugin
15 {
16     class Plugin
17     {
18     public:
19         virtual void initialize(std::shared_ptr<car::system::CarSystem> car_system) = 0;
20         virtual void update() = 0;
21         virtual void stop() = 0;
22         virtual std::string getName() = 0;
23     };
24 }
25
26 #endif
```

12.12 common/include/car/plugin/PluginManager.h File Reference

```
#include <vector>
#include <memory>
#include "utils/Utility.hpp"
#include "utils/TypeName.hpp"
#include "Plugin.h"
```

Classes

- class [car::plugin::PluginManager](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::plugin](#)

12.13 PluginManager.h

[Go to the documentation of this file.](#)

```

1  #ifndef PLUGIN_MANAGER_H
2  #define PLUGIN_MANAGER_H
3
4  #pragma once
5
6  #include <vector>
7  #include <memory>
8
9  #include "utils/Utility.hpp"
10 #include "utils/TypeName.hpp"
11
12 #include "Plugin.h"
13
14 namespace car::system
15 {
16     class CarSystem;
17 }
18
19 namespace car::plugin
20 {
21     class PluginManager
22     {
23     public:
24         void initialize(std::shared_ptr<system::CarSystem> car_system)
25         {
26             for (std::shared_ptr<Plugin>& plugin : this->plugins)
27             {
28                 plugin->initialize(car_system);
29             }
30         }
31
32         void update()
33         {
34             for (std::shared_ptr<Plugin>& plugin : this->plugins)
35             {
36                 plugin->update();
37             }
38         }
39
40         void stop()
41         {
42             for (std::shared_ptr<Plugin>& plugin : this->plugins)
43             {
44                 plugin->stop();
45             }
46         }
47
48         void terminate()
49         {
50             this->stop();
51         }
52
53         void addPlugin(std::shared_ptr<Plugin> plugin)
54         {
55             this->plugins.push_back(plugin);
56         }
57
58         template<typename T>
59         std::shared_ptr<T> getPlugin()
60         {
61             static_assert(std::is_base_of<Plugin, T>::value, "T must be a Plugin");
62             std::string type_name = std::string(utils::TypeName<T>());
63             type_name = utils::getStringAfterLastColon(type_name);
64
65             for (std::shared_ptr<Plugin>& plugin : this->plugins)
66             {
67                 if (plugin->getName() == type_name)
68                 {
69                     return plugin;
70                 }
71             }
72
73             return nullptr;
74         }
75
76     private:
77         std::vector<std::shared_ptr<Plugin> > plugins;
78     };
79 }
80
81
82 #endif

```

12.14 common/include/car/system/CarSystem.h File Reference

```
#include <memory>
#include "car/configuration/Configuration.h"
#include "car/system/device/DeviceManager.h"
#include "car/system/messaging/MessagingSystem.h"
#include "car/system/movement/MovementSystem.h"
#include "car/plugin/PluginManager.h"
```

Classes

- class [car::system::CarSystem](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)

12.15 CarSystem.h

[Go to the documentation of this file.](#)

```
1 #ifndef CARSYSTEM_H
2 #define CARSYSTEM_H
3
4 #pragma once
5
6 #include <memory>
7
8 #include "car/configuration/Configuration.h"
9
10 #include "car/system/device/DeviceManager.h"
11 #include "car/system/messaging/MessagingSystem.h"
12 #include "car/system/movement/MovementSystem.h"
13
14 #include "car/plugin/PluginManager.h"
15
16 using namespace car::configuration;
17 using namespace car::plugin;
18 using namespace car::system::device;
19 using namespace car::system::messaging;
20 using namespace car::system::movement;
21
22 namespace car::system
23 {
24     // Make sure this is stored as a shared_ptr
25     class CarSystem : public std::enable_shared_from_this<CarSystem>
26     {
27     public:
28         CarSystem(
29             std::shared_ptr<Configuration> configuration,
30             std::unique_ptr<DeviceManager> device_manager,
31             std::unique_ptr<MessagingSystem> messaging_system,
32             std::unique_ptr<MovementSystem> movement_system,
33             std::unique_ptr<PluginManager> plugin_manager);
34
35         void initialize();
36         void reload();
37
38         void start();
39         void stop();
40
41         tl::expected<nullptr_t, std::string> tryConnect();
42         void disconnect();
43
44         void terminate();
45     }
```

```

46     void update();
47
48     const std::shared_ptr<Configuration> getConfiguration() const { return this->configuration_; };
49     void setConfiguration(std::shared_ptr<Configuration> configuration);
50
51     DeviceManager *getDeviceManager() const
52     {
53         return this->device_manager_.get();
54     }
55
56     MessagingSystem *getMessagingSystem() const
57     {
58         return this->messaging_system_.get();
59     }
60
61     MovementSystem *getMovementSystem() const
62     {
63         return this->movement_system_.get();
64     }
65
66     template <typename T>
67     const std::shared_ptr<T> getPlugin() const { return this->plugin_manager_->getPlugin<T>(); }
68
69 private:
70     void sendData();
71
72     std::shared_ptr<Configuration> configuration_;
73
74     const std::unique_ptr<DeviceManager> device_manager_;
75     const std::unique_ptr<MessagingSystem> messaging_system_;
76     const std::unique_ptr<MovementSystem> movement_system_;
77     const std::unique_ptr<PluginManager> plugin_manager_;
78
79     bool initialized = false;
80     bool started = false;
81 };
82 }
83
84 #endif

```

12.16 common/include/car/system/device/CameraDevice.h File Reference

```

#include <vector>
#include <tl/expected.hpp>
#include <opencv2/opencv.hpp>
#include "car/configuration/Configuration.h"

```

Classes

- class [car::system::device::CameraDevice](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::device](#)

12.17 CameraDevice.h

[Go to the documentation of this file.](#)

```

1  #ifndef CAMERADEVICE_H
2  #define CAMERADEVICE_H
3
4  #pragma once
5
6  #include <vector>
7
8  #include <tl/expected.hpp>
9  #include <opencv2/opencv.hpp>
10
11 #include "car/configuration/Configuration.h"
12
13 namespace car::system::device
14 {
15     class DeviceManager;
16     class CameraDevice
17     {
18     public:
19         CameraDevice(std::shared_ptr<configuration::Configuration> configuration) :
20             configuration(configuration) {}
21
22         CameraDevice(const CameraDevice&) = delete;
23         CameraDevice& operator=(const CameraDevice&) = delete;
24
25         CameraDevice(CameraDevice&&) = delete;
26         CameraDevice& operator=(CameraDevice&&) = delete;
27
28         ~CameraDevice() = default;
29
30     public:
31         [[nodiscard]] static tl::expected<std::unique_ptr<CameraDevice>, std::string>
32             create(std::shared_ptr<configuration::Configuration> configuration);
33         std::string getFrameBuffer() const;
34
35     protected:
36         void start();
37         void update();
38         void stop();
39         void disconnect();
40         void terminate();
41
42     friend class DeviceManager;
43
44     private:
45         std::shared_ptr<configuration::Configuration> configuration;
46
47         std::unique_ptr<cv::VideoCapture> camera_;
48
49         bool connected_ = false;
50         std::string frame_buffer_;
51
52         std::mutex camera_mutex_;
53
54         std::chrono::steady_clock::time_point last;
55     };
56 #endif

```

12.18 common/include/car/system/device/DeviceManager.h File Reference

```

#include <memory>
#include <tl/expected.hpp>
#include "car/configuration/Configuration.h"
#include "CameraDevice.h"
#include "lidar/LidarDevice.h"
#include "lidar/LidarScanner.h"

```

Classes

- class `car::system::device::DeviceManager`

Namespaces

- namespace `car`
- namespace `car::system`
- namespace `car::system::device`

12.19 DeviceManager.h

[Go to the documentation of this file.](#)

```

1 #ifndef DEVICE_MANAGER_H
2 #define DEVICE_MANAGER_H
3
4 #pragma once
5
6 #include <memory>
7
8 #include <tl/expected.hpp>
9
10 #include "car/configuration/Configuration.h"
11
12 #include "CameraDevice.h"
13 #include "lidar/LidarDevice.h"
14 #include "lidar/LidarScanner.h"
15
16 using namespace car::configuration;
17
18 namespace car::system
19 {
20     class CarSystem;
21 }
22
23 namespace car::system::device
24 {
25     class DeviceManager {
26     public:
27         [[nodiscard]] static tl::expected<std::unique_ptr<DeviceManager>, std::string>
28         create(std::shared_ptr<Configuration> configuration);
29
30         DeviceManager(std::unique_ptr<CameraDevice> camera_device, std::unique_ptr<lidar::LidarDevice>
31         lidar_device) :
32             camera_device_(std::move(camera_device)),
33             lidar_device_(std::move(lidar_device))
34         {
35         }
36
37         CameraDevice* getCameraDevice() {
38             return this->camera_device_.get();
39         }
40
41         lidar::LidarDevice* getLidarDevice() {
42             return this->lidar_device_.get();
43         }
44
45         const bool isRunning() const {
46             return this->is_running_;
47         }
48
49         void initialize(std::shared_ptr<system::CarSystem> car_system);
50         void start();
51         void update();
52         void stop();
53         void terminate();
54
55     private:
56         std::shared_ptr<car::system::CarSystem> car_system;
57
58         bool is_initialized_ = false;
59         bool is_running_ = false;
60
61         std::unique_ptr<lidar::LidarDevice> lidar_device_;
62         std::unique_ptr<CameraDevice> camera_device_;
63     };
64 }
65 #endif

```

12.20 common/include/car/system/device/lidar/LidarDevice.h File Reference

```
#include <vector>
#include <rapidjson/document.h>
#include <RPLidar.h>
```

Classes

- class [car::system::device::lidar::LidarDevice](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::device](#)
- namespace [car::system::device::lidar](#)

12.21 LidarDevice.h

[Go to the documentation of this file.](#)

```
1 #ifndef LIDARDEVICE_H
2 #define LIDARDEVICE_H
3
4 #pragma once
5
6 #include <vector>
7
8 #include <rapidjson/document.h>
9
10 #include <RPLidar.h>
11
12 using namespace rplidar;
13
14 namespace car::system::device {
15     class DeviceManager;
16 }
17
18 namespace car::system::device::lidar
19 {
20     class LidarDevice
21     {
22     public:
23         std::vector<Measure> getScanData() const { return this->scan_data_; }
24
25         virtual void start() = 0;
26         virtual void update() = 0;
27         virtual void stop() = 0;
28
29         virtual void initialize() = 0;
30         virtual void terminate() = 0;
31         virtual void disconnect() = 0;
32
33     protected:
34         friend class DeviceManager;
35
36         void setScanData(const std::vector<Measure>& scan_data)
37         {
38             this->scan_data_ = scan_data;
39         }
40
41         std::vector<Measure> scan_data_;
42     };
43 }
44
45 #endif
```

12.22 common/include/car/system/device/lidar/LidarDummy.h File Reference

```
#include <fstream>
#include <spdlog/spdlog.h>
#include "LidarDevice.h"
```

Classes

- class [car::system::device::lidar::LidarDummy](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::device](#)
- namespace [car::system::device::lidar](#)

12.23 LidarDummy.h

[Go to the documentation of this file.](#)

```
1 #ifndef LIDARDUMMY_H
2 #define LIDARDUMMY_H
3
4 #pragma once
5
6 #include <fstream>
7 #include <spdlog/spdlog.h>
8
9 #include "LidarDevice.h"
10
11 namespace car::system::device::lidar
12 {
13     class LidarDummy final : public LidarDevice
14     {
15     public:
16         LidarDummy()
17         {
18             spdlog::warn("Currently using the LidarDummy");
19         };
20
21         void start() final override {};
22         void update() final override {};
23         void stop() final override {};
24         void initialize() final override {};
25         void terminate() final override {};
26         void disconnect() final override {};
27
28     private:
29     };
30 }
31
32 #endif
```

12.24 common/include/car/system/device/lidar/LidarScanner.h File Reference

