NIST AV SIMULATION

User Manual [version 1.0]



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- Acceleration Map
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▶ v1.0 (09/22): Original version.

Conventions **V1.0**

Conventions used in this document.

link

- **folder**
- file
- >_ command
- keyboard
- note

A warning

PREREQUISITES _____

- ▶ Ubuntu 20.04
 - ► Choose *Desktop Image*
- Python 3.8
- ▶ ROS2 Galactic
- Git
 - >_ sudo apt-get update
 - ▶ >_ sudo apt-get -y install git

WORKING DIRECTORY

In the document, the path for Carla, Autoware, and ScenarioRunner installation is

CARLA SERVER 0.9.12

The version of Carla and Additional Maps have to be 0.9.12

- ▶ Download and extract Carla 0.9.12 in ► ~/seri_av
- Download <u>AdditionalMaps 0.9.12</u> in __~/seri_av/CARLA_0.9.12/Import
 There is no need to unzip this file.
- ▶ cd ~/seri_av/CARLA_0.9.12/
- >_ ./ImportAssets.sh

*** CARLA CLIENT 0.9.12 _____

▶ >_ pip3 install carla==0.9.12

******* AUTOWARE MAPS _____

- Create a folder to store maps for Autoware.
 - > mkdir -p ~/seri_av/autoware_map/
- ▶ Unzip carla-town-4.zip in this folder.

INSTALL AUTOWARE _____

- >_ cd ~/seri_av
- pit clone https://github.com/autowarefoundation/autoware.git -b galactic

INSTALL DEPENDENCIES _____

- >_ cd autoware
- >_ ./setup-dev-env.sh
 - Be very careful with this method. Make sure you read and confirmed all the steps in the Ansible configuration before using it.

ADD REPOSITORIES ____

Add the list of repositories from extra-repos.txt at the end of autoware/autoware.repos

⚠ Make sure to properly indent new additions to extra-repos.txt, otherwise these new packages will be ignored.

```
WORKSPACE
```

If you previously created a src folder in autoware, delete it. We are going to re-create this folder.

- >_ cd autoware
- ▶ >_ mkdir src
- >_ vcs import --recursive src < autoware.repos

Install ROS dependencies

- >_ rosdep update --include-eol-distros
- ▶ > source /opt/ros/galactic/setup.bash
- > rosdep install -y --from-paths src --ignore-src --rosdistro galactic -y -r

Build Workspace

>_ colcon build --symlink-install --cmake-args -DCMAKE_BUILD_TYPE=Release

Clone the Scenario Runner repository.

- >_ cd ~/seri_av
- > git clone https://github.com/carla-simulator/scenario_runner.git
- >_ cd scenario_runner
- ▶ >_ git checkout v0.9.12

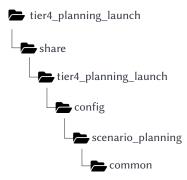
Add scenario file.

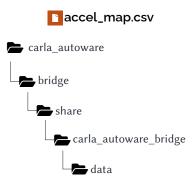
- Copy the file Reveal_wEgo52.xosc in the folder scenario_runner
 Install the requirements for Python.
- >_ sudo apt remove python3-networkx
- >_ pip3 install --user -r requirements.txt

To be able to run the reveal scenario, as shown during the workshop, we need to replace some files located in subfolders of autoware/install. A Make a backup of the files you are about to replace.

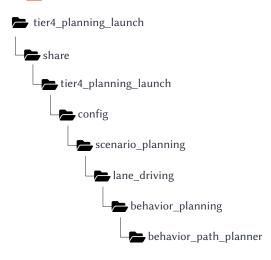
It is not safe to place these files in the install folder because they will be overwritten if you do a colcon build. The correct way should be to place these files in the colder and then do a colcon build, which in turn will move these new files to install However, recompiling Autoware may take very long, and this is why we are using the install folder directly.

motion_velocity_smoother.param.yaml

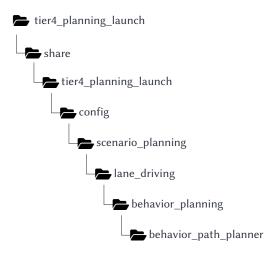




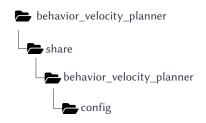
behavior_path_planner.param.yaml

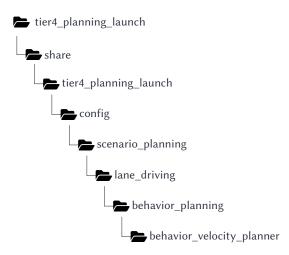


behavior_path_planner.param.yaml



occlusion_spot.param.yaml (must be placed in two different folders).





adaptive_cruise_control.param.yaml tier4_planning_launch share 🗕 tier4_planning_launch config scenario_planning lane driving motion_planning **a** obstacle_stop_planner We need to modify **bashrc** to include the correct path for Carla, Autoware, and Open Scenario.

I have create a bash function to makes life easier. This function sources the needed ROS workspaces, set the path for Carla and Open Scenario, and includes aliases. This function is located in bash_function.txt

- Copy this function in your .bashrc
- Adapt the paths for your system.
- ► The function is just declared in **L**.bashrc and not called. To execute the function, you can use > seri_demo or add the line seri_demo in **L**.bashrc

The file seri_ros_ws.zip is a ROS workspace which you will need to unzip in ~/seri_av

Once the file is unzipped:

- > cd ~/seri_av/seri_ros_ws
- ▶ >_ colcon build
- >_ source install/setup.bash

To run the full demo, you will need 6 terminal windows.

The aliases created in the function from **bash_function.txt** informs the order of the commands to run.

- ▶ 1-carla_start Starts the CARLA server and a GUI. If you prefer to disable the GUI, add the flag *-RenderOffScreen* to the alias.
- >_ 2-bridge_start Starts the Carla-Autoware bridge
- >_ 3-scenario_start Start the Reveal scenario.
- ▶ 4-autoware_start Starts Autoware with RViz turned on. If the map is not shown in RViz, you will need to close and restart everything.
- ► > 5-run ROS publishers and subscribers.
- ▶ 2 6-run Initialize the ego vehicle and sets the goal.

Contact me at zeid.kootbally@nist.gov if you run into some issues.