# Adas TestSim Manual



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# Introduction

Adas TestSim is an application powered by Unreal Engine. It provides visualization of traffic situations and simple vehicle dynamics which can be used to test ADAS features in lab. The following picture depicts a setup for testing ADAS features implemented on a multi purpose camera ECU.
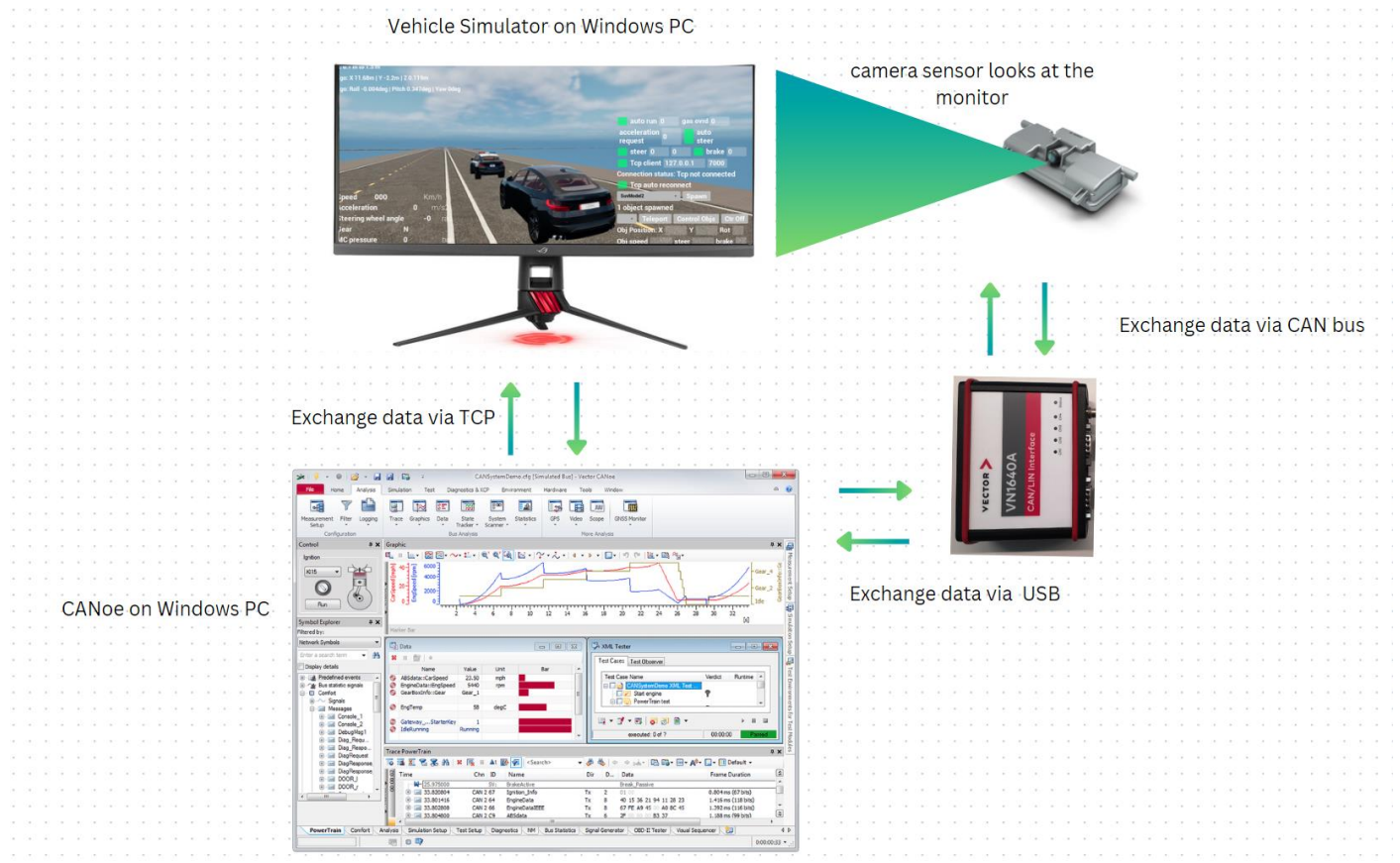
# Coordinate System

There is a difference between vehicle coordinate system (y to the left) and Unreal Engine coordinate system (y to the right). All locations described in maps section are presented in Unreal Engine coordinate system. Please remember to change the sign of y, yaw and roll in case you use these locations to put vehicles in a map.
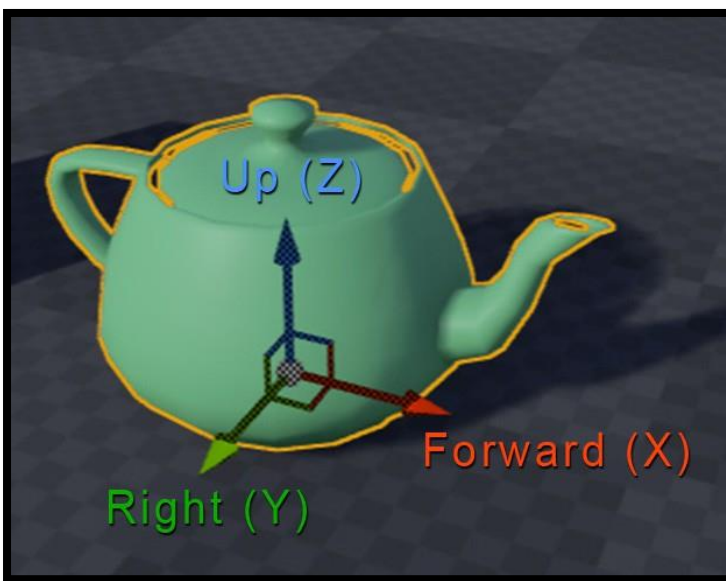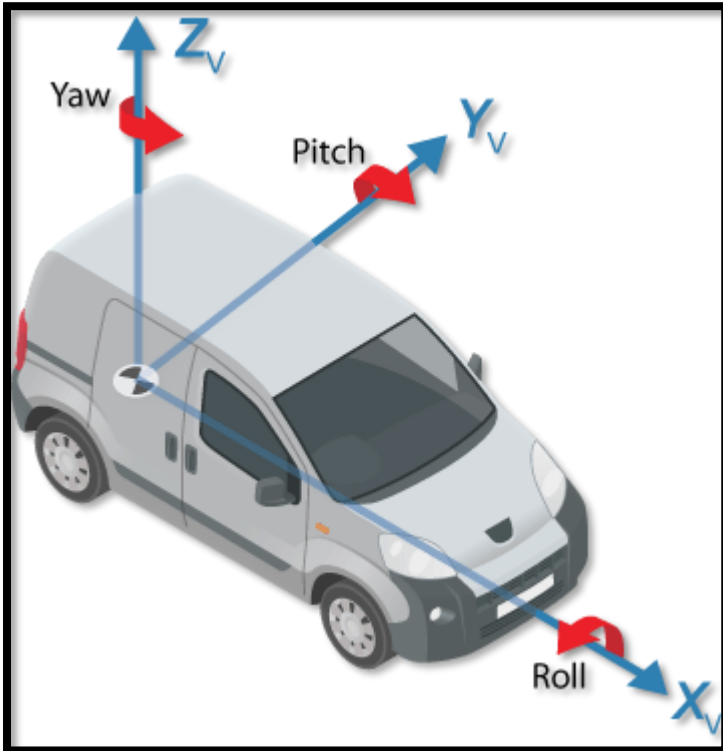