```
#include "LidarDevice.h"
#include <memory>
#include <variant>
#include <RPLidar.h>
#include <tl/expected.hpp>
#include "car/configuration/Configuration.h"
```


Classes

- class `car::system::device::lidar::LidarScanner`

Namespaces

- namespace `car`
- namespace `car::system`
- namespace `car::system::device`
- namespace `car::system::device::lidar`

12.25 LidarScanner.h

[Go to the documentation of this file.](#)

```

1 #ifndef LIDARSCANNER_H
2 #define LIDARSCANNER_H
3
4 #pragma once
5
6 #include "LidarDevice.h"
7
8 #include <memory>
9 #include <variant>
10
11 #include <RPLidar.h>
12 #include <tl/expected.hpp>
13
14 #include "car/configuration/Configuration.h"
15
16 using namespace rplidar;
17
18 namespace car::system::device::lidar
19 {
20     class LidarScanner final : public LidarDevice
21     {
22     public:
23         [[nodiscard]] static tl::expected<std::unique_ptr<LidarScanner>, std::string>
24         create(std::shared_ptr<configuration::Configuration> configuration) noexcept
25         {
26             auto maybe_lidar = RPLidar::create(configuration->lidar_port);
27             if (maybe_lidar.has_value())
28             {
29                 return std::make_unique<LidarScanner>(configuration, std::move(maybe_lidar.value()));
30             }
31             else
32             {
33                 return tl::make_unexpected(maybe_lidar.error());
34             }
35         }
36
37         // Do not call this constructor directly. Use the create method instead.
38         LidarScanner(std::shared_ptr<configuration::Configuration> configuration,
39                     std::unique_ptr<RPLidar> lidar) : configuration_(configuration), lidar_(std::move(lidar)) {}
40
41         void start() final override
42         {
43             this->running = true;
44             this->lidar_->start_motor();
45             std::lock_guard<std::mutex> lock(this->scan_data_mutex_);
46             this->scan_generator_ = this->lidar_->iter_scans();
47         }
48
49         void update() final override
50         {
51             if (this->running) {
52                 std::lock_guard<std::mutex> lock(this->scan_data_mutex_);
53                 const auto& scan_generator =
54                     std::get<std::function<std::vector<Measure>()>>(this->scan_generator_);
55                 this->set_scan_data(scan_generator());
56             }
57         }
58
59         void stop() final override

```

```

58     {
59         if (this->running) {
60             this->running = false;
61             std::lock_guard<std::mutex> lock(this->scan_data_mutex_);
62             this->scan_generator_ = nullptr;
63             this->lidar_->stop();
64             this->lidar_->stop_motor();
65         }
66     }
67
68     void initialize() final override
69     {
70     };
71
72     void disconnect() final override
73     {
74         if (this->running) {
75             this->running = false;
76             std::lock_guard<std::mutex> lock(this->scan_data_mutex_);
77             this->scan_generator_ = nullptr;
78             this->lidar_->disconnect();
79         }
80     }
81
82     void terminate() final override
83     {
84         this->stop();
85         this->disconnect();
86     }
87
88     private:
89         std::atomic_bool running = false;
90
91         std::shared_ptr<configuration::Configuration> configuration_;
92
93         std::vector<Measure> scan_data_;
94
95         std::unique_ptr<RPLidar> lidar_;
96         std::variant<std::function<std::vector<Measure>()>, nullptr_t> scan_generator_ = nullptr;
97
98         std::mutex scan_data_mutex_;
99     };
100 }
101
102 #endif

```

12.26 common/include/car/system/logging/VectorSink.h File Reference

```

#include <algorithm>
#include <vector>
#include <fmt/format.h>
#include <spdlog/sinks/base_sink.h>
#include <spdlog/details/synchronous_factory.h>
#include <iostream>

```

Classes

- class [car::system::logging::VectorSink< Mutex >](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::logging](#)

Typedefs

- using `car::system::logging::vector_sink_mt` = `VectorSink< std::mutex >`

12.27 VectorSink.h

[Go to the documentation of this file.](#)

```

1 #ifndef VECTORSINK_CXX
2 #define VECTORSINK_CXX
3
4 #include <algorithm>
5 #include <vector>
6
7 #include <fmt/format.h>
8
9 #include <spdlog/sinks/base_sink.h>
10 #include <spdlog/details/synchronous_factory.h>
11 #include <iostream>
12
13 namespace car::system::logging
14 {
15     template <typename Mutex>
16     class VectorSink : public spdlog::sinks::base_sink<Mutex>
17     {
18     public:
19         VectorSink(int max_lines) : max_lines(max_lines)
20         {
21         }
22
23         void sink_it_(const spdlog::details::log_msg &msg) override
24         {
25             spdlog::memory_buf_t formatted;
26             spdlog::sinks::base_sink<Mutex>::formatter_>format(msg, formatted);
27             if (this->log_messages.size() < this->max_lines)
28             {
29                 this->log_messages.push_back(std::string(formatted.data(), formatted.size()));
30             }
31             else
32             {
33                 std::rotate(this->log_messages.begin(), this->log_messages.begin() + 1,
34                             this->log_messages.end());
35                 this->log_messages[this->log_messages.size() - 1] = std::string(formatted.data(),
36                                         formatted.size());
37             }
38         };
39
40         void flush_() override
41         {
42             this->log_messages.clear();
43         };
44
45         const std::vector<std::string> &get_log_messages() const
46         {
47             return this->log_messages;
48         }
49
50     private:
51         const int max_lines;
52
53         std::vector<std::string> log_messages;
54     };
55
56     using vector_sink_mt = VectorSink<std::mutex>;
57 }
58 #endif

```

12.28 common/include/car/system/messaging/MessagingSystem.h File Reference

```

#include <functional>
#include <memory>
#include <ixwebsocket/IXNetSystem.h>

```

```
#include <ixwebsocket/IXWebSocket.h>
#include <nod/nod.hpp>
#include <rapidjson/rapidjson.h>
#include <rapidjson/document.h>
#include "utils/Utility.hpp"
#include "car/configuration/Configuration.h"
```

Classes

- class [car::system::messaging::MessagingSystem](#)
- struct [car::system::messaging::MessagingSystem::FirstMessageStruct](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::messaging](#)

12.29 MessagingSystem.h

[Go to the documentation of this file.](#)

```
1 #ifndef MESSAGINGSYSTEM_H
2 #define MESSAGINGSYSTEM_H
3
4 #pragma once
5
6 #include <functional>
7 #include <memory>
8
9 #include <ixwebsocket/IXNetSystem.h>
10 #include <ixwebsocket/IXWebSocket.h>
11
12 #include <nod/nod.hpp>
13
14 #include <rapidjson/rapidjson.h>
15 #include <rapidjson/document.h>
16
17 #include "utils/Utility.hpp"
18
19 #include "car/configuration/Configuration.h"
20
21 namespace car::system::messaging
22 {
23     class MessagingSystem
24     {
25     public:
26         MessagingSystem();
27
28         void initialize(std::shared_ptr<configuration::Configuration> configuration);
29         void initializeWebSocket();
30         const tl::expected<nullptr_t, std::string> tryConnect();
31         void stop();
32         void terminate();
33
34         // Necessary for the reloading the configuration
35         void setConfiguration(std::shared_ptr<configuration::Configuration> configuration);
36
37         nod::signal<void(const std::string, const rapidjson::Document*)>& getCommandSignal() { return
this->command_signal_; }
38         nod::signal<void(const std::string, const rapidjson::Document*)>& getSelectionSignal() { return
this->selection_signal_; }
39         nod::signal<void(const std::string)>& getMessageSignal() { return this->message_signal_; }
40         nod::signal<void(const std::string)>& getDisconnectSignal() { return this->on_disconnect_signal_;
}
41
42         void onMessageCallback(const ix::WebSocketMessagePtr& msg) const;
43         void onDisconnect(const std::string);
```

```

44
45     const std::string getUUID() const { return this->uuid_; }
46     void handleMessage(const std::string& message) const;
47     void sendMessage(const std::string& message);
48
49     struct FirstMessageStruct
50     {
51         std::string error_message;
52         std::string uuid;
53         std::condition_variable condition;
54     };
55     void onFirstMessage(const ix::WebSocketMessagePtr& msg, FirstMessageStruct&
first_message_struct);
56
57     const bool isConnected() const { return this->connected_; }
58
59     nod::signal<void(std::string)> on_disconnect_signal_;
60
61     nod::signal<void(const std::string)> message_signal_;
62     nod::signal<void(const std::string, const rapidjson::Document&)> command_signal_;
63     nod::signal<void(const std::string, const rapidjson::Document&)> selection_signal_;
64
65     private:
66         tl::expected<std::string, std::string> getFirstMessage();
67
68         std::shared_ptr<configuration::Configuration> configuration_;
69
70         std::unique_ptr<ix::WebSocket> websocket_;
71         std::string websocket_url_;
72
73         std::string uuid_;
74
75         bool connected_ = false;
76     };
77 };
78
79 #endif

```

12.30 common/include/car/system/messaging/StreamType.h File Reference

Enumerations

- enum [StreamType](#) { [None](#) = 0 , [Lidar](#) , [Camera](#) , [Both](#) }

12.30.1 Enumeration Type Documentation

12.30.1.1 StreamType

enum [StreamType](#)

Enumerator

None	
Lidar	
Camera	
Both	

12.31 StreamType.h

[Go to the documentation of this file.](#)

```
1 #ifndef STREAM_TYPE_H
2 #define STREAM_TYPE_H
3
4 #pragma once
5
6 enum StreamType {
7     None = 0,
8     Lidar,
9     Camera,
10    Both,
11 };
12
13 #endif
```

12.32 common/include/car/system/movement/controller/AbstractMovementController.h File Reference

Classes

- class [car::system::movement::controller::AbstractMovementController](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::movement](#)
- namespace [car::system::movement::controller](#)

12.33 AbstractMovementController.h

[Go to the documentation of this file.](#)

```
1 #ifndef ABSTRACTWHEELCONTROLLER_H
2 #define ABSTRACTWHEELCONTROLLER_H
3
4 #pragma once
5
6 namespace car::system::movement::controller
7 {
8     class AbstractMovementController
9     {
10     public:
11         virtual void initialize() = 0;
12         virtual void stop() = 0;
13         virtual void terminate() = 0;
14
15         virtual void setRearWheelsSpeed(const int speed) = 0;
16
17         virtual void setRearLeftWheelSpeed(const int speed) = 0;
18         virtual void setRearRightWheelSpeed(const int speed) = 0;
19
20         virtual void setFrontWheelsAngle(const float angle) = 0;
21         virtual void setCameraServo1Angle(const float angle) = 0;
22         virtual void setCameraServo2Angle(const float angle) = 0;
23
24         virtual void setRearWheelsDirectionToForward() = 0;
25         virtual void setRearLeftWheelDirectionToForward() = 0;
26         virtual void setRearRightWheelDirectionToForward() = 0;
27
28         virtual void setRearWheelsDirectionToBackward() = 0;
29         virtual void setRearLeftWheelDirectionToBackward() = 0;
30         virtual void setRearRightWheelDirectionToBackward() = 0;
31     };
32 } // namespace car::system::movement::controller
33
34 #endif
```

12.34 common/include/car/system/movement/controller/DeviceMovementController.h File Reference

12.35 DeviceMovementController.h

[Go to the documentation of this file.](#)

