

RWR 4015

Traffic Simulation for Planning Applications

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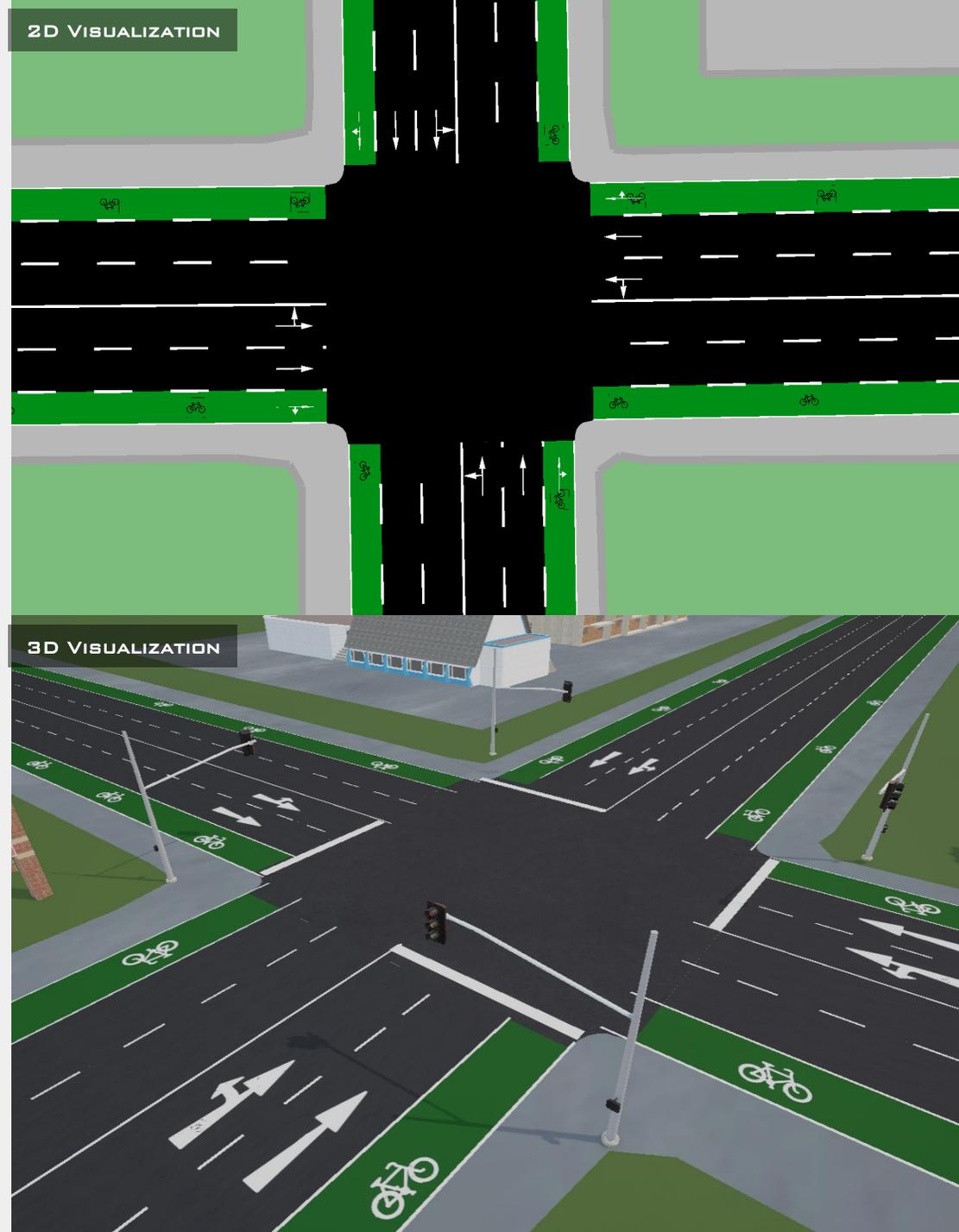
Week 11 | Hands-on:
3D Simulation in Planning II

Fall 2026

RoadwayVR



roadwayvr.github.io/TrafficSimulationforPlanningApplications



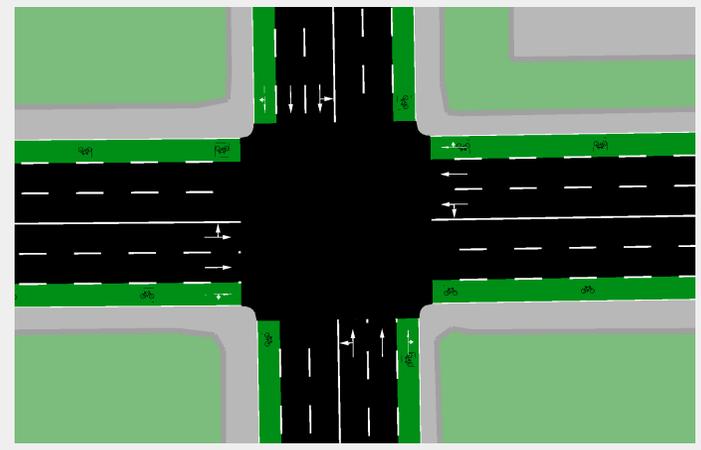
Scenario 3: (Bicycle, Scooter)