Another way to know where to put vehicles is to drive the ego vehicle in a map. Once you get to the desired location, look at the top left of the screen,

you will have information of the desired location. The location coordinate is already converted to vehicle coordinate system.
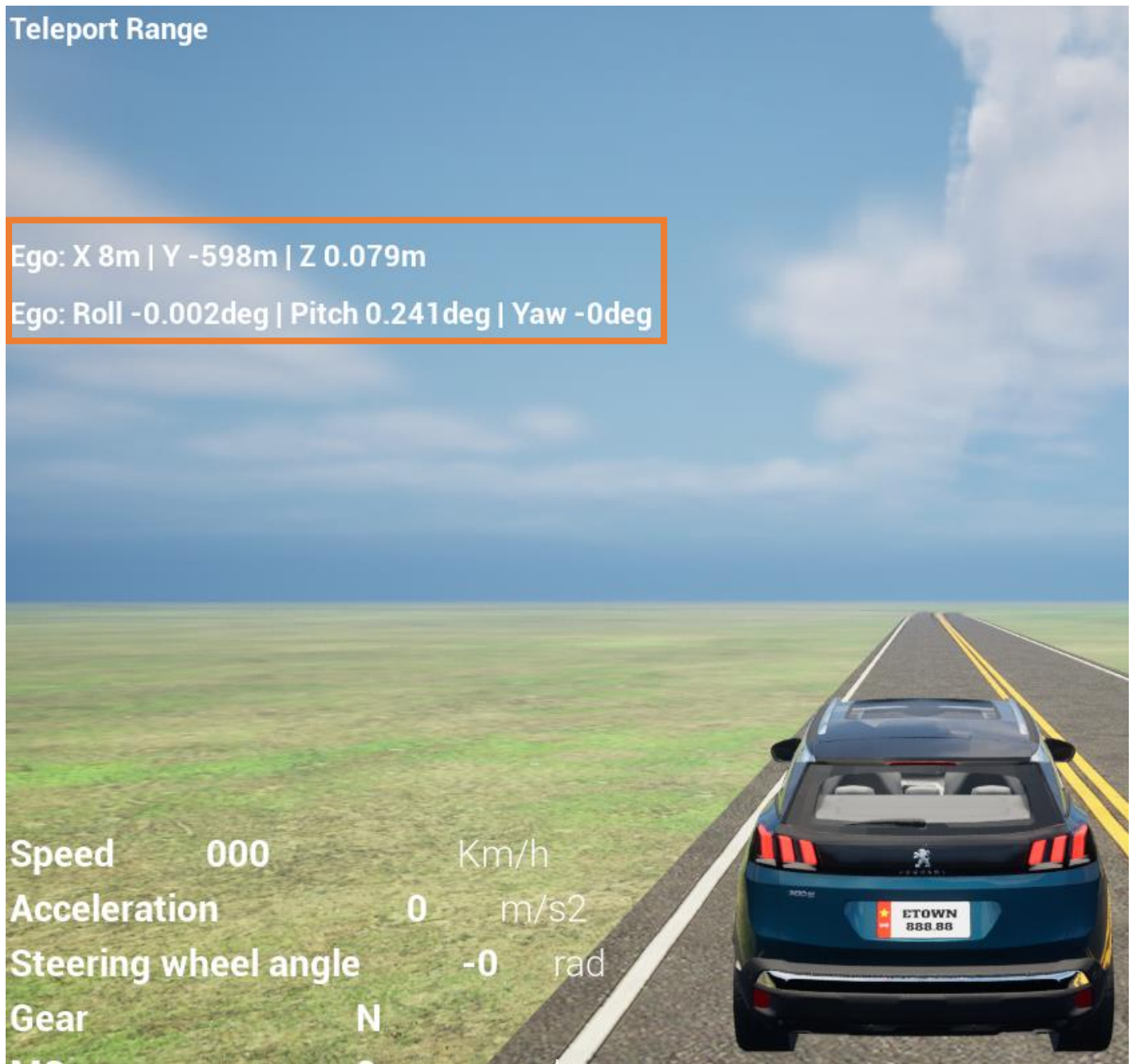


## Maps

Don't try to spawn/teleport vehicles too near to the border of a map, it may cause error.