```

1 #ifndef __linux__
2 #ifndef DEVICEMOVEMENTCONTROLLER_H
3 #define DEVICEMOVEMENTCONTROLLER_H
4
5 #pragma once
6
7 #include <memory>
8
9 #include "AbstractMovementController.h"
10
11 #include "car/system/movement/devices/Servo.h"
12 #include "car/system/movement/devices/RearWheel.h"
13
14 using namespace car::system::movement::devices;
15
16 namespace car::system::movement::controller
17 {
18     static constexpr int Motor_A = 17;
19     static constexpr int Motor_B = 27;
20     static constexpr int PWM_A = 4;
21     static constexpr int PWM_B = 5;
22
23     static constexpr int MIN_PULSE_WIDTH = 900;
24     static constexpr int MAX_PULSE_WIDTH = 2100;
25     static constexpr int FREQUENCY = 50;
26
27     static constexpr int BUS_NUMBER = 1;
28
29     class DeviceMovementController : public AbstractMovementController
30     {
31     public:
32         [[nodiscard]] DeviceMovementController();
33
34         void initialize() final override;
35
36         void stop() final override;
37
38         void terminate() final override;
39
40         void setRearWheelsSpeed(const int speed) final override;
41
42         void setRearLeftWheelSpeed(const int speed) final override;
43
44         void setRearRightWheelSpeed(const int speed) final override;
45
46         void setFrontWheelsAngle(const float angle) final override;
47
48         void setCameraServo1Angle(const float angle) final override;
49
50         void setCameraServo2Angle(const float angle) final override;
51
52         void setRearWheelsDirectionToForward() final override;
53
54         void setRearLeftWheelDirectionToForward() final override;
55
56         void setRearRightWheelDirectionToForward() final override;
57
58         void setRearWheelsDirectionToBackward() final override;
59
60         void setRearLeftWheelDirectionToBackward() final override;
61
62         void setRearRightWheelDirectionToBackward() final override;
63
64     private:
65         std::shared_ptr<PCA9685> pwm;
66
67         std::unique_ptr<Servo> front_wheels_;
68         std::unique_ptr<Servo> camera_servo_1_;
69         std::unique_ptr<Servo> camera_servo_2_;
70
71         std::unique_ptr<RearWheel> rear_left_wheel_;
72         std::unique_ptr<RearWheel> rear_right_wheel_;
73     };
74 } // namespace car::system::movement::controller
75

```

```

76 #endif
77 #endif // __linux__

```

12.36 common/include/car/system/movement/controller/DummyMovementController.h File Reference

```
#include "AbstractMovementController.h"
```

Classes

- class [car::system::movement::controller::DummyMovementController](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::movement](#)
- namespace [car::system::movement::controller](#)

12.37 DummyMovementController.h

[Go to the documentation of this file.](#)

```

1 #ifndef DUMMYWHEELCONTROLLER_H
2 #define DUMMYWHEELCONTROLLER_H
3
4 #pragma once
5
6 #include "AbstractMovementController.h"
7
8 namespace car::system::movement::controller
9 {
10     class DummyMovementController : public AbstractMovementController
11     {
12     public:
13         void initialize() final override {};
14
15         void stop() final override;
16
17         void terminate() final override {};
18
19         void setRearWheelsSpeed(const int speed) final override;
20
21         void setRearLeftWheelSpeed(const int speed) final override;
22
23         void setRearRightWheelSpeed(const int speed) final override;
24
25         void setFrontWheelsAngle(const float angle) final override;
26
27         void setCameraServo1Angle(const float angle) final override;
28
29         void setCameraServo2Angle(const float angle) final override;
30
31         void setRearWheelsDirectionToForward() final override;
32
33         void setRearLeftWheelDirectionToForward() final override;
34
35         void setRearRightWheelDirectionToForward() final override;
36
37         void setRearWheelsDirectionToBackward() final override;
38
39         void setRearLeftWheelDirectionToBackward() final override;
40
41         void setRearRightWheelDirectionToBackward() final override;
42
43     private:
44     };
45 } // namespace car::system::movement::controller
46
47 #endif

```


12.38 common/include/car/system/movement/devices/RearWheel.h File Reference

12.39 RearWheel.h

[Go to the documentation of this file.](#)

```
1 #ifndef __linux__
2 #ifndef REARWHEEL_H
3 #define REARWHEEL_H
4
5 #include <memory>
6
7 #include <PCA9685.h>
8 #include <TB6612.h>
9
10 // Made with the help of ChatGPT
11
12 namespace car::system::movement::devices
13 {
14     class RearWheel
15     {
16     public:
17         RearWheel(std::shared_ptr<PCA9685> pwm, std::unique_ptr<TB6612> motor);
18
19         void forward();
20
21         void backward();
22
23         void stop();
24
25         int getSpeed() const;
26
27         void setSpeed(const int speed);
28
29         void ready();
30
31     private:
32         std::shared_ptr<PCA9685> pwm_;
33         std::unique_ptr<TB6612> motor_;
34
35         int speed_;
36     };
37 } // namespace car::system::movement::wheels
38
39 #endif
40 #endif
```

12.40 common/include/car/system/movement/devices/Servo.h File Reference

12.41 Servo.h

[Go to the documentation of this file.](#)

```
1 #ifndef __linux__
2 #ifndef SERVO_H
3 #define SERVO_H
4
5 #include <algorithm>
6 #include <memory>
7
8 #include <PCA9685.h>
9
10 namespace car::system::movement::devices
11 {
12     class Servo
13     {
14     private:
15         static int map(int x, int in_min, int in_max, int out_min, int out_max)
16         {
17             return ((x - in_min) * (out_max - out_min) / (in_max - in_min) + out_min);
18         }
19     };
20 }
21
```

```

22     }
23
24     static constexpr int MIN_PULSE_WIDTH = 900;
25     static constexpr int MAX_PULSE_WIDTH = 2100;
26     static constexpr int FREQUENCY = 50;
27
28     public:
29         Servo(std::shared_ptr<PCA9685> pwm, int channel);
30
31         // Some of the code was from: https://github.com/chaoticmachinery/pca9685
32         int getAnalogAngle() const;
33
34         int getAngle() const;
35
36         // Some of the code was from: https://github.com/chaoticmachinery/pca9685
37         void setAngle(const int angle);
38
39         void reset();
40
41     private:
42         const std::shared_ptr<PCA9685> pwm_;
43         const int channel_;
44
45         int angle_;
46     };
47 } // namespace car::system::movement::wheels
48
49 #endif
50 #endif // __linux__

```

12.42 common/include/car/system/movement/MovementSystem.h File Reference

```

#include <memory>
#include "car/system/movement/controller/AbstractMovementController.h"

```

Classes

- class [car::system::movement::MovementSystem](#)

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::movement](#)

12.43 MovementSystem.h

[Go to the documentation of this file.](#)

```

1 #ifndef MOVEMENTSYSTEM_H
2 #define MOVEMENTSYSTEM_H
3
4 #pragma once
5
6 #include <memory>
7
8 #include "car/system/movement/controller/AbstractMovementController.h"
9
10 using namespace car::system::movement::controller;
11
12 namespace car::system::movement
13 {
14     class MovementSystem

```

```

15     {
16     public:
17         MovementSystem(std::unique_ptr<AbstractMovementController> movement_controller) :
            movement_controller(std::move(movement_controller)) {};
18
19         void initialize()
20         {
21             this->movement_controller->initialize();
22         }
23
24         void start()
25         {
26         }
27
28         void stop()
29         {
30             this->movement_controller->stop();
31         }
32
33         void terminate()
34         {
35             this->movement_controller->terminate();
36         }
37
38 #pragma region Wheels
39         void setRearWheelsSpeed(const int speed) const
40         {
41             this->movement_controller->setRearWheelsSpeed(speed);
42         }
43
44         void setRearLeftWheelSpeed(const int speed) const
45         {
46             this->movement_controller->setRearLeftWheelSpeed(speed);
47         }
48
49         void setRearRightWheelSpeed(const int speed) const
50         {
51             this->movement_controller->setRearRightWheelSpeed(speed);
52         }
53
54         void setFrontWheelsAngle(const float angle) const
55         {
56             this->movement_controller->setFrontWheelsAngle(angle);
57         }
58
59         void setCameraServo1Angle(const float angle) const
60         {
61             this->movement_controller->setCameraServo1Angle(angle);
62         }
63
64         void setCameraServo2Angle(const float angle) const
65         {
66             this->movement_controller->setCameraServo2Angle(angle);
67         }
68
69         void setRearWheelsDirectionToForward() const
70         {
71             this->movement_controller->setRearWheelsDirectionToForward();
72         }
73
74         void setRearLeftWheelDirectionToForward() const
75         {
76             this->movement_controller->setRearLeftWheelDirectionToForward();
77         }
78
79         void setRearRightWheelDirectionToForward() const
80         {
81             this->movement_controller->setRearRightWheelDirectionToForward();
82         }
83
84         void setRearWheelsDirectionToBackward() const
85         {
86             this->movement_controller->setRearWheelsDirectionToBackward();
87         }
88
89         void setRearLeftWheelDirectionToBackward() const
90         {
91             this->movement_controller->setRearLeftWheelDirectionToBackward();
92         }
93
94         void setRearRightWheelDirectionToBackward() const
95         {
96             this->movement_controller->setRearRightWheelDirectionToBackward();
97         }
98 #pragma endregion
99
100     ~MovementSystem() {};

```

```
101
102     private:
103         std::unique_ptr<AbstractMovementController> movement_controller;
104     };
105 };
106
107 #endif
```

12.44 common/src/car/system/CarSystem.cpp File Reference

```
#include "car/system/CarSystem.h"
#include <memory>
#include <rapidjson/rapidjson.h>
#include <rapidjson/document.h>
#include <rapidjson/stringbuffer.h>
#include <rapidjson/writer.h>
#include <tobiaslocker_base64/base64.hpp>
#include "car/configuration/Configuration.h"
#include "car/system/device/DeviceManager.h"
#include "car/system/device/lidar/LidarDevice.h"
#include "car/system/device/CameraDevice.h"
#include "car/system/messaging/MessagingSystem.h"
#include "car/system/movement/MovementSystem.h"
#include "car/plugin/PluginManager.h"
```

Namespaces

- namespace [car](#)
- namespace [car::system](#)

12.45 common/src/car/system/device/CameraDevice.cpp File Reference

```
#include "car/system/device/CameraDevice.h"
```

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::device](#)

12.46 common/src/car/system/device/DeviceManager.cpp File Reference

```
#include "car/system/device/DeviceManager.h"
#include "car/system/CarSystem.h"
```

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::device](#)

12.47 common/src/car/system/messaging/MessagingSystem.cpp File Reference

```
#include "car/system/messaging/MessagingSystem.h"  
#include <functional>  
#include <memory>  
#include <ixwebsocket/IXNetSystem.h>  
#include <ixwebsocket/IXWebSocket.h>  
#include <nod/nod.hpp>  
#include <spdlog/spdlog.h>  
#include <rapidjson/rapidjson.h>  
#include <rapidjson/document.h>  
#include <fmt/format.h>  
#include "car/configuration/Configuration.h"
```

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::messaging](#)

12.48 common/src/car/system/movement/controller/DeviceMovement↵ Controller.cpp File Reference

12.49 common/src/car/system/movement/controller/DummyMovement↵ Controller.cpp File Reference

```
#include "car/system/movement/controller/DummyMovementController.h"  
#include <spdlog/spdlog.h>
```

Namespaces

- namespace [car](#)
- namespace [car::system](#)
- namespace [car::system::movement](#)
- namespace [car::system::movement::controller](#)

12.50 common/src/car/system/movement/devices/RearWheel.cpp File Reference

12.51 common/src/car/system/movement/devices/Servo.cpp File Reference

12.52 common/tests/pca9685/test_front_wheels.cpp File Reference

```
#include "PCA9685.h"  
#include <iostream>  
#include <algorithm>  
#include <thread>
```

Functions

- int [setAngle](#) (int &angle, PCA9685 pwm, int channel)
- int [map](#) (int x, int in_min, int in_max, int out_min, int out_max)
- int [setAngleToAnalog](#) (int angle)
- int [main](#) ()

Variables

- int [offset](#) = 0

12.52.1 Function Documentation

12.52.1.1 main()