1. Create Road Network

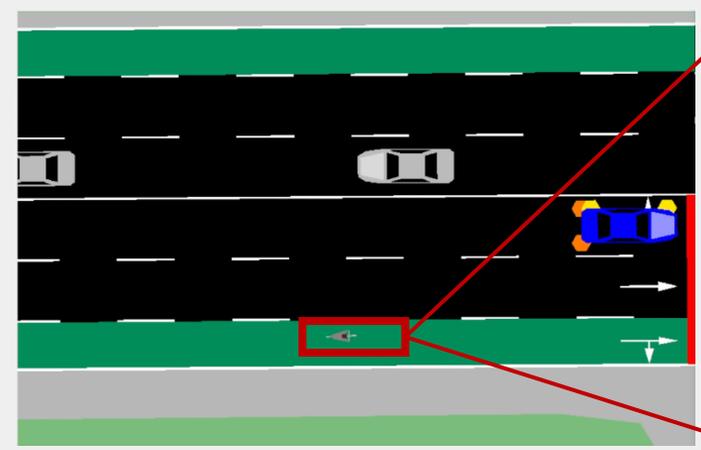
2. Run Sumo2Unity Integration

3. Generate Performance Functions

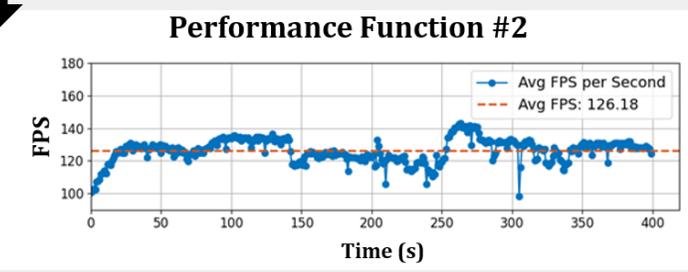
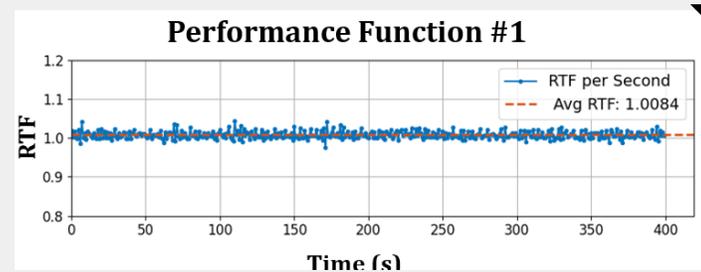
1



2



3



Step 1: Create Road Network

1.1. SUMO Steps

A) Adding Lane

B) Adding Terrain

C) Adding Roadside

D) Adding Residential

E) Adding Wood

1.2. Unity Steps

F) Import SUMO Road Network

G) Road Marking As Decals: Stamp an image on a 3D model

H) Add Stop Signs, and Navigation Arrow

I) Add Trees, Buildings, and Road Signs

Step 1. Create Road Network

SUMO Steps:

❑ Note: We use Scenario 2 files for demonstrating

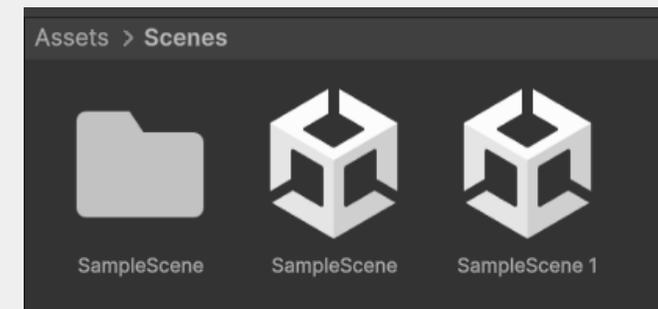
Unity Steps:

❑ Note: Create a Scene “Scenario3”

❑ Project Window → Scenes → Duplicate Scenario2 (Ctrl + D) → Name it Scenario3

Assets	2025-07-23 6:09 AM	File folder
Library	2025-07-25 10:21 AM	File folder
Logs	2025-07-25 8:11 AM	File folder
obj	2025-07-21 11:41 AM	File folder
Packages	2025-07-21 11:22 AM	File folder
ProjectSettings	2025-07-24 1:39 PM	File folder
Results	2025-07-25 8:03 AM	File folder
Scenario1	2025-07-25 8:02 AM	File folder
Scenario2	2025-07-25 9:28 AM	File folder
Scenario3	2025-07-25 10:56 AM	File folder
temp	2025-07-25 10:13 AM	File folder
UserSettings	2025-07-25 10:06 AM	File folder

Copy and Paste Scenario 2 and name it Scenario 3

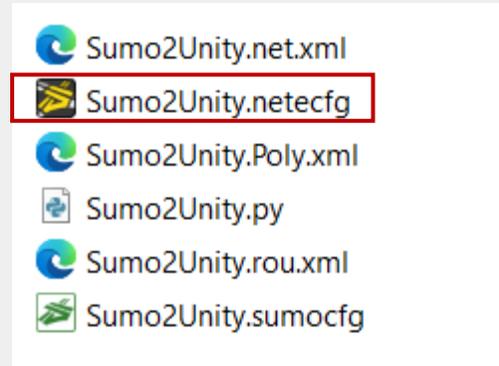
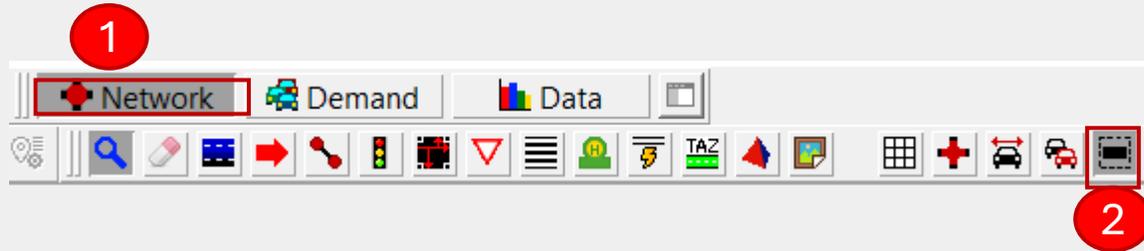


Step 1: Create Road Network

A) Adding Lanes

❑ Scenario3 → Open Sumo2Unity.netecfg →

❑ Select “Lane”



Net: lane

Overlapped elements

1 / 2

Help

Internal attributes

id	E0_0
	0
	13.89
allow	all
disallow	
width	2.5
speed	0.00
allow on	<input type="checkbox"/> false
customShape	
opposite	
changeLeft	all
changeRight	all
type	
stopOffset	0.00