### 1. Straight Road Map

8 lanes, width ~45.4 m, length ~2220 m, default ego position (x: 8m, y: 2.22m)
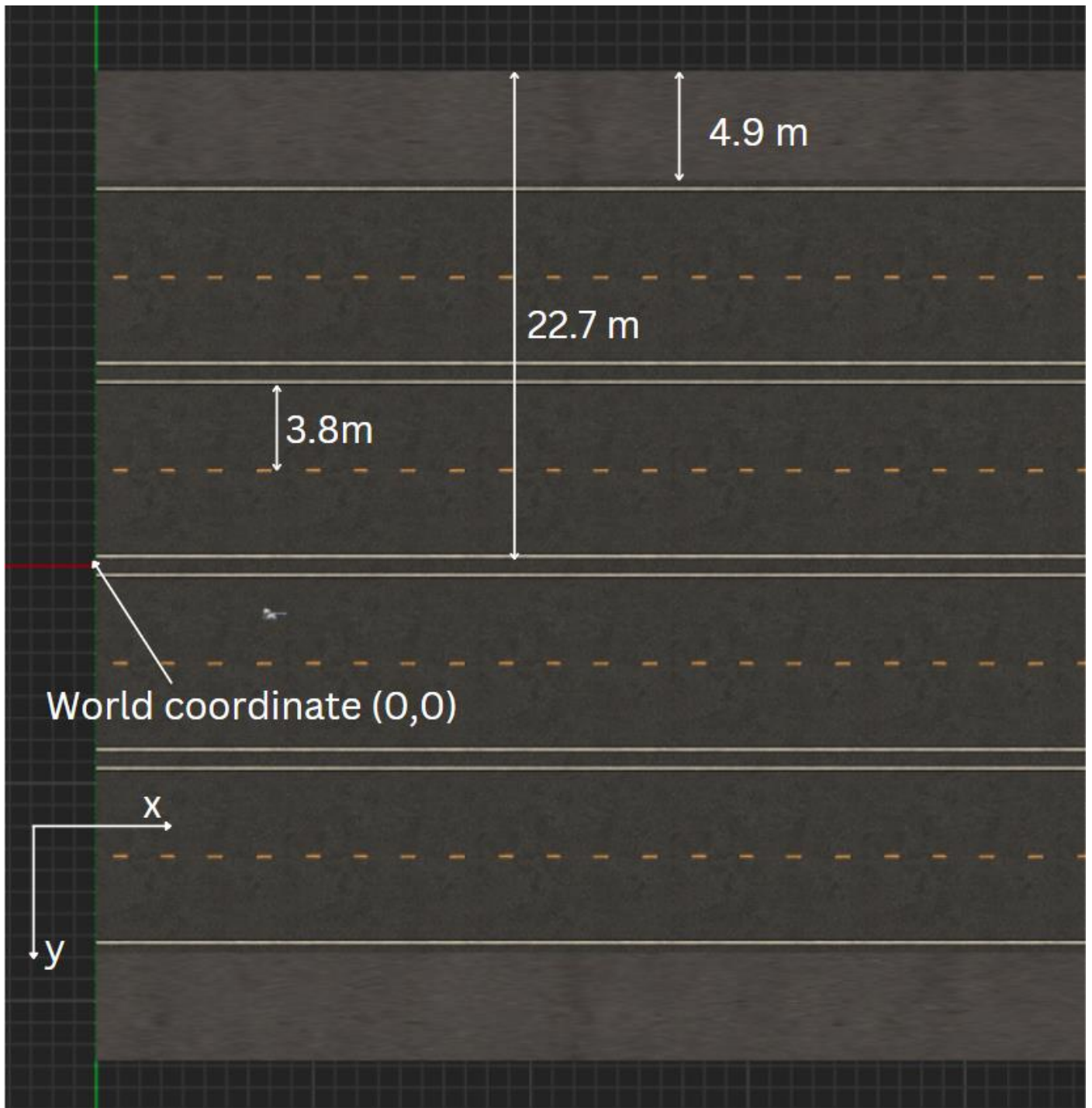
## 2. Cross Road Map

default ego position (x: 11.68m, y: 2.2m)

4.4 m

3.8m

13.3m

World coordinate (0,0)