```
int main ( )
```

12.52.1.2 map()

```
int map (  
    int x,  
    int in_min,  
    int in_max,  
    int out_min,  
    int out_max )
```

Following method clamps the x to in_min and in_max. Afterwards, it puts the result of that into the range of out_min and out_max

12.52.1.3 `setAngle()`

```
int setAngle (
    int & angle,
    PCA9685 pwm,
    int channel )
```

12.52.1.4 `setAngleToAnalog()`

```
int setAngleToAnalog (
    int angle )
```

12.52.2 Variable Documentation

12.52.2.1 `offset`

```
int offset = 0
```

12.53 common/tests/tb6612/test_rear_wheels.cpp File Reference

```
#include <pigpio.h>
#include <iostream>
#include <memory>
#include <thread>
#include <chrono>
#include <algorithm>
#include "PCA9685.h"
#include "TB6612.h"
```

Classes

- class [BackWheels](#)

Functions

- void [test](#) ()
- int [main](#) ()

12.53.1 Function Documentation

12.53.1.1 main()

```
int main ( )
```

12.53.1.2 test()

```
void test ( )
```

12.54 daemon/install/README.md File Reference

12.55 daemon/README.md File Reference

12.56 README.md File Reference

12.57 tui/README.md File Reference

12.58 repository/packages/t/tb6612/tb6612/include/TB6612.h File Reference

```
#include "pigpio.h"  
#include "pigpiod_if2.h"
```

Classes

- class [TB6612](#)

12.59 TB6612.h

[Go to the documentation of this file.](#)

```
1 #ifndef TB6612_HPP  
2 #define TB6612_HPP  
3  
4 #pragma once  
5  
6 // Made with the help of ChatGPT  
7  
8 #include "pigpio.h"  
9 #include "pigpiod_if2.h"  
10  
11 class TB6612  
12 {  
13 public:  
14     TB6612(int motor_pin, int pwm_pin);  
15  
16     void setPWM(int value);  
17
```



```
18     void forward();
19
20     void backward();
21
22     void stop();
23
24     void setOffset(bool offset);
25
26     const int &getMotorPin() const;
27
28     const int &getPWMPin() const;
29
30 private:
31     const int motor_pin;
32     const int pwm_pin;
33     bool offset = true;
34 };
35
36 #endif
```

12.60 repository/packages/t/tb6612/tb6612/src/TB6612.cpp File Reference

```
#include "TB6612.h"
```

12.61 SETUP.md File Reference

12.62 tui/src/car/configuration/JsonConfiguration.cxx File Reference

```
#include <iostream>
#include <fstream>
#include <variant>
#include <optional>
#include <rapidjson/document.h>
#include <rapidjson/istreamwrapper.h>
#include <spdlog/spdlog.h>
#include <fmt/format.h>
#include <tl/expected.hpp>
#include "car/configuration/Configuration.h"
```

Classes

- class [car::configuration::JsonConfiguration](#)

Namespaces

- namespace [car](#)
- namespace [car::configuration](#)

Macros

- [#define JSONCONFIGURATION_CXX](#)

12.62.1 Macro Definition Documentation

12.62.1.1 JSONCONFIGURATION_CXX

```
#define JSONCONFIGURATION_CXX
```

12.63 tui/src/car/display/console/CarConsole.cpp File Reference

```
#include "CarConsole.h"  
#include <ftxui/component/component.hpp>  
#include <ftxui/component/screen_interactive.hpp>  
#include <ftxui/dom/elements.hpp>  
#include <ftxui/component/loop.hpp>  
#include <nod/nod.hpp>
```

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)

12.64 tui/src/car/display/console/CarConsole.h File Reference

```
#include <memory>  
#include "car/system/CarSystem.h"  
#include "car/system/logging/VectorSink.h"  
#include "screen/MainScreen.cxx"  
#include "screen/SettingsScreen.cxx"  
#include "screen/LoggingScreen.cxx"
```

Classes

- class [car::display::console::CarConsole](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)

12.65 CarConsole.h

[Go to the documentation of this file.](#)

```

1 #ifndef CARCONSOLE_H
2 #define CARCONSOLE_H
3
4 #pragma once
5
6 #include <memory>
7
8 #include "car/system/CarSystem.h"
9 #include "car/system/logging/VectorSink.h"
10
11 #include "screen/MainScreen.cxx"
12 #include "screen/SettingsScreen.cxx"
13 #include "screen/LoggingScreen.cxx"
14
15 using namespace car::system;
16 using namespace car::display::console::screen;
17
18 namespace car::display::console
19 {
20     class CarConsole
21     {
22     public:
23         CarConsole(std::shared_ptr<CarSystem> car_system, std::shared_ptr<JsonConfiguration>
                json_configuration, std::shared_ptr<logging::vector_sink_mt> vector_sink);
24
25         void initialize();
26
27         void run();
28
29         void terminate();
30
31     private:
32         std::shared_ptr<CarSystem> car_system;
33         std::shared_ptr<JsonConfiguration> json_configuration;
34         std::shared_ptr<logging::vector_sink_mt> vector_sink;
35     };
36 }
37
38 #endif

```

12.66 tui/src/car/display/console/component/debug/DebugEnabler.cxx

File Reference

```

#include <nod/nod.hpp>
#include <ftxui/component/component.hpp>

```

Classes

- class [car::display::console::component::debug::DebugEnabler](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::component](#)
- namespace [car::display::console::component::debug](#)

Macros

- #define [DEBUGENABLER_CXX](#)

12.66.1 Macro Definition Documentation

12.66.1.1 DEBUGENABLER_CXX

```
#define DEBUGENABLER_CXX
```

12.67 tui/src/car/display/console/component/debug/DebugLidarCheckbox.cxx File Reference

```
#include <nod/nod.hpp>
#include <ftxui/component/component.hpp>
```

Classes

- class [car::display::console::component::debug::DebugLidarCheckbox](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::component](#)
- namespace [car::display::console::component::debug](#)

Macros

- #define [DEBUGLIDARCHECKBOX_CXX](#)

12.67.1 Macro Definition Documentation

12.67.1.1 DEBUGLIDARCHECKBOX_CXX

```
#define DEBUGLIDARCHECKBOX_CXX
```

12.68 tui/src/car/display/console/component/debug/DebugMessagingTextbox.cxx File Reference ↩

```
#include <nod/nod.hpp>
#include <ftxui/component/component.hpp>
```

Classes

- class [car::display::console::component::debug::DebugMessagingTextbox](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::component](#)
- namespace [car::display::console::component::debug](#)

Macros

- `#define` [DEBUGMESSAGINGTEXTBOX_CXX](#)

12.68.1 Macro Definition Documentation

12.68.1.1 DEBUGMESSAGINGTEXTBOX_CXX

```
#define DEBUGMESSAGINGTEXTBOX_CXX
```

12.69 tui/src/car/display/console/component/debug/DebugMovementRenderer.cxx File Reference ↩

```
#include <nod/nod.hpp>
#include <ftxui/component/component.hpp>
```

Classes

- class [car::display::console::component::debug::DebugMovementRenderer](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::component](#)
- namespace [car::display::console::component::debug](#)

Macros

- `#define` [DEBUGMOVEMENTRENDERER_CXX](#)

12.69.1 Macro Definition Documentation

12.69.1.1 DEBUGMOVEMENTRENDERER_CXX

```
#define DEBUGMOVEMENTRENDERER_CXX
```

12.70 tui/src/car/display/console/component/main/ConnectButton.cxx File Reference

```
#include <ftxui/component/component.hpp>  
#include "car/system/CarSystem.h"
```

Classes

- class [car::display::console::component::main::ConnectButton](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::component](#)
- namespace [car::display::console::component::main](#)

Macros

- `#define` [CONNECTBUTTON_CXX](#)

12.70.1 Macro Definition Documentation

12.70.1.1 CONNECTBUTTON_CXX

```
#define CONNECTBUTTON_CXX
```

12.71 tui/src/car/display/console/component/main/MainErrorModal.cxx File Reference

```
#include <ftxui/component/component.hpp>  
#include "car/system/CarSystem.h"
```

Classes

- class [car::display::console::component::main::MainErrorModal](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::component](#)
- namespace [car::display::console::component::main](#)

Macros

- #define [MAINERRORMODAL_CXX](#)

12.71.1 Macro Definition Documentation

12.71.1.1 MAINERRORMODAL_CXX

```
#define MAINERRORMODAL_CXX
```

12.72 tui/src/car/display/console/component/main/MainExitModal.cxx File Reference

```
#include <ftxui/component/component.hpp>
#include "car/system/CarSystem.h"
```

Classes

- class [car::display::console::component::main::MainExitModal](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::component](#)
- namespace [car::display::console::component::main](#)

Macros

- #define [MAINEXITMODAL_CXX](#)

12.72.1 Macro Definition Documentation

12.72.1.1 MAINEXITMODAL_CXX

```
#define MAINEXITMODAL_CXX
```

12.73 tui/src/car/display/console/component/settings/SettingsEdit↵ Config.cxx File Reference

```
#include <ftxui/component/component.hpp>
#include "car/system/CarSystem.h"
#include "../../../../../configuration/JsonConfiguration.cxx"
```

Classes

- class [car::display::console::component::settings::SettingsEditConfig](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::component](#)
- namespace [car::display::console::component::settings](#)

Macros

- `#define` [SETTINGSEDTCONFIG_CXX](#)

12.73.1 Macro Definition Documentation

12.73.1.1 SETTINGSEDTCONFIG_CXX

```
#define SETTINGSEDTCONFIG_CXX
```

12.74 tui/src/car/display/console/screen/LoggingScreen.cxx File Reference

```
#include <ftxui/component/component.hpp>  
#include <spdlog/spdlog.h>  
#include "car/system/logging/VectorSink.h"
```

Classes

- class [car::display::console::screen::LoggingScreen](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::screen](#)

Macros

- `#define` [LOGGINGSCREEN_CXX](#)

12.74.1 Macro Definition Documentation

12.74.1.1 LOGGINGSCREEN_CXX

```
#define LOGGINGSCREEN_CXX
```

12.75 tui/src/car/display/console/screen/MainScreen.cxx File Reference

```
#include <memory>
#include <ftxui/component/component.hpp>
#include "car/system/CarSystem.h"
#include "../component/main/ConnectButton.cxx"
#include "../component/main/MainExitModal.cxx"
#include "../component/main/MainErrorModal.cxx"
```

Classes

- class [car::display::console::screen::MainScreen](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::screen](#)

Macros

- #define [MAINSCREEN_CXX](#)

12.75.1 Macro Definition Documentation

12.75.1.1 MAINSCREEN_CXX

```
#define MAINSCREEN_CXX
```

12.76 tui/src/car/display/console/screen/SettingsScreen.cxx File Reference

```
#include <memory>
#include <ftxui/component/component.hpp>
#include "car/system/CarSystem.h"
#include "../../configuration/JsonConfiguration.cxx"
#include "../component/settings/SettingsEditConfig.cxx"
#include "../component/debug/DebugEnabler.cxx"
#include "../component/debug/DebugLidarCheckbox.cxx"
#include "../component/debug/DebugMovementRenderer.cxx"
#include "../component/debug/DebugMessagingTextbox.cxx"
```

Classes

- class [car::display::console::screen::SettingsScreen](#)

Namespaces

- namespace [car](#)
- namespace [car::display](#)
- namespace [car::display::console](#)
- namespace [car::display::console::screen](#)

Macros

- #define [SETTINGSSCREEN_CXX](#)

12.76.1 Macro Definition Documentation

12.76.1.1 SETTINGSSCREEN_CXX