Parameters

Edit parameters

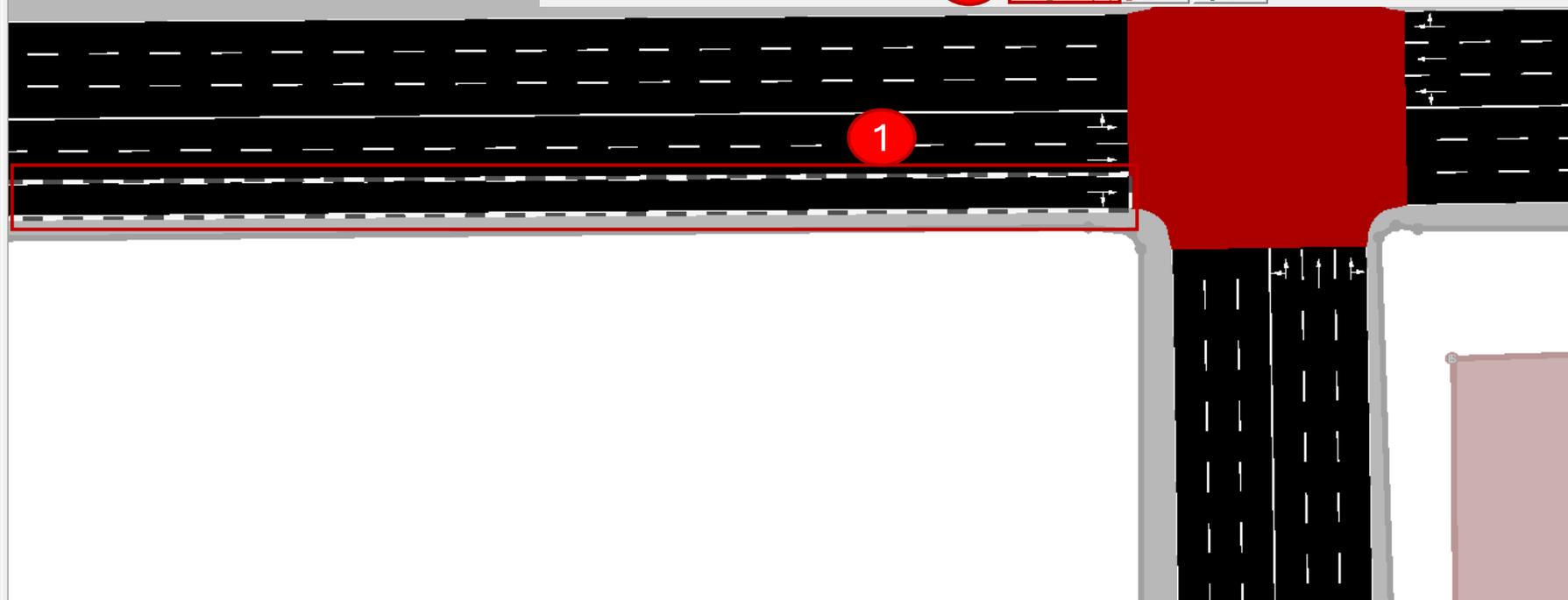
Netedit attributes

Front element

Help

Hierarchy

- junction origin
- junction destination
 - edge: E0
 - lane 0
 - Outgoing



Allow all vehicles Allow only road vehicles Allow only rail vehicles Disallow all vehicles

Select vClasses

<input checked="" type="checkbox"/> passenger Default vehicle class	<input checked="" type="checkbox"/> bicycle Human-powered, pedal-driven vehicle	<input checked="" type="checkbox"/> evehicle Future electric mobility vehicles
<input checked="" type="checkbox"/> private A passenger car assigned for private use	<input checked="" type="checkbox"/> scooter An electric scooter or a kick scooter	<input checked="" type="checkbox"/> army Vehicle designed for military force
<input checked="" type="checkbox"/> taxi Vehicle for hire with a driver	<input checked="" type="checkbox"/> pedestrian Person traveling on foot	<input checked="" type="checkbox"/> ship Basic class for navigating waterways
<input checked="" type="checkbox"/> bus Urban line traffic	<input checked="" type="checkbox"/> wheelchair A mobility impaired person	<input checked="" type="checkbox"/> authority Vehicle of a governmental security force
<input checked="" type="checkbox"/> coach Overland transport	<input checked="" type="checkbox"/> tram Rail vehicle which runs on tracks	<input checked="" type="checkbox"/> vip A civilian security armored car used by a government
<input checked="" type="checkbox"/> delivery Vehicles specialized in delivering goods	<input checked="" type="checkbox"/> rail_electric Rail electric vehicle	<input checked="" type="checkbox"/> hov High-Occupancy Vehicle (two or more people)
<input checked="" type="checkbox"/> truck Vehicle designed to transport cargo	<input checked="" type="checkbox"/> rail_fast High-speed rail vehicle	<input checked="" type="checkbox"/> container A transport container
<input checked="" type="checkbox"/> trailer Truck with trailer	<input checked="" type="checkbox"/> rail_urban Heavier than tram	<input checked="" type="checkbox"/> aircraft An airplane
<input checked="" type="checkbox"/> emergency Vehicle designated to respond to an emergency	<input checked="" type="checkbox"/> rail Heavy rail vehicle	<input checked="" type="checkbox"/> drone A small unmanned robot
<input checked="" type="checkbox"/> motorcycle Two- or three-wheeled motor vehicle	<input checked="" type="checkbox"/> cable_car A conveyance suspended on a cable	<input checked="" type="checkbox"/> custom1 Reserved for user-defined semantics
<input checked="" type="checkbox"/> moped Motorcycle not allowed in motorways	<input checked="" type="checkbox"/> subway A railway that mostly runs underground	<input checked="" type="checkbox"/> custom2 Reserved for user-defined semantics