x

y
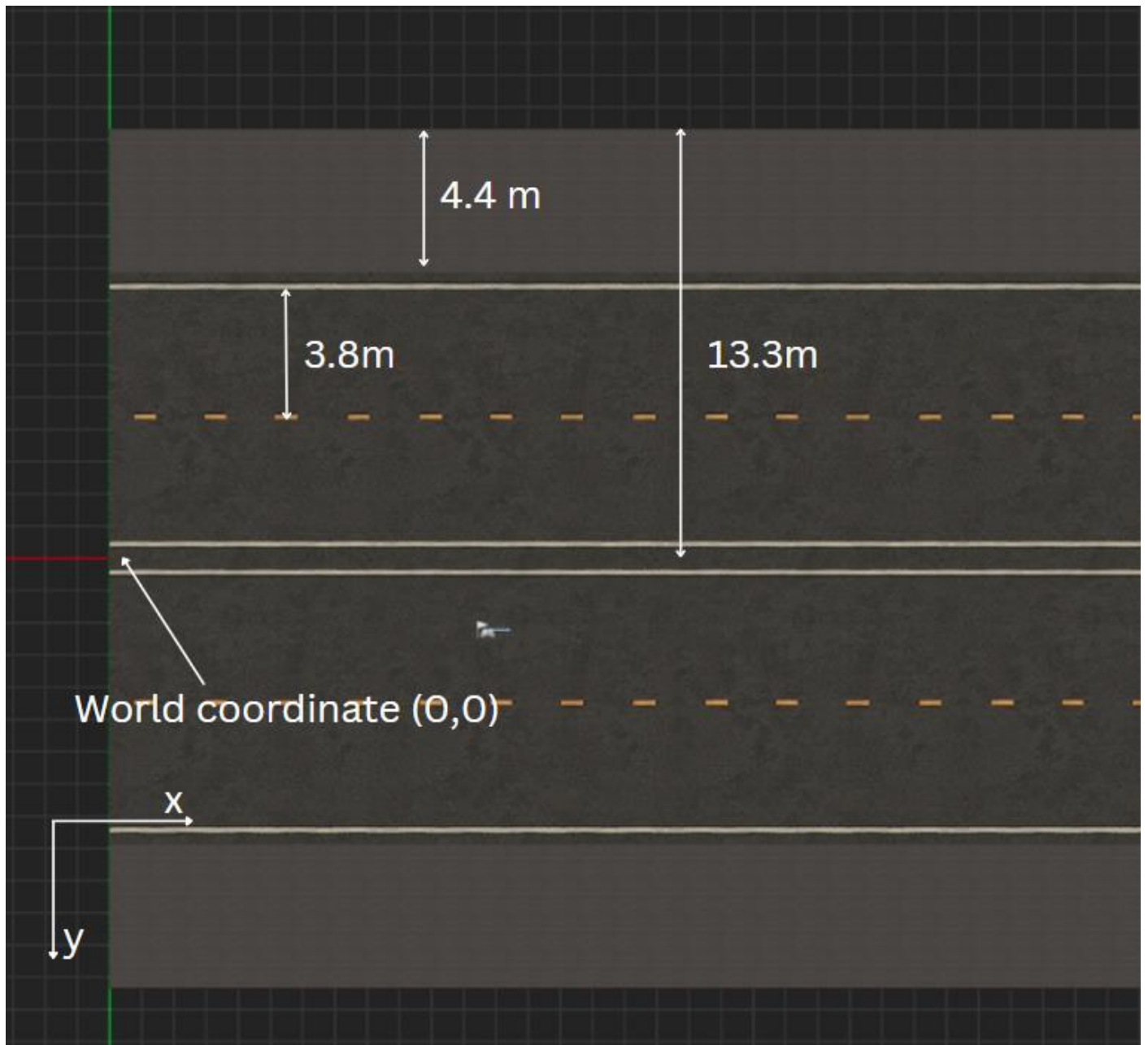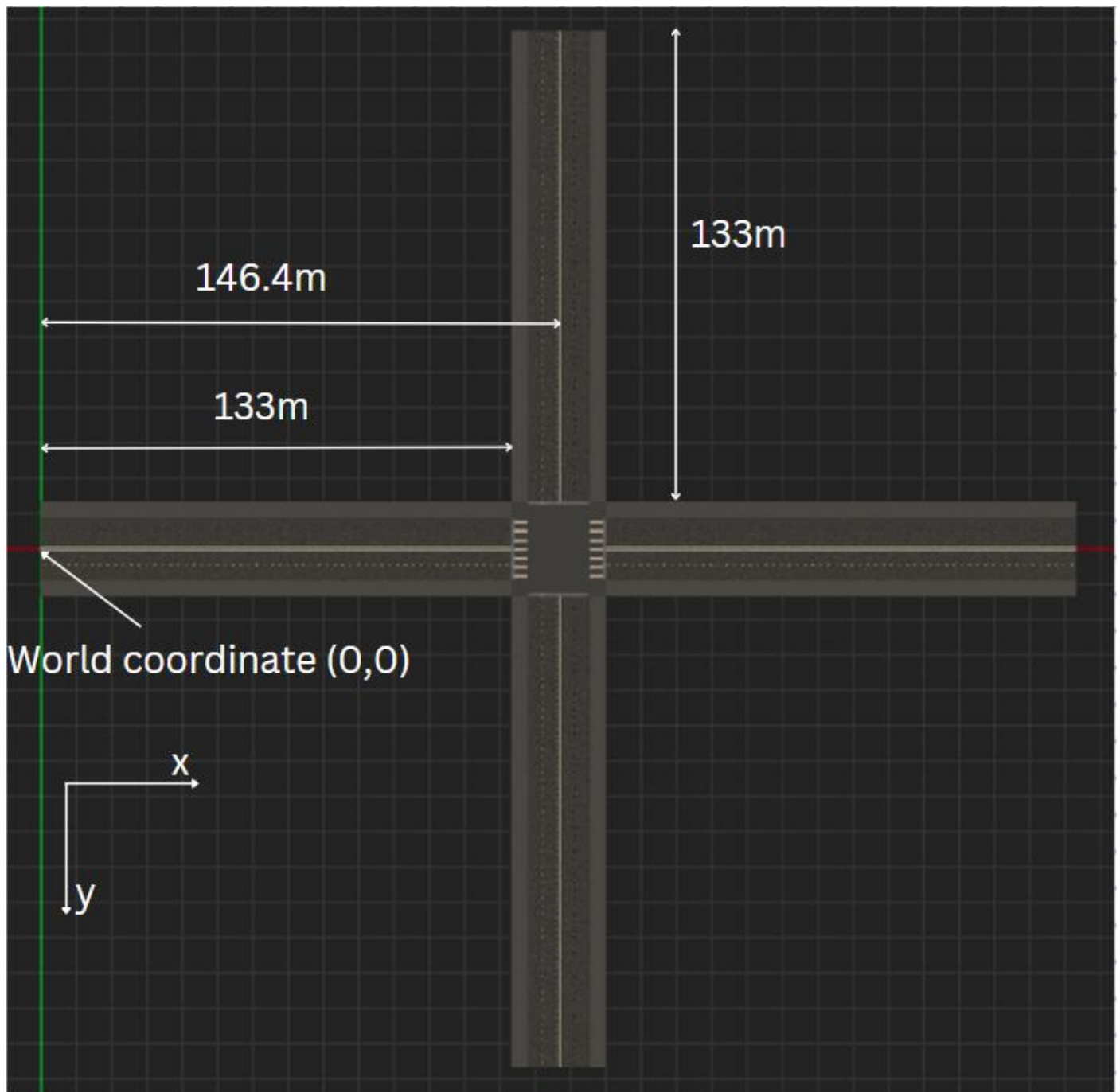
### 3. Mixed Roads Map A