```
#define SETTINGSSCREEN_CXX
```


Index

- - behaviour_tree::CarContext, [39](#)
- _setBehaviourTree
 - behaviour_tree::BehaviourTreeHandler, [31](#)
- ~CameraDevice
 - car::system::device::CameraDevice, [34](#)
- ~MovementSystem
 - car::system::movement::MovementSystem, [92](#)
- addPlugin
 - car::plugin::PluginManager, [97](#)
- any_configuration_empty
 - rpi_daemon, [99](#)
- attempted_to_reconnect
 - rpi_daemon, [99](#)
- backward
 - BackWheels, [27](#)
 - TB6612, [105](#)
- BackWheels, [27](#)
 - backward, [27](#)
 - BackWheels, [27](#)
 - cali_forward_A, [29](#)
 - cali_forward_B, [29](#)
 - calibration, [27](#)
 - caliLeft, [28](#)
 - caliOK, [28](#)
 - caliRight, [28](#)
 - forward, [28](#)
 - forward_A, [29](#)
 - forward_B, [29](#)
 - getSpeed, [28](#)
 - left_wheel, [29](#)
 - pca9685, [29](#)
 - ready, [28](#)
 - right_wheel, [29](#)
 - setSpeed, [28](#)
 - speed, [30](#)
 - stop, [28](#)
- behaviour_tree, [19](#)
 - behaviour_tree::BehaviourTreeHandler, [32](#)
- behaviour_tree/src/main.cpp, [109](#)
- behaviour_tree::BehaviourTreeHandler, [30](#)
 - _setBehaviourTree, [31](#)
 - behaviour_tree, [32](#)
 - car_system, [32](#)
 - context, [32](#)
 - getName, [31](#)
 - handleCommand, [31](#)
 - initialize, [31](#)
 - last_connected, [33](#)
 - setBehaviourTree, [31](#)
 - startBehaviourTree, [31](#)
 - stop, [32](#)
 - stopBehaviourTree, [32](#)
 - tick_count, [33](#)
 - update, [32](#)
- behaviour_tree::CarContext, [39](#)
 - _, [39](#)
 - car_system, [40](#)
 - CarContext, [39](#)
 - getCarSystem, [40](#)
- behaviour_tree_update_ms_interval
 - car::configuration::Configuration, [45](#)
- Both
 - StreamType.h, [129](#)
- box
 - car::display::console::screen::MainScreen, [84](#)
- button_pressed
 - car::display::console::component::main::ConnectButton, [47](#)
- cali_forward_A
 - BackWheels, [29](#)
- cali_forward_B
 - BackWheels, [29](#)
- calibration
 - BackWheels, [27](#)
- caliLeft
 - BackWheels, [28](#)
- caliOK
 - BackWheels, [28](#)
- caliRight
 - BackWheels, [28](#)
- Camera
 - StreamType.h, [129](#)
- camera_
 - car::system::device::CameraDevice, [36](#)
- camera_device_
 - car::system::device::DeviceManager, [64](#)
- camera_fps
 - car::configuration::Configuration, [45](#)
- camera_fps_interval
 - car::configuration::Configuration, [46](#)
- camera_index
 - car::configuration::Configuration, [46](#)
- camera_mutex_
 - car::system::device::CameraDevice, [36](#)
- camera_servo_1_angle_slider

- car::display::console::component::debug::DebugMovementRenderer, 58
- camera_servo_1_angle_slider_angle
 - car::display::console::component::debug::DebugMovementRenderer, 58
- camera_servo_2_angle_slider
 - car::display::console::component::debug::DebugMovementRenderer, 58
- camera_servo_2_angle_slider_angle
 - car::display::console::component::debug::DebugMovementRenderer, 58
- CameraDevice
 - car::system::device::CameraDevice, 34
- car, 19
- car::configuration, 19
- car::configuration::Configuration, 44
 - behaviour_tree_update_ms_interval, 45
 - camera_fps, 45
 - camera_fps_interval, 46
 - camera_index, 46
 - getCameraFpsInterval, 45
 - host, 46
 - lidar_port, 46
 - setCameraFps, 45
 - use_camera, 46
 - use_lidar, 46
- car::configuration::JsonConfiguration, 70
 - config_file_path, 71
 - exe_dir, 71
 - getConfigFilePath, 70
 - JsonConfiguration, 70
 - loadConfiguration, 70
 - setConfigFilePath, 70
- car::display, 19
- car::display::console, 20
- car::display::console::CarConsole, 37
 - car_system, 38
 - CarConsole, 37
 - initialize, 38
 - json_configuration, 38
 - run, 38
 - terminate, 38
 - vector_sink, 38
- car::display::console::component, 20
- car::display::console::component::debug, 20
- car::display::console::component::debug::DebugEnabler, 48
 - checkbox_value, 49
 - component, 49
 - debounce, 50
 - DEBUG_ENABLE_WARNING_MESSAGE, 50
 - DEBUG_MODE_DISABLED_MESSAGE, 50
 - DEBUG_MODE_ENABLED_MESSAGE, 50
 - DEBUG_MODE_WAIT_MESSAGE, 50
 - display_warn_debug_modal, 50
 - enabled, 50
 - getCheckbox, 49
 - getWarningModal, 49
- car::display::console::component::debug::DebugMovementRenderer, 58
 - is_enabled, 49
 - status, 51
- car::display::console::component::debug::DebugLidarCheckbox, 51
 - DebugLidarCheckbox, 51
 - element, 52
 - lidar_motor_signal, 52
 - lidar_motor_checkbox_component, 52
 - LIDAR_MOTOR_DISABLED_MESSAGE, 52
 - lidar_motor_enabled, 52
 - LIDAR_MOTOR_ENABLED_MESSAGE, 52
 - lidar_motor_loading_debounce, 52
 - lidar_motor_signal, 53
 - lidar_motor_status, 53
- car::display::console::component::debug::DebugMessagingTextbox, 53
 - DebugMessagingTextbox, 53
 - element, 54
 - message, 54
 - message_signal, 54
 - messaging_container, 54
 - messaging_textbox, 54
 - messaging_title, 54
- car::display::console::component::debug::DebugMovementRenderer, 55
 - camera_servo_1_angle_slider, 58
 - camera_servo_1_angle_slider_angle, 58
 - camera_servo_2_angle_slider, 58
 - camera_servo_2_angle_slider_angle, 58
 - DebugMovementRenderer, 56
 - DEFAULT_FRONT_WHEEL_ANGLE, 58
 - DEFAULT_REAR_WHEEL_SPEED, 58
 - element, 56
 - front_wheels_angle_slider, 59
 - front_wheels_angle_slider_value, 59
 - getCameraServo1AngleSliderValue, 56
 - getCameraServo2AngleSliderValue, 56
 - getFrontWheelsAngleSliderValue, 56
 - getRearLeftWheelSpeedSliderValue, 57
 - getRearRightWheelSpeedSliderValue, 57
 - getRearWheelDirectionSignal, 57
 - previous_camera_servo_1_angle_slider_angle, 59
 - previous_camera_servo_2_angle_slider_angle, 59
 - previous_front_wheels_angle_slider_value, 59
 - previous_rear_left_wheel_speed_slider_value, 59
 - previous_rear_right_wheel_speed_slider_value, 59
 - previous_rear_wheels_speed_slider_value, 60
 - rear_left_wheel_speed_slider, 60
 - rear_left_wheel_speed_slider_value, 60
 - rear_right_wheel_speed_slider, 60
 - rear_right_wheel_speed_slider_value, 60
 - rear_wheel_direction, 60
 - REAR_WHEEL_DIRECTION_BACKWARD_MESSAGE, 60
 - rear_wheel_direction_checkbox_component, 61
 - rear_wheel_direction_debounce, 61

- REAR_WHEEL_DIRECTION_FORWARD_MESSAGE, 61
- rear_wheel_direction_signal, 61
- rear_wheel_direction_status, 61
- rear_wheel_menu_entry, 61
- rear_wheel_speed_slider, 61
- rear_wheels_speed_slider_value, 62
- servo_menu_entry, 62
- slider_container, 62
- updateCameraServo1, 57
- updateCameraServo2, 57
- updateFrontWheels, 57
- updateRearWheels, 57
- car::display::console::component::main, 20
- car::display::console::component::main::ConnectButton, 47
 - button_pressed, 47
 - car_system, 48
 - ConnectButton, 47
 - element, 47
 - main_button, 48
 - main_button_text, 48
 - main_debounce, 48
 - on_connect_failure, 48
- car::display::console::component::main::MainErrorModal, 81
 - element, 81
 - error_element, 81
 - error_modal_shown, 82
 - main_error_modal, 82
 - MainErrorModal, 81
 - setErrorMessage, 81
- car::display::console::component::main::MainExitModal, 82
 - element, 83
 - exit, 83
 - exit_modal_shown, 83
 - main_exit_modal, 83
 - MainExitModal, 82
- car::display::console::component::settings, 20
- car::display::console::component::settings::SettingsEditConfig, 100
 - car_system, 101
 - element, 101
 - input_settings_file_path, 101
 - json_configuration, 101
 - load_button, 101
 - placeholder, 101
 - settings_file_path, 102
 - SettingsEditConfig, 100
- car::display::console::screen, 21
- car::display::console::screen::LoggingScreen, 79
 - element, 79
 - line_elements, 80
 - LoggingScreen, 79
 - menu, 80
 - my_custom_menu, 80
 - selected_line, 80
 - vector_sink, 80
- car::display::console::screen::MainScreen, 83
 - box, 84
 - car_system, 84
 - connect_button, 84
 - element, 84
 - info, 85
 - main_component, 85
 - main_error_modal, 85
 - main_exit_modal, 85
 - main_screen, 85
 - MainScreen, 84
- car::display::console::screen::SettingsScreen, 102
 - car_system, 103
 - debug_enabler, 103
 - debug_lidar_checkbox, 103
 - debug_messaging_text_box, 103
 - debug_movement_renderer, 103
 - element, 103
 - settings_edit_config, 104
 - SettingsScreen, 102
 - update, 103
- car::plugin, 21
- car::plugin::Plugin, 95
 - getName, 95
 - initialize, 95
 - stop, 96
 - update, 96
- car::plugin::PluginManager, 96
 - addPlugin, 97
 - getPlugin, 97
 - initialize, 97
 - plugins, 97
 - stop, 97
 - terminate, 97
 - update, 97
- car::system, 21
- car::system::CarSystem, 40
 - CarSystem, 41
 - configuration_, 43
 - device_manager_, 43
 - disconnect, 41
 - getConfiguration, 41
 - getDeviceManager, 41
 - getMessagingSystem, 42
 - getMovementSystem, 42
 - getPlugin, 42
 - initialize, 42
 - initialized, 44
 - messaging_system_, 44
 - movement_system_, 44
 - plugin_manager_, 44
 - reload, 42
 - sendData, 42
 - setConfiguration, 42
 - start, 43
 - started, 44
 - stop, 43

- terminate, 43
 - tryConnect, 43
 - update, 43
- car::system::device, 21
- car::system::device::CameraDevice, 33
 - ~CameraDevice, 34
 - camera_, 36
 - camera_mutex_, 36
 - CameraDevice, 34
 - configuration, 36
 - connected_, 36
 - create, 34
 - DeviceManager, 36
 - disconnect, 35
 - frame_buffer_, 37
 - getFrameBuffer, 35
 - last, 37
 - operator=, 35
 - start, 35
 - stop, 35
 - terminate, 35
 - update, 36
- car::system::device::DeviceManager, 62
 - camera_device_, 64
 - car_system, 64
 - create, 63
 - DeviceManager, 63
 - getCameraDevice, 63
 - getLidarDevice, 63
 - initialize, 63
 - is_initialized_, 65
 - is_running_, 65
 - isRunning, 64
 - lidar_device_, 65
 - start, 64
 - stop, 64
 - terminate, 64
 - update, 64
- car::system::device::lidar, 21
- car::system::device::lidar::LidarDevice, 71
 - DeviceManager, 73
 - disconnect, 72
 - getScanData, 72
 - initialize, 72
 - scan_data_, 73
 - setScanData, 72
 - start, 72
 - stop, 72
 - terminate, 73
 - update, 73
- car::system::device::lidar::LidarDummy, 74
 - disconnect, 74
 - initialize, 74
 - LidarDummy, 74
 - start, 75
 - stop, 75
 - terminate, 75
 - update, 75
- car::system::device::lidar::LidarScanner, 76
 - configuration_, 78
 - create, 77
 - disconnect, 77
 - initialize, 77
 - lidar_, 78
 - LidarScanner, 76
 - running, 78
 - scan_data_, 78
 - scan_data_mutex_, 78
 - scan_generator_, 79
 - start, 77
 - stop, 77
 - terminate, 77
 - update, 78
- car::system::logging, 22