accept cancel reset

2

3

5

4

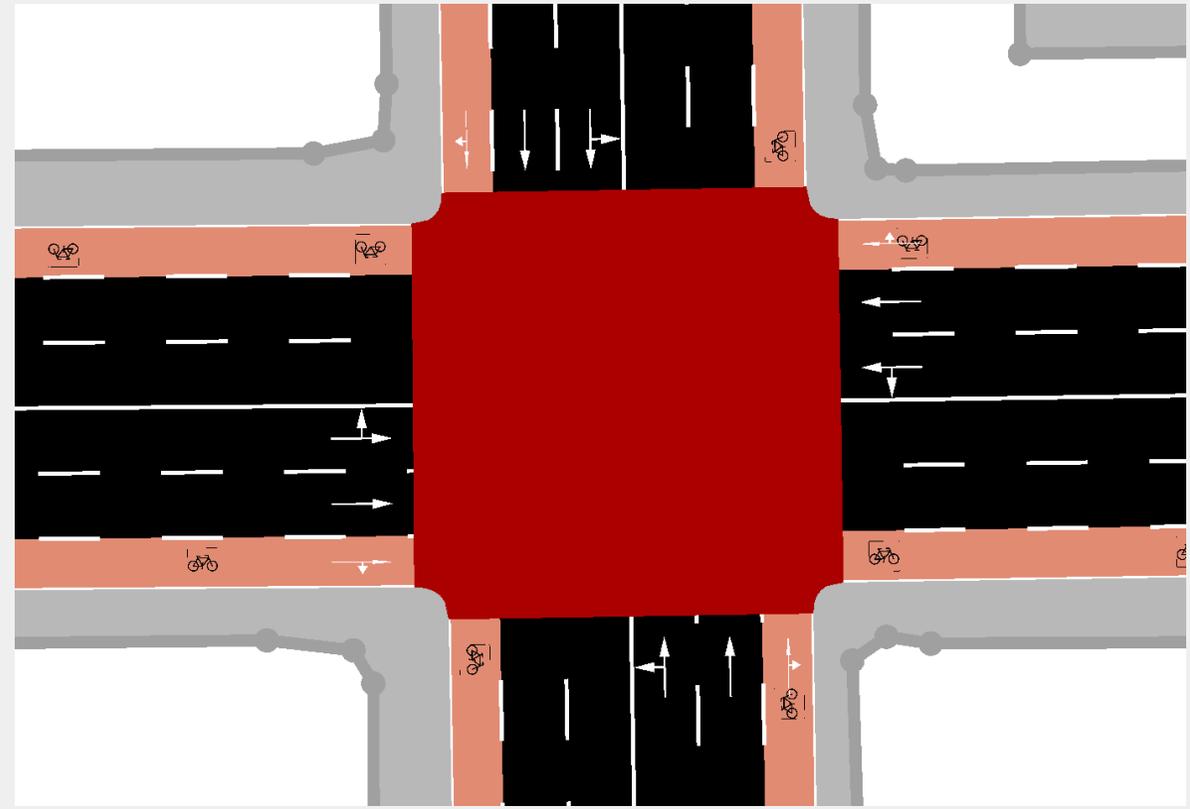
6

1

Step 1: Create Road Network

A) Adding Lanes

- ❑ Assigning bike lane for all directions
- ❑ Processing → Compute Junctions



Step 1: Create Road Network

1.2. Unity Steps

F) Import SUMO Road Network

G) Road Marking As Decals: Stamp an image on a 3D model

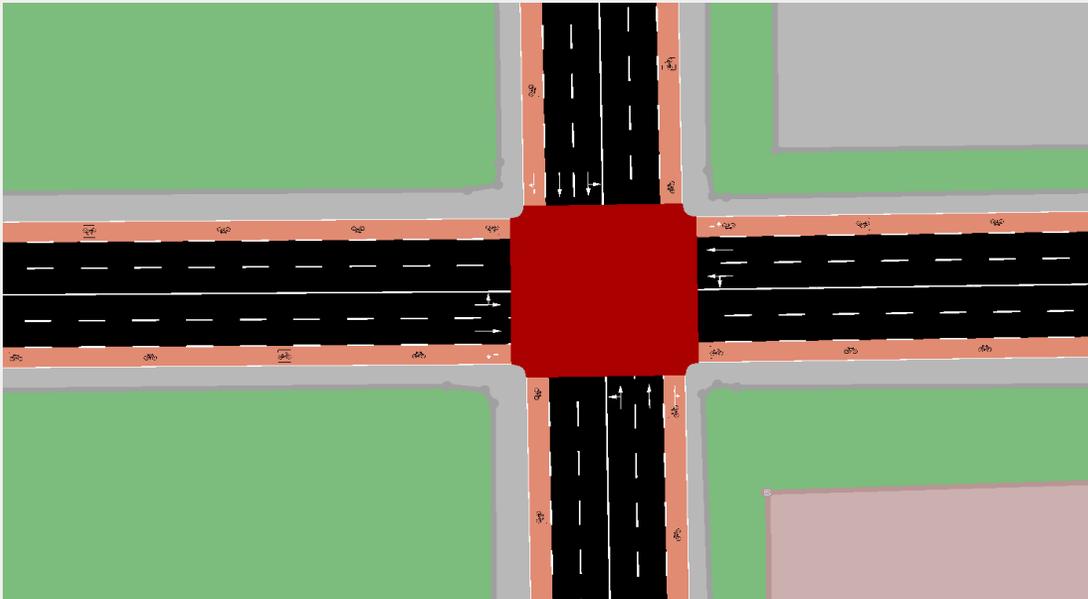
Step 1: Create Road Network

F) Import SUMO Road Network

Note: Open Scene “Scenario3”

Remove Existing GameObject “RoadNetworkRoot”

Sumo2Unity → 1. Create Road Network → Set Sumo Files Folder as Directory\SUMO2Unity\Scenario3 → Start



Step 1: Create Road Network

G) Road Marking As Decals: Stamp an image on a 3D model

Fix Road Marking



Step 1: Create Road Network

G) Road Marking As Decals: Stamp an image on a 3D model

- ❑ Add Decal Bike Lane
- ❑ Hierarchy Window → Rendering → URP Decal Projector
- ❑ Inspector Window → Material → BikeLane-Decal