This map contains 7 roads, default ego position (x: 8m, y: 598m, on road 1)
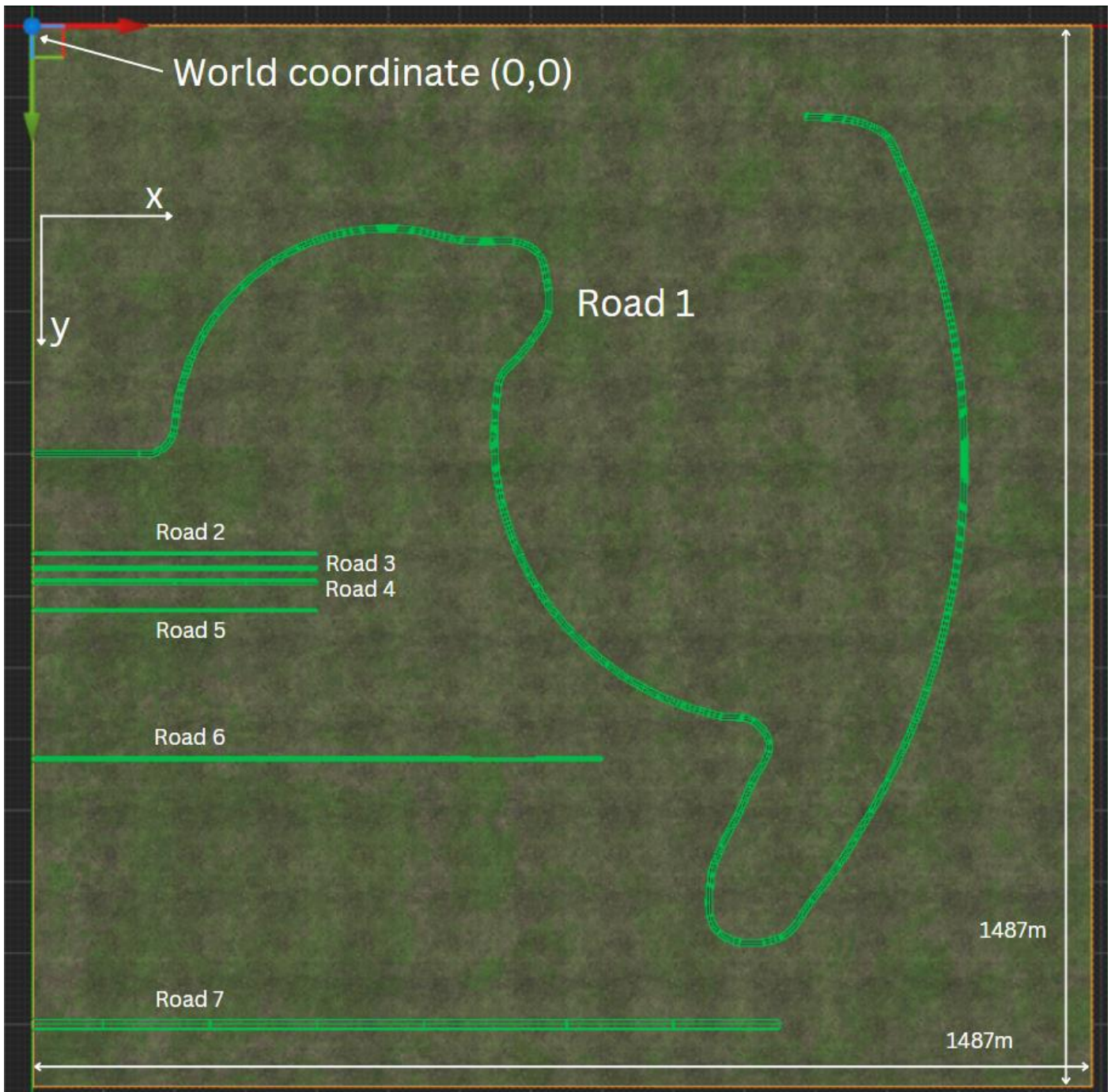
Road 1 is a 2-lanes road, lane width 3.4m. Road 1 consists of 3 main segments: 150m straight, 300m curve radius, 400m curve radius, 1000m curve radius. Reference location on curve radius 300m to place vehicles (x: 205.3m, y: 515.5m), (x: 209m, y: 516.4m)

World coordinate (0,0)