 - vector_sink_mt, 22
- car::system::logging::VectorSink< Mutex >, 106
 - flush_, 107
 - get_log_messages, 107
 - log_messages, 107
 - max_lines, 108
 - sink_it_, 107
 - VectorSink, 107
- car::system::messaging, 22
- car::system::messaging::MessagingSystem, 85
 - command_signal_, 90
 - configuration_, 90
 - connected_, 90
 - getCommandSignal, 87
 - getDisconnectSignal, 87
 - getFirstMessage, 87
 - getMessageSignal, 87
 - getSelectionSignal, 87
 - getUUID, 87
 - handleMessage, 88
 - initialize, 88
 - initializeWebSocket, 88
 - isConnected, 88
 - message_signal_, 90
 - MessagingSystem, 86
 - on_disconnect_signal_, 90
 - onDisconnect, 88
 - onFirstMessage, 89
 - onMessageCallback, 89
 - selection_signal_, 91
 - sendMessage, 89
 - setConfiguration, 89
 - stop, 89
 - terminate, 89
 - tryConnect, 90
 - uuid_, 91
 - websocket_, 91
 - websocket_url_, 91
- car::system::messaging::MessagingSystem::FirstMessageStruct, 69
 - condition, 69
 - error_message, 69

- uuid, 69
- car::system::movement, 22
- car::system::movement::controller, 22
- car::system::movement::controller::AbstractMovementController, 23
 - initialize, 23
 - setCameraServo1Angle, 24
 - setCameraServo2Angle, 24
 - setFrontWheelsAngle, 24
 - setRearLeftWheelDirectionToBackward, 24
 - setRearLeftWheelDirectionToForward, 24
 - setRearLeftWheelSpeed, 25
 - setRearRightWheelDirectionToBackward, 25
 - setRearRightWheelDirectionToForward, 25
 - setRearRightWheelSpeed, 25
 - setRearWheelsDirectionToBackward, 25
 - setRearWheelsDirectionToForward, 26
 - setRearWheelsSpeed, 26
 - stop, 26
 - terminate, 26
- car::system::movement::controller::DummyMovementController, 65
 - initialize, 66
 - setCameraServo1Angle, 66
 - setCameraServo2Angle, 66
 - setFrontWheelsAngle, 66
 - setRearLeftWheelDirectionToBackward, 67
 - setRearLeftWheelDirectionToForward, 67
 - setRearLeftWheelSpeed, 67
 - setRearRightWheelDirectionToBackward, 67
 - setRearRightWheelDirectionToForward, 67
 - setRearRightWheelSpeed, 67
 - setRearWheelsDirectionToBackward, 68
 - setRearWheelsDirectionToForward, 68
 - setRearWheelsSpeed, 68
 - stop, 68
 - terminate, 68
- car::system::movement::MovementSystem, 91
 - ~MovementSystem, 92
 - initialize, 92
 - movement_controller, 95
 - MovementSystem, 92
 - setCameraServo1Angle, 92
 - setCameraServo2Angle, 93
 - setFrontWheelsAngle, 93
 - setRearLeftWheelDirectionToBackward, 93
 - setRearLeftWheelDirectionToForward, 93
 - setRearLeftWheelSpeed, 93
 - setRearRightWheelDirectionToBackward, 93
 - setRearRightWheelDirectionToForward, 93
 - setRearRightWheelSpeed, 94
 - setRearWheelsDirectionToBackward, 94
 - setRearWheelsDirectionToForward, 94
 - setRearWheelsSpeed, 94
 - start, 94
 - stop, 94
 - terminate, 94
- car_system
 - behaviour_tree::BehaviourTreeHandler, 32
 - behaviour_tree::CarContext, 40
 - car::display::console::CarConsole, 38
 - car::display::console::component::main::ConnectButton, 48
 - car::display::console::component::settings::SettingsEditConfig, 101
 - car::display::console::screen::MainScreen, 84
 - car::display::console::screen::SettingsScreen, 103
 - car::system::device::DeviceManager, 64
 - rpi_daemon, 99
 - CarConsole
 - car::display::console::CarConsole, 37
 - CarContext
 - behaviour_tree::CarContext, 39
 - CarSystem
 - car::system::CarSystem, 41
 - checkbox_value
 - car::display::console::component::debug::DebugEnabler, 49
 - color_and_signal_
 - car::system::messaging::MessagingSystem, 90
 - common/include/behaviour_tree/BehaviourTreeHandler.hpp, 112, 113
 - common/include/behaviour_tree/CarContext.hpp, 115
 - common/include/car/configuration/Configuration.h, 116
 - common/include/car/plugin/Plugin.h, 116, 117
 - common/include/car/plugin/PluginManager.h, 117, 118
 - common/include/car/system/CarSystem.h, 119
 - common/include/car/system/device/CameraDevice.h, 120, 121
 - common/include/car/system/device/DeviceManager.h, 121, 122
 - common/include/car/system/device/lidar/LidarDevice.h, 123
 - common/include/car/system/device/lidar/LidarDummy.h, 124
 - common/include/car/system/device/lidar/LidarScanner.h, 124, 125
 - common/include/car/system/logging/VectorSink.h, 126, 127
 - common/include/car/system/messaging/MessagingSystem.h, 127, 128
 - common/include/car/system/messaging/StreamType.h, 129, 130
 - common/include/car/system/movement/controller/AbstractMovementController.h, 130
 - common/include/car/system/movement/controller/DeviceMovementController.h, 131
 - common/include/car/system/movement/controller/DummyMovementController.h, 132
 - common/include/car/system/movement/devices/RearWheel.h, 133
 - common/include/car/system/movement/devices/Servo.h, 133
 - common/include/car/system/movement/MovementSystem.h, 134
 - common/src/car/system/CarSystem.cpp, 136

- common/src/car/system/device/CameraDevice.cpp, 136
- common/src/car/system/device/DeviceManager.cpp, 136
- common/src/car/system/messaging/MessagingSystem.cpp, 137
- common/src/car/system/movement/controller/DeviceMovementController.cpp, 137
- common/src/car/system/movement/controller/DummyMovementController.cpp, 137
- common/src/car/system/movement/devices/RearWheel.cpp, 138
- common/src/car/system/movement/devices/Servo.cpp, 138
- common/tests/pca9685/test_front_wheels.cpp, 138
- common/tests/tb6612/test_rear_wheels.cpp, 139
- component
 - car::display::console::component::debug::DebugEnabler, 49
- condition
 - car::system::messaging::MessagingSystem::FirstMessageFinalizer, 69
- config_file_path
 - car::configuration::JsonConfiguration, 71
- configuration
 - car::system::device::CameraDevice, 36
- configuration_
 - car::system::CarSystem, 43
 - car::system::device::lidar::LidarScanner, 78
 - car::system::messaging::MessagingSystem, 90
- connect
 - rpi_daemon, 98
- connect_button
 - car::display::console::screen::MainScreen, 84
- ConnectButton
 - car::display::console::component::main::ConnectButton, 47
- ConnectButton.cxx
 - CONNECTBUTTON_CXX, 147
- CONNECTBUTTON_CXX
 - ConnectButton.cxx, 147
- connected_
 - car::system::device::CameraDevice, 36
 - car::system::messaging::MessagingSystem, 90
- connection_ms_interval
 - rpi_daemon, 100
- context
 - behaviour_tree::BehaviourTreeHandler, 32
- create
 - car::system::device::CameraDevice, 34
 - car::system::device::DeviceManager, 63
 - car::system::device::lidar::LidarScanner, 77
- daemon/install/README.md, 140
- daemon/README.md, 140
- daemon/src/main.cpp, 110
- debounce
 - car::display::console::component::debug::DebugEnabler, 50
- DEBUG_ENABLE_WARNING_MESSAGE
 - car::display::console::component::debug::DebugEnabler, 50
 - debug_enabler
 - car::display::console::screen::SettingsScreen, 103
 - debug_lidar_checkbox
 - car::display::console::screen::SettingsScreen, 103
 - debug_messaging_text_box
 - car::display::console::screen::SettingsScreen, 103
 - DEBUG_MODE_DISABLED_MESSAGE
 - car::display::console::component::debug::DebugEnabler, 50
 - DEBUG_MODE_ENABLED_MESSAGE
 - car::display::console::component::debug::DebugEnabler, 50
 - DEBUG_MODE_WAIT_MESSAGE
 - car::display::console::component::debug::DebugEnabler, 50
 - debug_movement_renderer
 - car::display::console::screen::SettingsScreen, 103
 - DebugEnabler.cxx
 - DEBUGENABLER_CXX, 144
 - DEBUGENABLER_CXX
 - DebugEnabler.cxx, 144
 - DebugLidarCheckbox
 - car::display::console::component::debug::DebugLidarCheckbox, 51
 - DebugLidarCheckbox.cxx
 - DEBUGLIDARCHECKBOX_CXX, 144
 - DEBUGLIDARCHECKBOX_CXX
 - DebugLidarCheckbox.cxx, 144
 - DebugMessagingTextbox
 - car::display::console::component::debug::DebugMessagingTextbox, 53
 - DebugMessagingTextbox.cxx
 - DEBUGMESSAGINGTEXTBOX_CXX, 145
 - DEBUGMESSAGINGTEXTBOX_CXX
 - DebugMessagingTextbox.cxx, 145
 - DebugMovementRenderer
 - car::display::console::component::debug::DebugMovementRenderer, 56
 - DebugMovementRenderer.cxx
 - DEBUGMOVEMENTRENDERER_CXX, 146
 - DEBUGMOVEMENTRENDERER_CXX
 - DebugMovementRenderer.cxx, 146
 - DEFAULT_FRONT_WHEEL_ANGLE
 - car::display::console::component::debug::DebugMovementRenderer, 58
 - DEFAULT_REAR_WHEEL_SPEED
 - car::display::console::component::debug::DebugMovementRenderer, 58
 - device_manager_
 - car::system::CarSystem, 43
 - DeviceManager
 - car::system::device::CameraDevice, 36
 - car::system::device::DeviceManager, 63
 - car::system::device::lidar::LidarDevice, 73
 - disconnect
 - car::system::CarSystem, 41

car::system::device::CameraDevice, 35
 car::system::device::lidar::LidarDevice, 72
 car::system::device::lidar::LidarDummy, 74
 car::system::device::lidar::LidarScanner, 77
 display_warn_debug_modal
 car::display::console::component::debug::DebugEnabler, 50
 element
 car::display::console::component::debug::DebugLidarCheckbox, 52
 car::display::console::component::debug::DebugMessagingSystem, 54
 car::display::console::component::debug::DebugMovementRenderer, 56
 car::display::console::component::main::ConnectButton, 47
 car::display::console::component::main::MainErrorModal, 81
 car::display::console::component::main::MainExitModal, 83
 car::display::console::component::settings::SettingsEditControl, 101
 car::display::console::screen::LoggingScreen, 79
 car::display::console::screen::MainScreen, 84
 car::display::console::screen::SettingsScreen, 103
 enabled
 car::display::console::component::debug::DebugEnabler, 50
 error_element
 car::display::console::component::main::MainErrorModal, 81
 error_message
 car::system::messaging::MessagingSystem::FirstMessageSignal, 69
 error_modal_shown
 car::display::console::component::main::MainErrorModal, 82
 exe_dir
 car::configuration::JsonConfiguration, 71
 exit
 car::display::console::component::main::MainExitModal, 83
 exit_modal_shown
 car::display::console::component::main::MainExitModal, 83
 flush_
 car::system::logging::VectorSink< Mutex >, 107
 forward
 BackWheels, 28
 TB6612, 105
 forward_A
 BackWheels, 29
 forward_B
 BackWheels, 29
 frame_buffer
 car::system::device::CameraDevice, 37
 front_wheels_angle_slider
 car::display::console::component::debug::DebugMovementRenderer, 59
 front_wheels_angle_slider_value
 car::display::console::component::debug::DebugMovementRenderer, 59
 get_log_messages
 car::system::logging::VectorSink< Mutex >, 107