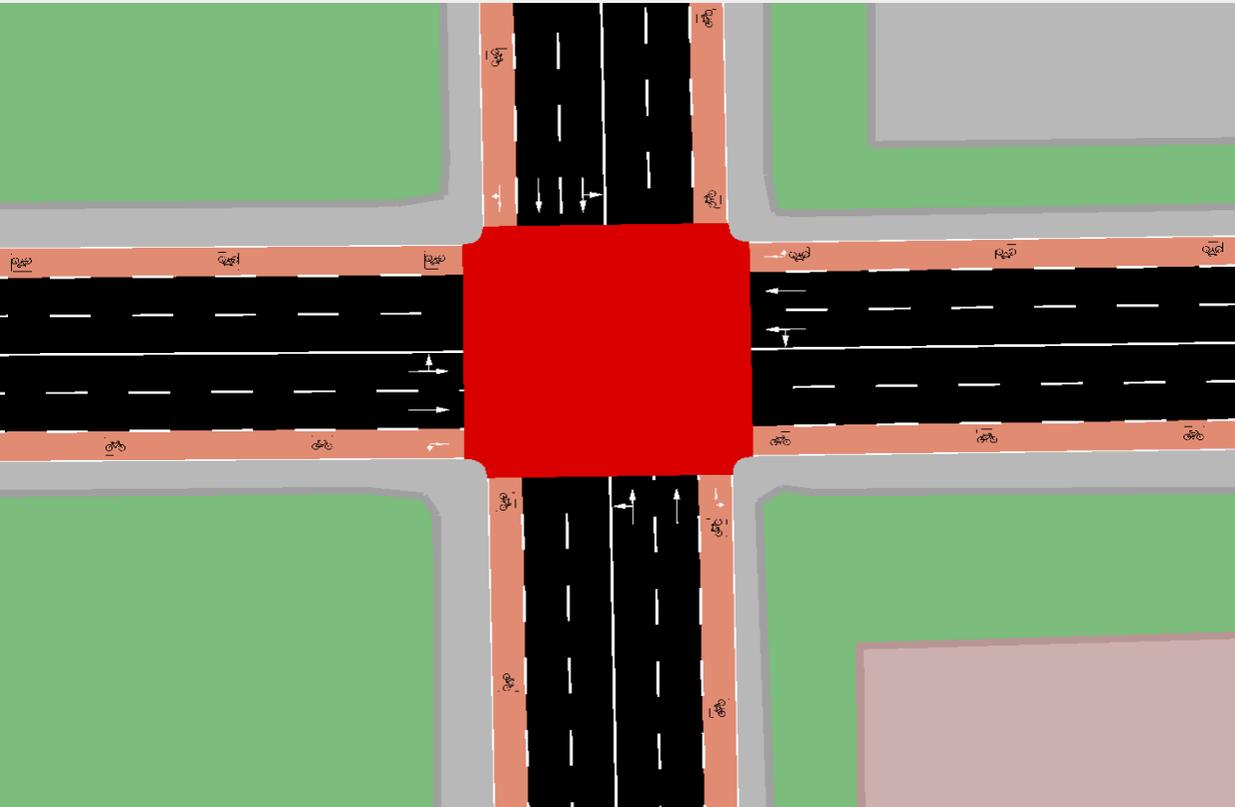


Step 1: Create Road Network

G) Road Marking As Decals: Stamp an image on a 3D model

Add orange Material to Bike Lane

Project Window → Materials → Drag and Drop BikeLaneMaterial into each Bike Lane

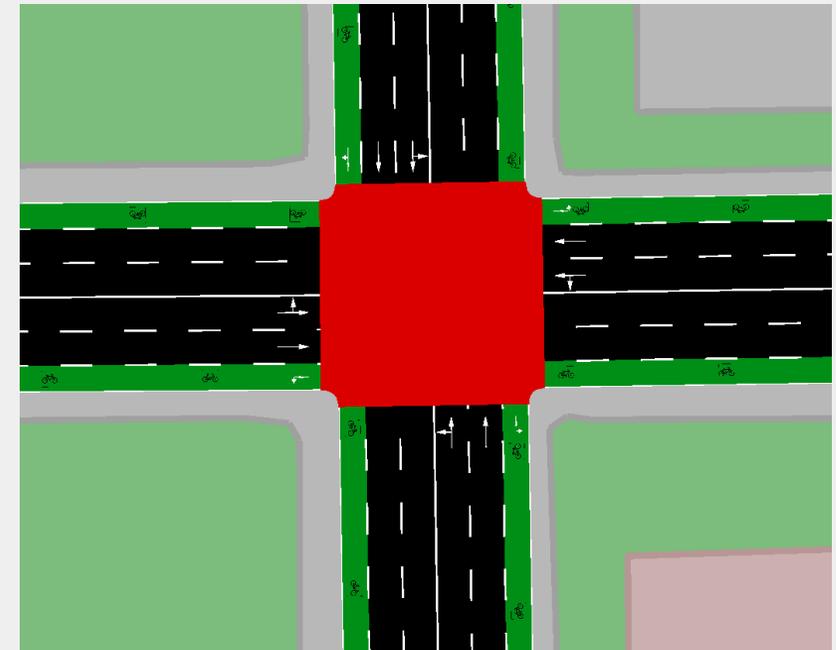
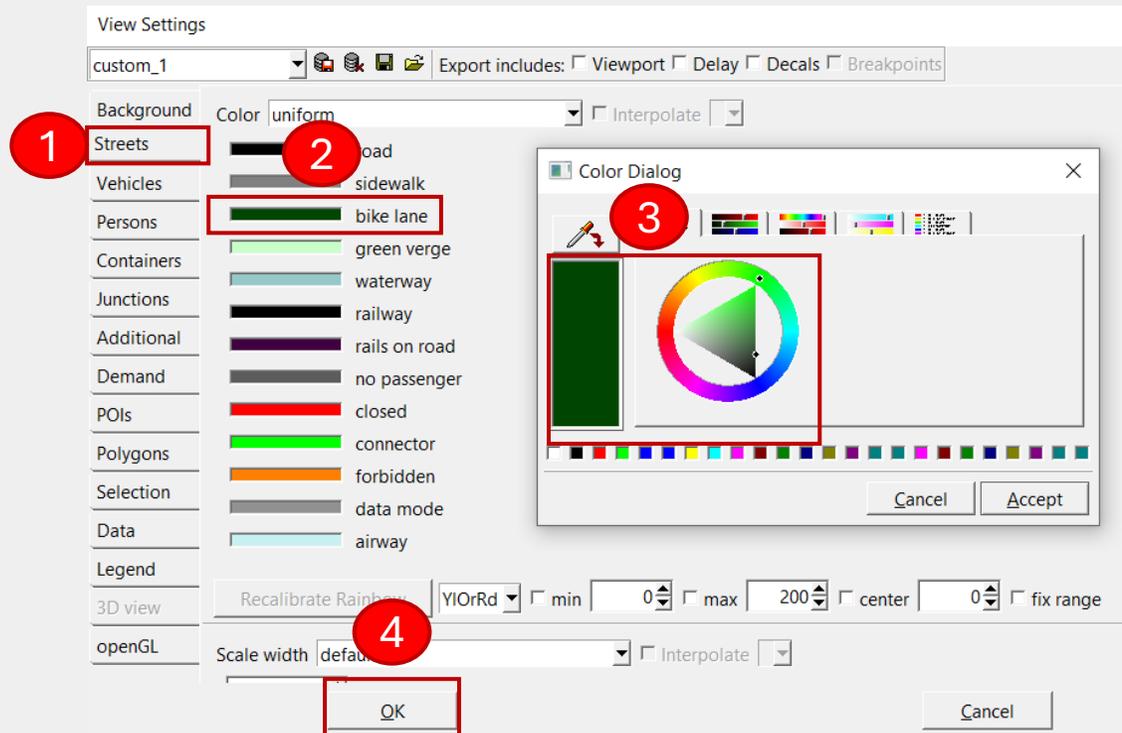