Curve radius 300m

Road 1

150m

Road 1

Curve radius 400m

Curve radius 1000m
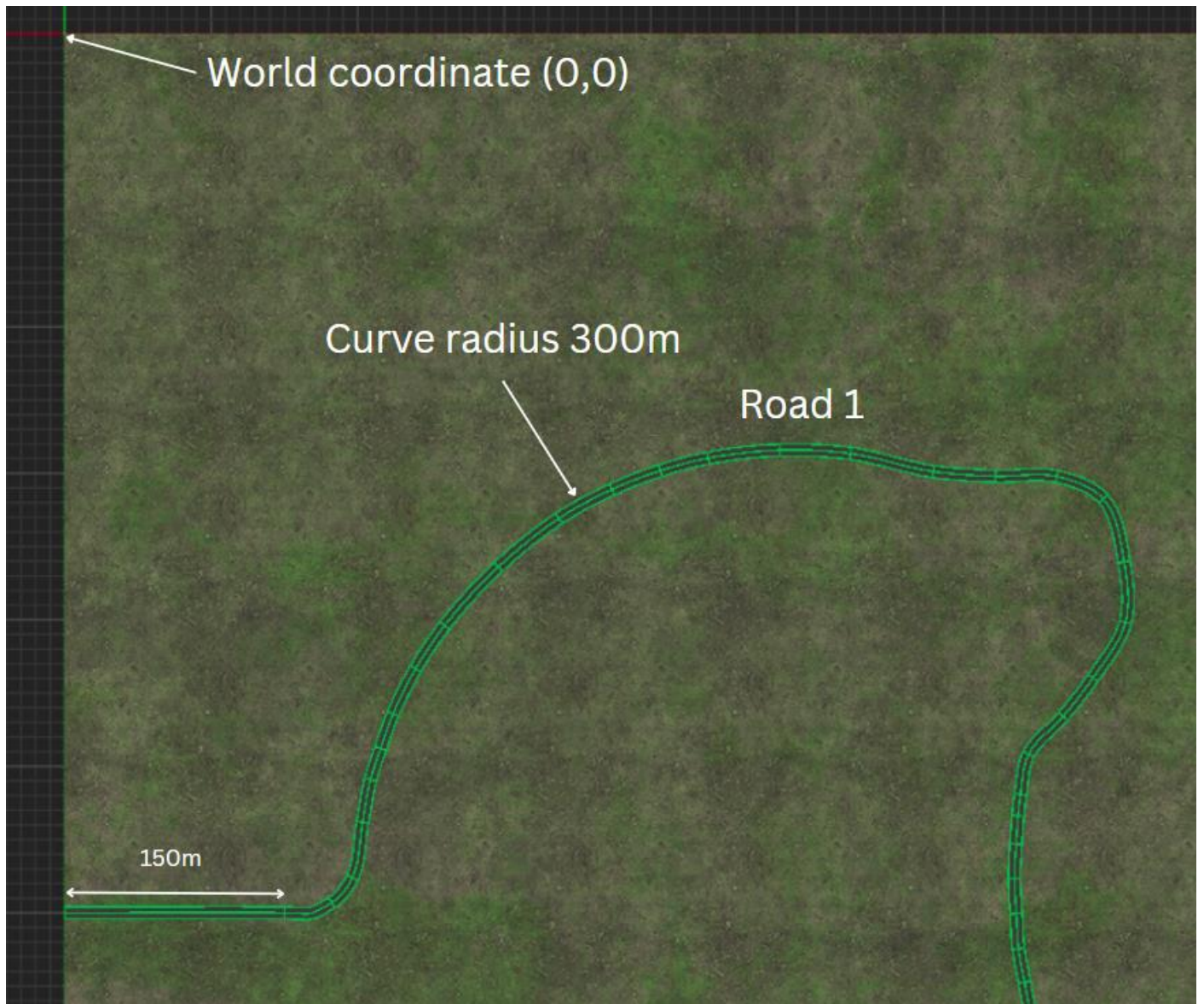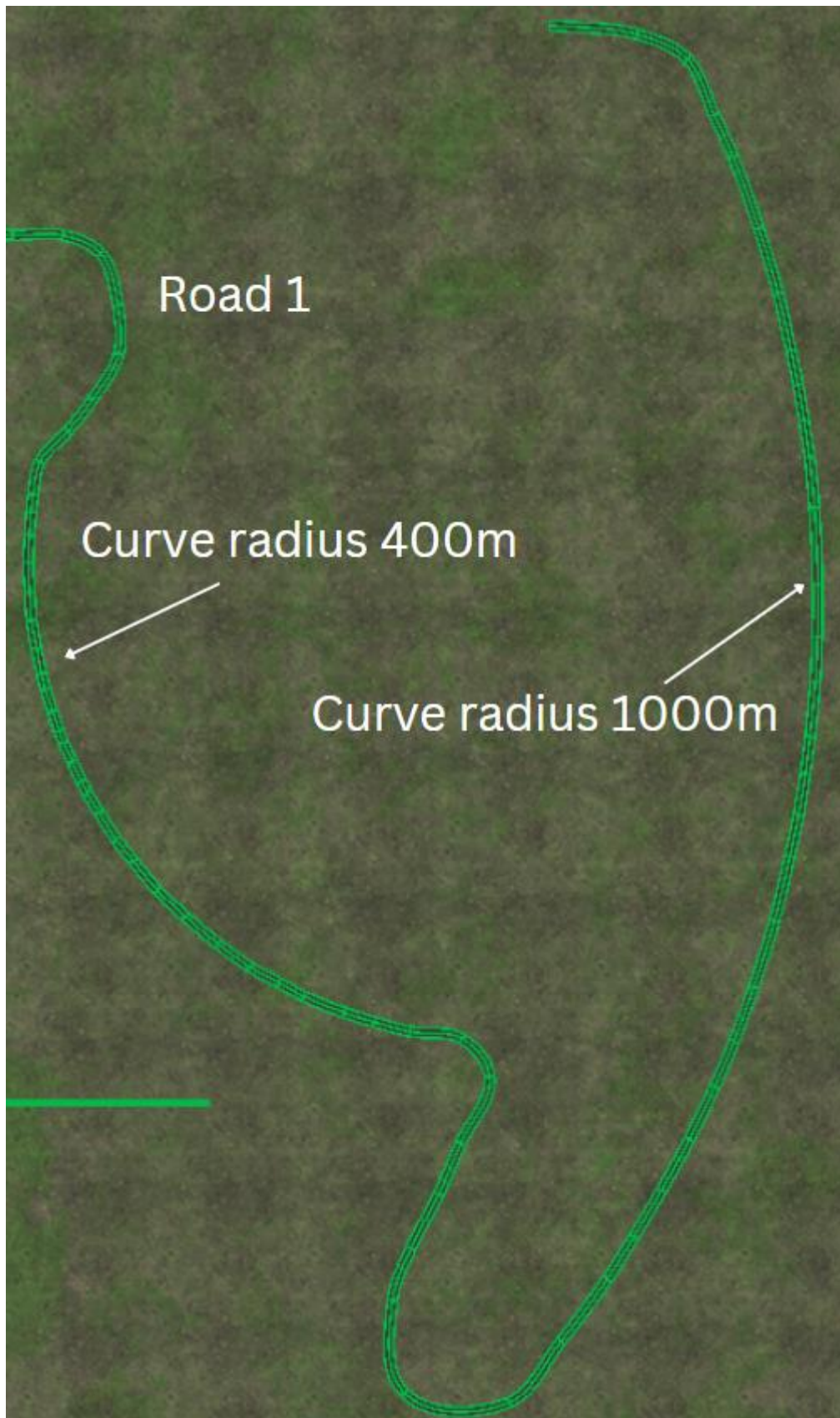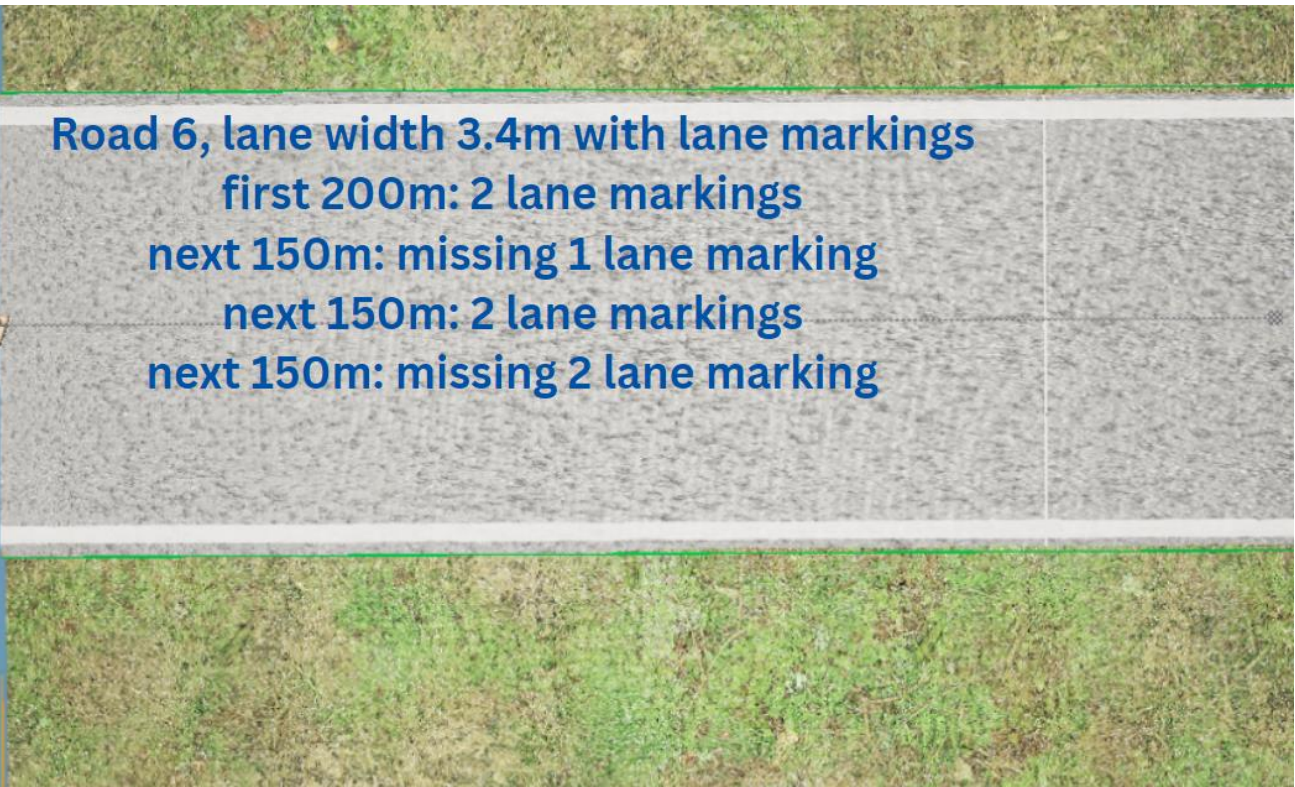
Road 2, 2-lanes, lane width 2m