 getCameraDevice
 car::system::device::DeviceManager, 63
 getCameraFpsInterval
 car::configuration::Configuration, 45
 getCameraServo1AngleSliderValue
 car::display::console::component::debug::DebugMovementRenderer, 56
 getCameraServo2AngleSliderValue
 car::display::console::component::debug::DebugMovementRenderer, 56
 getCarSystem
 behaviour_tree::CarContext, 40
 getCheckbox
 car::display::console::component::debug::DebugEnabler, 49
 getCommandSignal
 car::system::messaging::MessagingSystem, 87
 getConfigFilePath
 car::configuration::JsonConfiguration, 70
 getConfiguration
 car::system::CarSystem, 41
 getDeviceManager
 car::system::CarSystem, 41
 getDisconnectSignal
 car::system::messaging::MessagingSystem, 87
 getFirstMessage
 car::system::messaging::MessagingSystem, 87
 getFrameBuffer
 car::system::device::CameraDevice, 35
 getFrontWheelsAngleSliderValue
 car::display::console::component::debug::DebugMovementRenderer, 56
 getLidarDevice
 car::system::device::DeviceManager, 63
 main.cpp, 110, 111
 getLidarMotorSignal
 car::display::console::component::debug::DebugLidarCheckbox, 52
 getMessageSignal
 car::system::messaging::MessagingSystem, 87
 getMessagingSystem
 car::system::CarSystem, 42
 getMotorPin
 TB6612, 105
 getMovementController
 main.cpp, 110, 112
 getMovementSystem
 car::system::CarSystem, 42
 getName
 behaviour_tree::BehaviourTreeHandler, 31
 car::plugin::Plugin, 95

getPlugin
 car::plugin::PluginManager, 97
 car::system::CarSystem, 42
 getPWMPin
 TB6612, 105
 getRearLeftWheelSpeedSliderValue
 car::display::console::component::debug::DebugMovementController, 57
 getRearRightWheelSpeedSliderValue
 car::display::console::component::debug::DebugMovementController, 57
 getRearWheelDirectionSignal
 car::display::console::component::debug::DebugMovementController, 57
 getScanData
 car::system::device::lidar::LidarDevice, 72
 getSelectionSignal
 car::system::messaging::MessagingSystem, 87
 getSpeed
 BackWheels, 28
 getUUID
 car::system::messaging::MessagingSystem, 87
 getWarningModal
 car::display::console::component::debug::DebugEnabler, 49

 handleCommand
 behaviour_tree::BehaviourTreeHandler, 31
 handleMessage
 car::system::messaging::MessagingSystem, 88
 host
 car::configuration::Configuration, 46

 info
 car::display::console::screen::MainScreen, 85
 initialize
 behaviour_tree::BehaviourTreeHandler, 31
 car::display::console::CarConsole, 38
 car::plugin::Plugin, 95
 car::plugin::PluginManager, 97
 car::system::CarSystem, 42
 car::system::device::DeviceManager, 63
 car::system::device::lidar::LidarDevice, 72
 car::system::device::lidar::LidarDummy, 74
 car::system::device::lidar::LidarScanner, 77
 car::system::messaging::MessagingSystem, 88
 car::system::movement::controller::AbstractMovementController, 23
 car::system::movement::controller::DummyMovementController, 66
 car::system::movement::MovementSystem, 92
 initialized
 car::system::CarSystem, 44
 initializeWebSocket
 car::system::messaging::MessagingSystem, 88
 input_settings_file_path
 car::display::console::component::settings::SettingsEditConfig, 101
 is_initialized_
 car::system::device::DeviceManager, 65
 is_running_
 car::system::device::DeviceManager, 65
 isConnected
 car::system::messaging::MessagingSystem, 88
 isEnabled
 car::display::console::component::debug::DebugEnabler, 49
 isRunning
 car::system::device::DeviceManager, 64
 json_configuration
 car::display::console::CarConsole, 38
 car::display::console::component::settings::SettingsEditConfig, 101
 JsonConfiguration
 car::configuration::JsonConfiguration, 70
 JsonConfiguration.cxx
 JSONCONFIGURATION_CXX, 142
 JSONCONFIGURATION_CXX
 JsonConfiguration.cxx, 142
 kbhit
 main.cpp, 109
 last
 car::system::device::CameraDevice, 37
 last_connected
 behaviour_tree::BehaviourTreeHandler, 33
 rpi_daemon, 100
 left_wheel
 BackWheels, 29
 Lidar
 StreamType.h, 129
 lidar_
 car::system::device::lidar::LidarScanner, 78
 lidar_device_
 car::system::device::DeviceManager, 65
 lidar_motor_checkbox_component
 car::display::console::component::debug::DebugLidarCheckbox, 52
 LIDAR_MOTOR_DISABLED_MESSAGE
 car::display::console::component::debug::DebugLidarCheckbox, 52
 lidar_motor_enabled
 car::display::console::component::debug::DebugLidarCheckbox, 52
 LIDAR_MOTOR_ENABLED_MESSAGE
 car::display::console::component::debug::DebugLidarCheckbox, 52
 lidar_motor_loading_debounce
 car::display::console::component::debug::DebugLidarCheckbox, 52
 lidar_motor_signal
 car::display::console::component::debug::DebugLidarCheckbox, 53
 lidar_motor_status
 car::display::console::component::debug::DebugLidarCheckbox, 53

- lidar_port
 - car::configuration::Configuration, 46
- LidarDummy
 - car::system::device::lidar::LidarDummy, 74
- LidarScanner
 - car::system::device::lidar::LidarScanner, 76
- line_elements
 - car::display::console::screen::LoggingScreen, 80
- load_button
 - car::display::console::component::settings::SettingsEditControl, 101
- loadConfiguration
 - car::configuration::JsonConfiguration, 70
- log_messages
 - car::system::logging::VectorSink< Mutex >, 107
- LoggingScreen
 - car::display::console::screen::LoggingScreen, 79
- LoggingScreen.cxx
 - LOGGINGSCREEN_CXX, 150
- LOGGINGSCREEN_CXX
 - LoggingScreen.cxx, 150
- main
 - main.cpp, 109, 111, 112
 - test_front_wheels.cpp, 138
 - test_rear_wheels.cpp, 139
- main.cpp
 - getLidarDevice, 110, 111
 - getMovementController, 110, 112
 - kbhit, 109
 - main, 109, 111, 112
 - terminate_handler, 111
- main_button
 - car::display::console::component::main::ConnectButton, 48
- main_button_text
 - car::display::console::component::main::ConnectButton, 48
- main_component
 - car::display::console::screen::MainScreen, 85
- main_debounce
 - car::display::console::component::main::ConnectButton, 48
- main_error_modal
 - car::display::console::component::main::MainErrorModal, 82
 - car::display::console::screen::MainScreen, 85
- main_exit_modal
 - car::display::console::component::main::MainExitModal, 83
 - car::display::console::screen::MainScreen, 85
- main_screen
 - car::display::console::screen::MainScreen, 85
- MainErrorModal
 - car::display::console::component::main::MainErrorModal, 81
- MainErrorModal.cxx
 - MAINERRORMODAL_CXX, 147
- MAINERRORMODAL_CXX
 - MainErrorModal.cxx, 147
- MainExitModal
 - car::display::console::component::main::MainExitModal, 82
- MainExitModal.cxx
 - MAINEXITMODAL_CXX, 148
- MAINEXITMODAL_CXX
 - MainExitModal.cxx, 148
- MainScreen
 - car::display::console::screen::MainScreen, 84
- MainScreen.cxx
 - MAINSCREEN_CXX, 150
- MAINSCREEN_CXX
 - MainScreen.cxx, 150
- map
 - test_front_wheels.cpp, 138
- max_lines
 - car::system::logging::VectorSink< Mutex >, 108
- menu
 - car::display::console::screen::LoggingScreen, 80
- message
 - car::display::console::component::debug::DebugMessagingTextbox, 54
- message_signal
 - car::display::console::component::debug::DebugMessagingTextbox, 54
- message_signal_
 - car::system::messaging::MessagingSystem, 90
- messaging_container
 - car::display::console::component::debug::DebugMessagingTextbox, 54
- messaging_system_
 - car::system::CarSystem, 44
- messaging_textbox
 - car::display::console::component::debug::DebugMessagingTextbox, 54
- messaging_title
 - car::display::console::component::debug::DebugMessagingTextbox, 54
- MessagingSystem
 - car::system::messaging::MessagingSystem, 86
- motor_pin
 - TB6612, 106
- movement_controller
 - car::system::movement::MovementSystem, 95
- movement_system_
 - car::system::CarSystem, 44
- MovementSystem
 - car::system::movement::MovementSystem, 92
- my_custom_menu
 - car::display::console::screen::LoggingScreen, 80
- None
 - StreamType.h, 129
- offset
 - TB6612, 106
 - test_front_wheels.cpp, 139
- on_connect_failure

car::display::console::component::main::ConnectButton, 48
 on_disconnect_signal_
 car::system::messaging::MessagingSystem, 90
 on_reload
 rpi_daemon, 98
 on_start
 rpi_daemon, 99
 on_stop
 rpi_daemon, 99
 on_update
 rpi_daemon, 99
 onDisconnect
 car::system::messaging::MessagingSystem, 88
 onFirstMessage
 car::system::messaging::MessagingSystem, 89
 onMessageCallback
 car::system::messaging::MessagingSystem, 89
 operator=
 car::system::device::CameraDevice, 35
 pca9685
 BackWheels, 29
 placeholder
 car::display::console::component::settings::SettingsEditConfig, 101
 plugin_manager_
 car::system::CarSystem, 44
 plugins
 car::plugin::PluginManager, 97
 previous_camera_servo_1_angle_slider_angle
 car::display::console::component::debug::DebugMovementRenderer, 59
 previous_camera_servo_2_angle_slider_angle
 car::display::console::component::debug::DebugMovementRenderer, 59
 previous_front_wheels_angle_slider_value
 car::display::console::component::debug::DebugMovementRenderer, 59
 previous_rear_left_wheel_speed_slider_value
 car::display::console::component::debug::DebugMovementRenderer, 59
 previous_rear_right_wheel_speed_slider_value
 car::display::console::component::debug::DebugMovementRenderer, 59
 previous_rear_wheels_speed_slider_value
 car::display::console::component::debug::DebugMovementRenderer, 60
 pwm_pin
 TB6612, 106
 README.md, 140
 ready
 BackWheels, 28
 rear_left_wheel_speed_slider
 car::display::console::component::debug::DebugMovementRenderer, 60
 rear_left_wheel_speed_slider_value
 car::display::console::component::main::ConnectButton, 48
 car::display::console::component::debug::DebugMovementRenderer, 60
 car::display::console::component::debug::DebugMovementRenderer, 60
 car::display::console::component::debug::DebugMovementRenderer, 60
 car::display::console::component::debug::DebugMovementRenderer, 60
 REAR_WHEEL_DIRECTION_BACKWARD_MESSAGE
 car::display::console::component::debug::DebugMovementRenderer, 60
 rear_wheel_direction_checkbox_component
 car::display::console::component::debug::DebugMovementRenderer, 61
 rear_wheel_direction_debounce
 car::display::console::component::debug::DebugMovementRenderer, 61
 REAR_WHEEL_DIRECTION_FORWARD_MESSAGE
 car::display::console::component::debug::DebugMovementRenderer, 61
 rear_wheel_direction_signal
 car::display::console::component::debug::DebugMovementRenderer, 61