Step 1: Create Road Network

G) Road Marking As Decals: Stamp an image on a 3D model

❑ It is better to Change the color of Bike Lanes to Green

❑ In SUMO: Edit → Edit Visualization → Streets → bike lane → Project Window → Materials → Drag and Drop BikeLaneMaterial into each Bike Lane

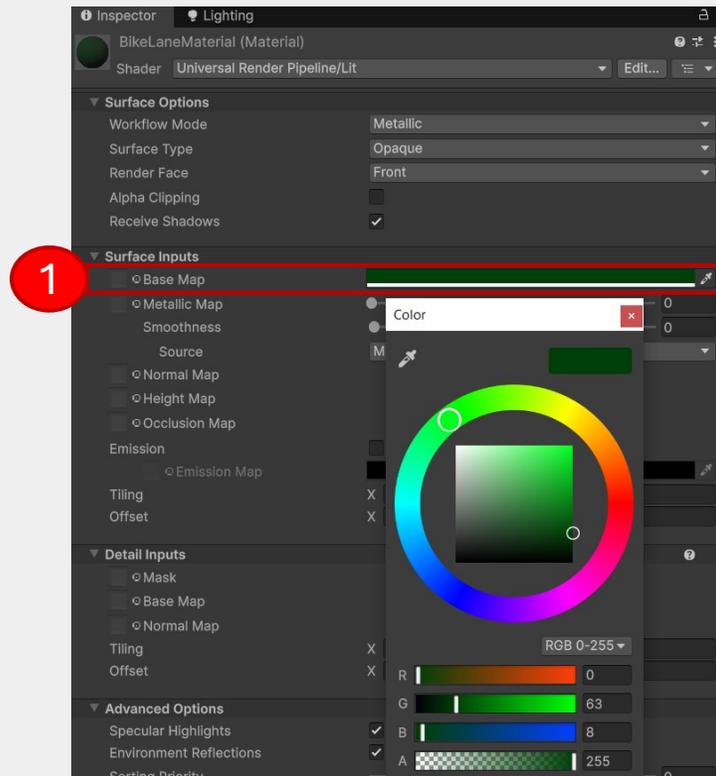


Step 1: Create Road Network

G) Road Marking As Decals: Stamp an image on a 3D model

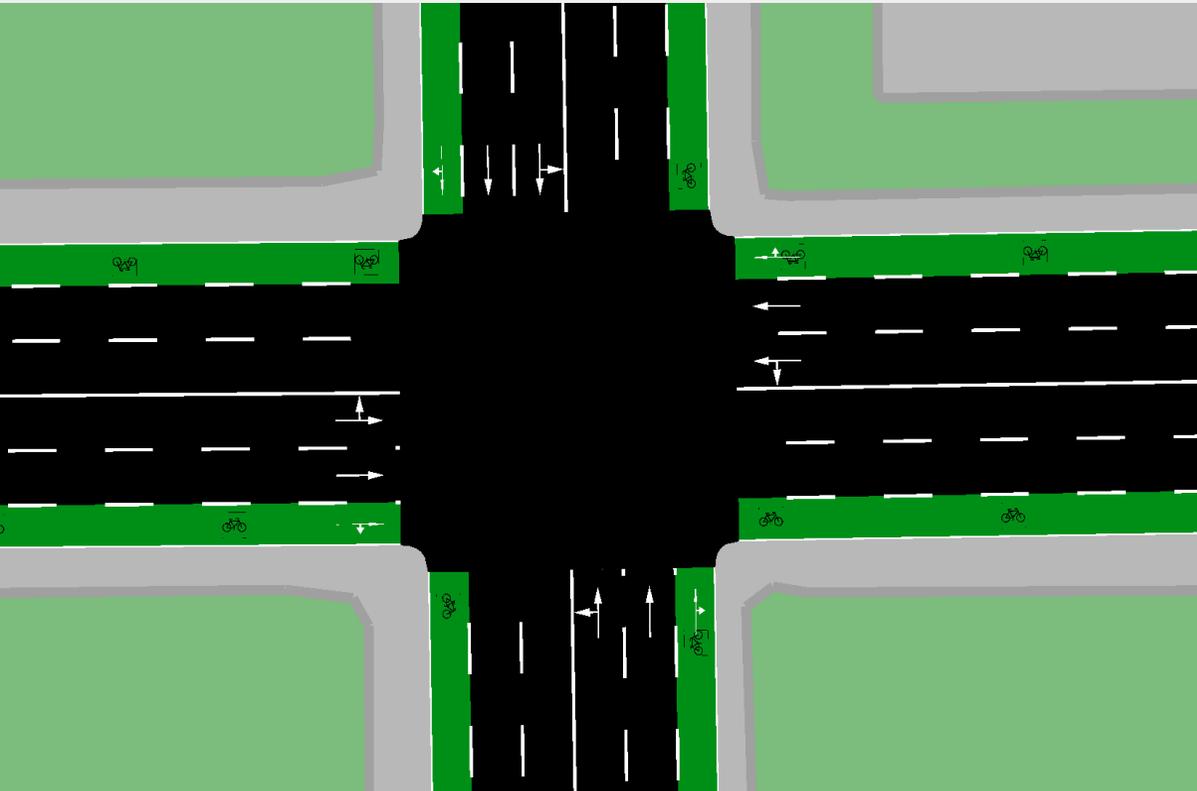
❑ It is better to Change the color of Bike Lanes to Green

❑ In Unity: Project Window → Materials → Select BikeLaneMaterial → Inspector window → BaseMapColor to Green



Step 1: Create Road Network

☐ This is Final Result



Step 2: Run Sumo2Unity integration

2.1. SUMO Steps

A) Add Ego Bike:

A.1. Create Vehicle Type for EgoBike

A.2. Add Vehicle To Network

B) Add Traffic Volume

B.1. Create Vehicle Types for Traffic Cars

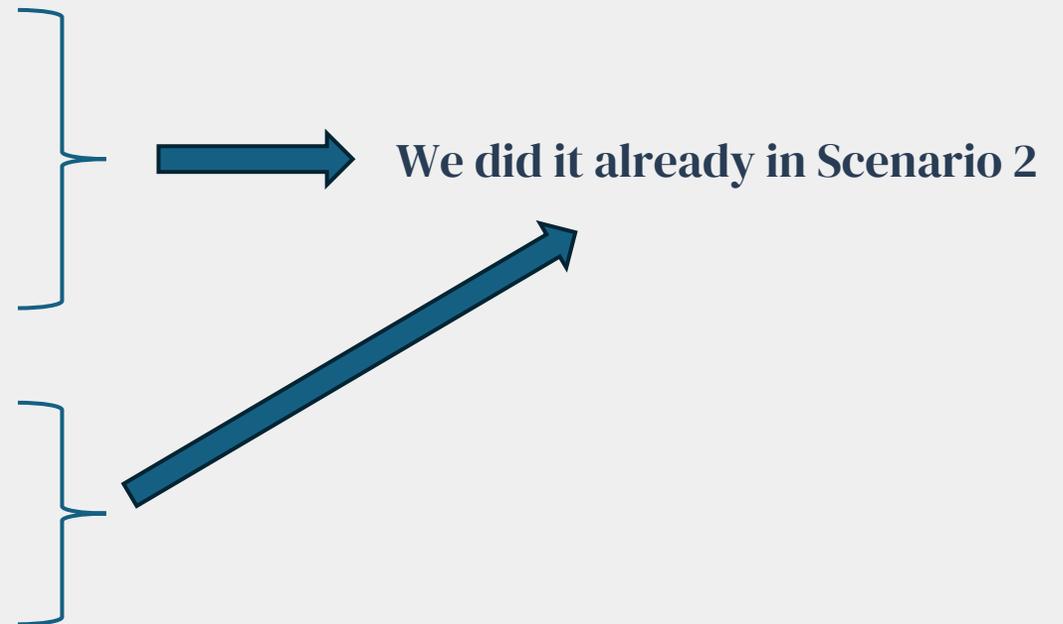
B.2. Add Vehicle To Network

C) Assign Ego Bike and Traffic Volume in Unity

D) Prepare and Run Python Code (Sumo2Unity.py)

E) Add Traffic Lights in SUMO

F) Add Traffic Light in Unity



Step 2: Run Sumo2Unity integration

A) Add Ego Bike (A.1. Create Vehicle Type for EgoBike)

❑ UI → Demand → Select “Creating Vehicles”

❑ Create vehicle types EgoBike (Black) (69,56,56)

❑ See image

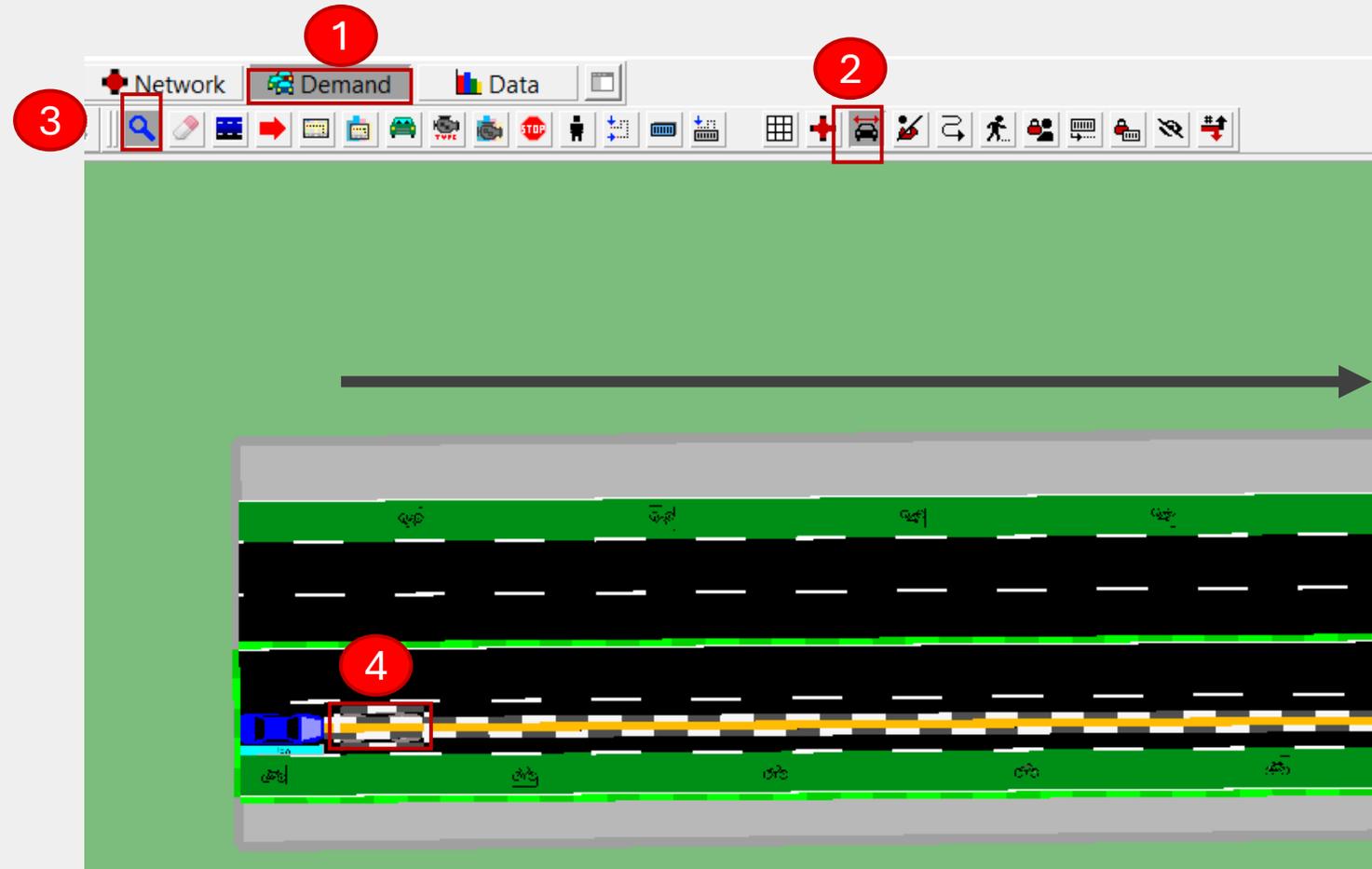
❑ File → Demand Element → Save Demand Element