 rear_wheel_direction_status
 car::display::console::component::debug::DebugMovementRenderer, 61
 rear_wheel_menu_entry
 car::display::console::component::debug::DebugMovementRenderer, 61
 rear_wheel_speed_slider
 car::display::console::component::debug::DebugMovementRenderer, 61
 rear_wheels_speed_slider_value
 car::display::console::component::debug::DebugMovementRenderer, 62
 reload
 car::system::CarSystem, 42
 repository/packages/tb6612/tb6612/include/TB6612.h, 140
 repository/packages/tb6612/tb6612/src/TB6612.cpp, 140
 right_wheel
 BackWheels, 29
 rpi_daemon, 98
 any_configuration_empty, 99
 attempted_to_reconnect, 99
 car_system, 99
 connect, 98
 connection_ms_interval, 100
 last_connected, 100
 on_reload, 98
 on_start, 99
 on_stop, 99
 on_update, 99
 update, 99

- run
 - car::display::console::CarConsole, 38
- running
 - car::system::device::lidar::LidarScanner, 78
- scan_data_
 - car::system::device::lidar::LidarDevice, 73
 - car::system::device::lidar::LidarScanner, 78
- scan_data_mutex_
 - car::system::device::lidar::LidarScanner, 78
- scan_generator_
 - car::system::device::lidar::LidarScanner, 79
- selected_line
 - car::display::console::screen::LoggingScreen, 80
- selection_signal_
 - car::system::messaging::MessagingSystem, 91
- sendData
 - car::system::CarSystem, 42
- sendMessage
 - car::system::messaging::MessagingSystem, 89
- servo_menu_entry
 - car::display::console::component::debug::DebugMovementRenderer, 62
- setAngle
 - test_front_wheels.cpp, 138
- setAngleToAnalog
 - test_front_wheels.cpp, 139
- setBehaviourTree
 - behaviour_tree::BehaviourTreeHandler, 31
- setCameraFps
 - car::configuration::Configuration, 45
- setCameraServo1Angle
 - car::system::movement::controller::AbstractMovementController, 24
 - car::system::movement::controller::DummyMovementController, 66
 - car::system::movement::MovementSystem, 92
- setCameraServo2Angle
 - car::system::movement::controller::AbstractMovementController, 24
 - car::system::movement::controller::DummyMovementController, 66
 - car::system::movement::MovementSystem, 93
- setConfigFilePath
 - car::configuration::JsonConfiguration, 70
- setConfiguration
 - car::system::CarSystem, 42
 - car::system::messaging::MessagingSystem, 89
- setErrorMessage
 - car::display::console::component::main::MainErrorModal, 81
- setFrontWheelsAngle
 - car::system::movement::controller::AbstractMovementController, 24
 - car::system::movement::controller::DummyMovementController, 66
 - car::system::movement::MovementSystem, 93
- setOffset
 - TB6612, 105
- setPWM
 - TB6612, 105
- setRearLeftWheelDirectionToBackward
 - car::system::movement::controller::AbstractMovementController, 24
 - car::system::movement::controller::DummyMovementController, 67
 - car::system::movement::MovementSystem, 93
- setRearLeftWheelDirectionToForward
 - car::system::movement::controller::AbstractMovementController, 24
 - car::system::movement::controller::DummyMovementController, 67
 - car::system::movement::MovementSystem, 93
- setRearLeftWheelSpeed
 - car::system::movement::controller::AbstractMovementController, 25
 - car::system::movement::controller::DummyMovementController, 67
 - car::system::movement::MovementSystem, 93
- setRearRightWheelDirectionToBackward
 - car::system::movement::controller::AbstractMovementController, 25
 - car::system::movement::controller::DummyMovementController, 67
 - car::system::movement::MovementSystem, 93
- setRearRightWheelDirectionToForward
 - car::system::movement::controller::AbstractMovementController, 25
 - car::system::movement::controller::DummyMovementController, 67
 - car::system::movement::MovementSystem, 93
- setRearRightWheelSpeed
 - car::system::movement::controller::AbstractMovementController, 25
 - car::system::movement::controller::DummyMovementController, 67
 - car::system::movement::MovementSystem, 94
- setRearWheelsDirectionToBackward
 - car::system::movement::controller::AbstractMovementController, 25
 - car::system::movement::controller::DummyMovementController, 68
 - car::system::movement::MovementSystem, 94
- setRearWheelsDirectionToForward
 - car::system::movement::controller::AbstractMovementController, 26
 - car::system::movement::controller::DummyMovementController, 68
 - car::system::movement::MovementSystem, 94
- setRearWheelsSpeed
 - car::system::movement::controller::AbstractMovementController, 26
 - car::system::movement::controller::DummyMovementController, 68
 - car::system::movement::MovementSystem, 94
- setScanData
 - car::system::device::lidar::LidarDevice, 72

- setSpeed
 - BackWheels, 28
- settings_edit_config
 - car::display::console::screen::SettingsScreen, 104
- settings_file_path
 - car::display::console::component::settings::SettingsEditConfig, 102
- SettingsEditConfig
 - car::display::console::component::settings::SettingsEditConfig, 100
- SettingsEditConfig.cxx
 - SETTINGSEDTCONFIG_CXX, 149
- SETTINGSEDTCONFIG_CXX
 - SettingsEditConfig.cxx, 149
- SettingsScreen
 - car::display::console::screen::SettingsScreen, 102
- SettingsScreen.cxx
 - SETTINGSSCREEN_CXX, 151
- SETTINGSSCREEN_CXX
 - SettingsScreen.cxx, 151
- SETUP.md, 141
- sink_it_
 - car::system::logging::VectorSink< Mutex >, 107
- slider_container
 - car::display::console::component::debug::DebugMovementController, 62
- speed
 - BackWheels, 30
- start
 - car::system::CarSystem, 43
 - car::system::device::CameraDevice, 35
 - car::system::device::DeviceManager, 64
 - car::system::device::lidar::LidarDevice, 72
 - car::system::device::lidar::LidarDummy, 75
 - car::system::device::lidar::LidarScanner, 77
 - car::system::movement::MovementSystem, 94
- startBehaviourTree
 - behaviour_tree::BehaviourTreeHandler, 31
- started
 - car::system::CarSystem, 44
- status
 - car::display::console::component::debug::DebugEnabler, 51
- stop
 - BackWheels, 28
 - behaviour_tree::BehaviourTreeHandler, 32
 - car::plugin::Plugin, 96
 - car::plugin::PluginManager, 97
 - car::system::CarSystem, 43
 - car::system::device::CameraDevice, 35
 - car::system::device::DeviceManager, 64
 - car::system::device::lidar::LidarDevice, 72
 - car::system::device::lidar::LidarDummy, 75
 - car::system::device::lidar::LidarScanner, 77
 - car::system::messaging::MessagingSystem, 89
 - car::system::movement::controller::AbstractMovementController, 26
- car::system::movement::controller::DummyMovementController, 68
- car::system::movement::MovementSystem, 94
- TB6612, 105
- stopBehaviourTree
 - behaviour_tree::BehaviourTreeHandler, 32
- StreamType
 - StreamType.h, 129
- StreamType.h
 - Both, 129
 - Camera, 129
 - Lidar, 129
 - None, 129
 - StreamType, 129
- TB6612, 104
 - backward, 105
 - forward, 105
 - getMotorPin, 105
 - getPWMPin, 105
 - motor_pin, 106
 - offset, 106
 - pwm_pin, 106
 - setOffset, 105
 - setPWM, 105
 - stop, 105
 - TB6612, 104
- terminate
 - car::display::console::CarConsole, 38
 - car::plugin::PluginManager, 97
 - car::system::CarSystem, 43
 - car::system::device::CameraDevice, 35
 - car::system::device::DeviceManager, 64
 - car::system::device::lidar::LidarDevice, 73
 - car::system::device::lidar::LidarDummy, 75
 - car::system::device::lidar::LidarScanner, 77
 - car::system::messaging::MessagingSystem, 89
 - car::system::movement::controller::AbstractMovementController, 26
 - car::system::movement::controller::DummyMovementController, 68
 - car::system::movement::MovementSystem, 94
 - terminate_handler
 - main.cpp, 111
- test
 - test_rear_wheels.cpp, 140
- test_front_wheels.cpp
 - main, 138
 - map, 138
 - offset, 139
 - setAngle, 138
 - setAngleToAnalog, 139
- test_rear_wheels.cpp
 - main, 139
 - test, 140
- tick_count
 - behaviour_tree::BehaviourTreeHandler, 33
- tryConnect
 - car::system::CarSystem, 43

- car::system::messaging::MessagingSystem, 90
- tui/README.md, 140
- tui/src/car/configuration/JsonConfiguration.cxx, 141
- tui/src/car/display/console/CarConsole.cpp, 142
- tui/src/car/display/console/CarConsole.h, 142, 143
- tui/src/car/display/console/component/debug/DebugEnabler.cxx, 143
- tui/src/car/display/console/component/debug/DebugLidarChecker.cxx, 144
- tui/src/car/display/console/component/debug/DebugMessagingTextbox.cxx, 145
- tui/src/car/display/console/component/debug/DebugMovementRenderer.cxx, 145
- tui/src/car/display/console/component/main/ConnectButton.cxx, 146
- tui/src/car/display/console/component/main/MainErrorModal.cxx, 147
- tui/src/car/display/console/component/main/MainExitModal.cxx, 148
- tui/src/car/display/console/component/settings/SettingsEditConfig.cxx, 148
- tui/src/car/display/console/screen/LoggingScreen.cxx, 149
- tui/src/car/display/console/screen/MainScreen.cxx, 150
- tui/src/car/display/console/screen/SettingsScreen.cxx, 151
- tui/src/main.cpp, 111
- update
 - behaviour_tree::BehaviourTreeHandler, 32
 - car::display::console::screen::SettingsScreen, 103
 - car::plugin::Plugin, 96
 - car::plugin::PluginManager, 97
 - car::system::CarSystem, 43
 - car::system::device::CameraDevice, 36
 - car::system::device::DeviceManager, 64
 - car::system::device::lidar::LidarDevice, 73
 - car::system::device::lidar::LidarDummy, 75
 - car::system::device::lidar::LidarScanner, 78
 - rpi_daemon, 99
- updateCameraServo1
 - car::display::console::component::debug::DebugMovementRenderer, 57
- updateCameraServo2
 - car::display::console::component::debug::DebugMovementRenderer, 57
- updateFrontWheels
 - car::display::console::component::debug::DebugMovementRenderer, 57
- updateRearWheels
 - car::display::console::component::debug::DebugMovementRenderer, 57
- use_camera
 - car::configuration::Configuration, 46
- use_lidar
 - car::configuration::Configuration, 46
- uuid
 - car::system::messaging::MessagingSystem::FirstMessageStruct, 69
- uuid_
 - car::system::messaging::MessagingSystem, 91
- vector_sink
 - car::display::console::CarConsole, 38
 - car::display::console::screen::LoggingScreen, 80
- vector_sink_mt
 - car::system::logging, 22
- VectorSink
 - car::system::logging::VectorSink< Mutex >, 107
- websocket
 - car::system::messaging::MessagingSystem, 91
- websocket_url_
 - car::system::messaging::MessagingSystem, 91