The screenshot shows the Sumo software interface. The top toolbar has three tabs: 'Network', 'Demand', and 'Data'. The 'Demand' tab is selected and highlighted with a red box and a red circle labeled '1'. Below the toolbar is a row of icons, with the 'Create Type' icon (a car with a plus sign) highlighted by a red box and a red circle labeled '2'. On the right side, the 'Types' editor is open. It has a 'Type Editor' section with 'Create Type', 'Delete Type', and 'Copy Type' buttons. The 'Current Type' section shows 'EgoBike' selected. The 'Internal attributes' section is expanded, showing a table of attributes. The 'id' is 'EgoBike', 'vClass' is 'bicycle' (highlighted with a red box and a red circle labeled '3'), and 'color' is '69,56,56' (highlighted with a red box and a red circle labeled '4'). Other attributes include length (1.60), minGap (0.50), maxSpeed (13.89), desiredMaxSpeed (5.56), parkingBadges, accel (2.60), decel (4.50), sigma (0.50), and tau (1.00). The 'Extended attributes' section is also visible at the bottom.

Step 2: Run Sumo2Unity integration

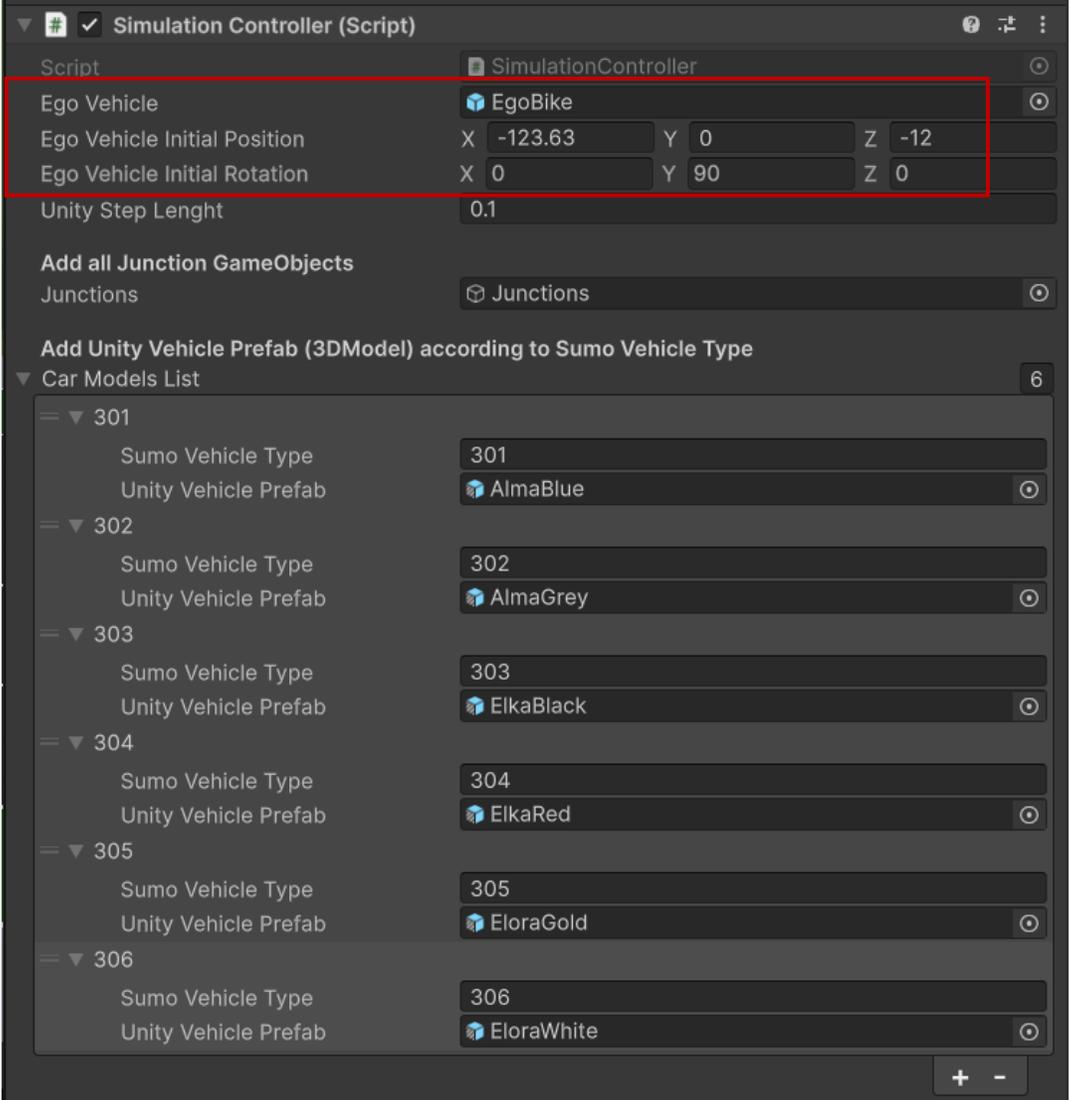
A) Add Ego Bike (A.2. Add Bike To Network)

- ❑ Follow Steps 1-4 in the image and press button “Delete” in the keyboard to delete EgoCar



Step 2: Run Sumo2Unity integration

C) Assign Ego Bike



The screenshot displays the Unity Inspector for the **Simulation Controller (Script)** component. The **Ego Vehicle** is assigned to **EgoBike**. The **Ego Vehicle Initial Position** is set to X: -123.63, Y: 0, Z: -12. The **Ego Vehicle Initial Rotation** is set to X: 0, Y: 90, Z: 0. The **Unity Step Length** is 0.1. The **Add all Junction GameObjects** section shows **Junctions** assigned. The **Add Unity Vehicle Prefab (3DModel) according to Sumo Vehicle Type** section shows a list of car models with their corresponding Sumo Vehicle Type and Unity Vehicle Prefab.

Car Models List	Sumo Vehicle Type	Unity Vehicle Prefab
301	301	AlmaBlue
302	302	AlmaGrey
303	303	ElkaBlack
304	304	ElkaRed
305	305	EloraGold
306	306	EloraWhite

Step 2: Run Sumo2Unity integration

D) Prepare and Run Python Code (Sumo2Unity.py)

- Run Python
- When it reaches second 540, SUMO ego bike will be added, then Run Unity