Road 3, 2-lanes, lane width 3m

Road 4, 2-lanes, lane width 3.5m

Road 5, lane width 3.4m, no lane marking


Road 6, lane width 3.4m with lane markings
first 200m: 2 lane markings
next 150m: missing 1 lane marking
next 150m: 2 lane markings
next 150m: missing 2 lane marking

Road 7, 3 lanes, contains 7 segments, some segment missing lane markings
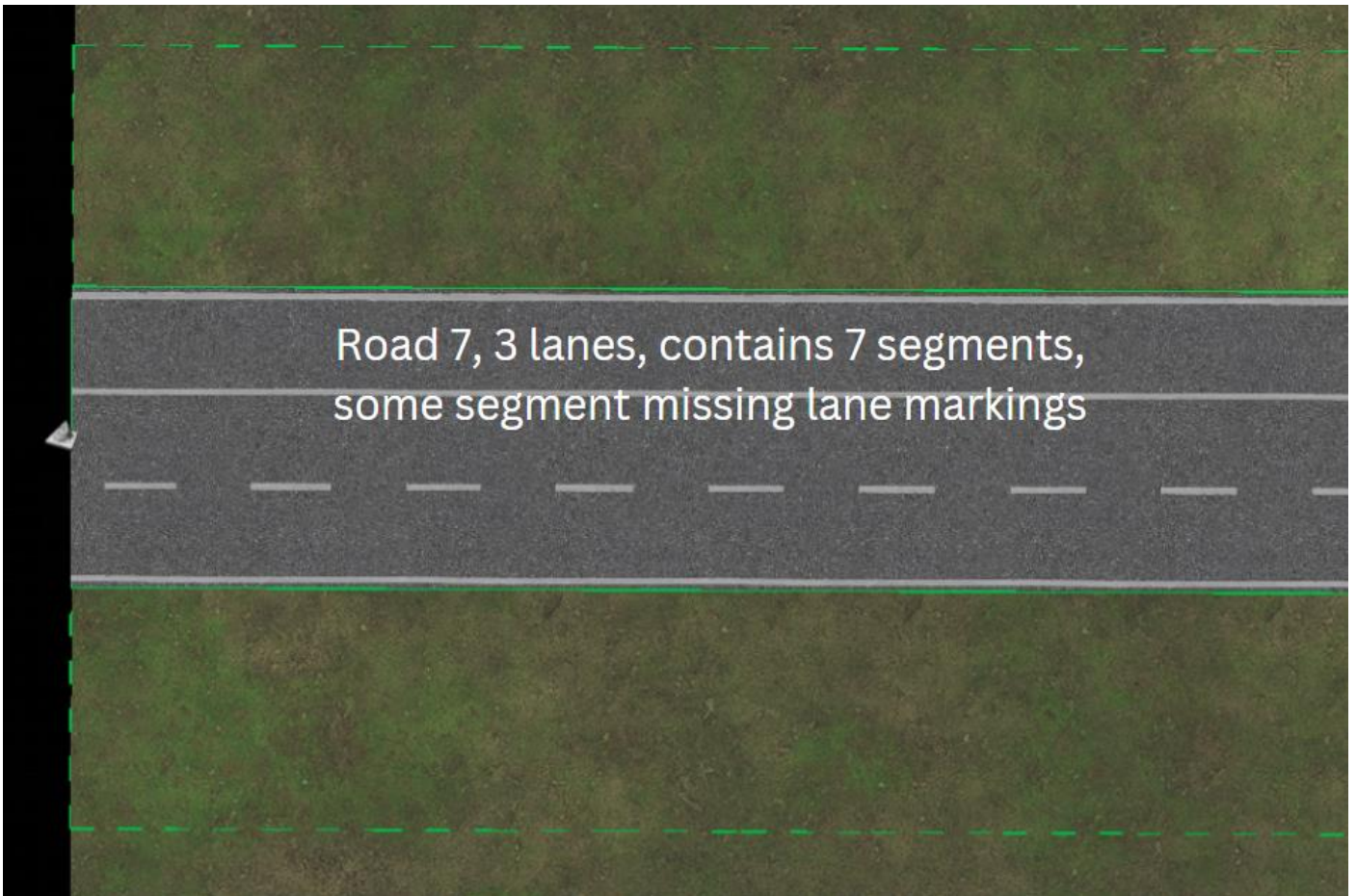
## 4. Mixed Roads Map B

Same size with Mixed Roads Map A. Contains 2 roads

Road 1: single lane, contains segments with different lane width

Road 2: 2 lanes, contains segments with different lane width

## Traffic Signs

Please use the exact name of traffic signs image as described in this section to spawn them in runtime. Default orientation of a traffic sign model in Unreal Engine as follows:

# Japan – JPN



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| psd | EndOfRestriction. png | EventTimeA.png | MinimumSpeedL imit30.png | MinimumSpeedL imit50.png | NoCrossingCent erLineToEnter.pn g | NoEntry.png | NoJaywalking.pn g | NoOvertake.png | NoParkingOrSto p.png |

| NoTurn.png | NoUTurn.png | OnlyStraightAnd LeftTurn.png | OnlyStraightAnd RightTurn.png | RestrictionBegins .png | RestrictionEnds.p ng | RoadClose.png | RoadNarrowsOn BothSides.png | RoundAbout.png | SafetySpeed30.p ng |

| SlipperyRoad.pn g | SlowDown.png | SpeedLimit10.pn g | SpeedLimit20.pn g | SpeedLimit30.pn g | SpeedLimit40.pn g | SpeedLimit50.pn g | SpeedLimit60.pn g | SpeedLimit70.pn g | SpeedLimit80.pn g |

| SpeedLimit90.pn g | SpeedLimit100.p ng | SpeedLimit110.p ng | SpeedLimit120.p ng | TomareStop.png | TurnLeft.png | TurnRight.png | WatchForLargeA nimals.png |

# China – CHN

psd | DoNotEnter.png | EndOfNoOvertake.png | EndSpeedLimit5.png | EndSpeedLimit10.png | EndSpeedLimit15.png | EndSpeedLimit20.png | EndSpeedLimit25.png | EndSpeedLimit30.png | EndSpeedLimit35.png | EndSpeedLimit40.png | EndSpeedLimit50.png | EndSpeedLimit60.png | EndSpeedLimit70.png

EndSpeedLimit80.png | EndSpeedLimit90.png | EndSpeedLimit100.png | EndSpeedLimit110.png | EndSpeedLimit120.png | EnteringBeijing.png | EventTimeA.png | EventTimeB.png | ExceptForBus.png | FogAhead.png | FreeWayNameA.png | MeterAhead200.png | MinimumSpeedLimit50.png | NoEntry.png

NoLeftTurn.png | NoOvertake.png | NoRightTurn.png | OneWayLeft.png | OneWayRight.png | OneWayStraight.png | PandaAhead.png | PedestrianCrossingAhead.png | RainAhead.png | Ramp.png | RemainingInTunnel2500.png | RoadworksAhead.png | RoundAbout.png | SchoolAhead.png

SnowAhead.png | SpeedLimit5.png | SpeedLimit10.png | SpeedLimit15.png | SpeedLimit20.png | SpeedLimit25.png | SpeedLimit30.png | SpeedLimit35.png | SpeedLimit40.png | SpeedLimit50.png | SpeedLimit60.png | SpeedLimit70.png | SpeedLimit80.png | SpeedLimit90.png

SpeedLimit100.png | SpeedLimit110.png | SpeedLimit120.png | SpeedLimitZone.png | SpeedLimitZoneEnd.png | Stop.png | StopOldSign.png | ThunderstormAhead.png | TurnLeft.png | TurnRight.png | Yield.png | YieldToOncomingTraffic.png

# Manual Controls

W: throttle

A, D: left, right steering

S: brake

Spacebar: handbrake

N, R: Neutral, Reverse gear

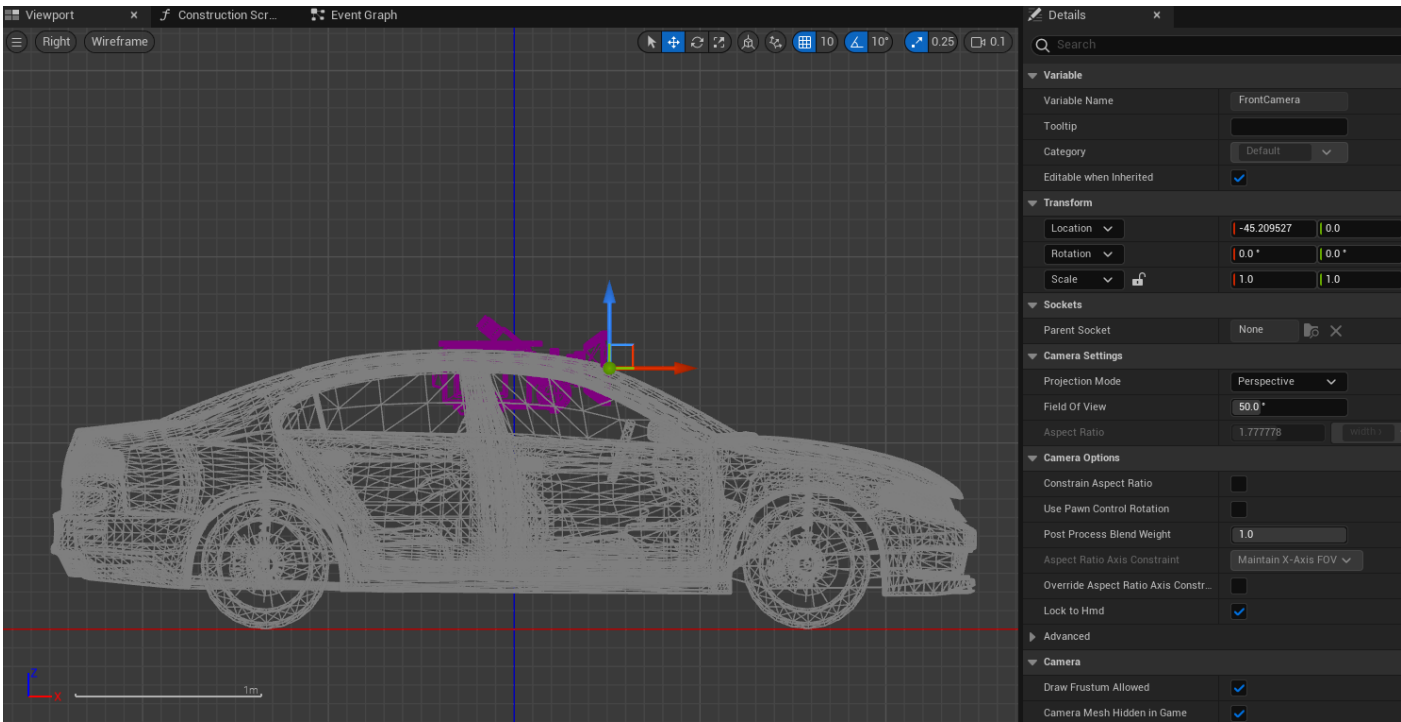1, 2, 3: Back, Front, Top view camera
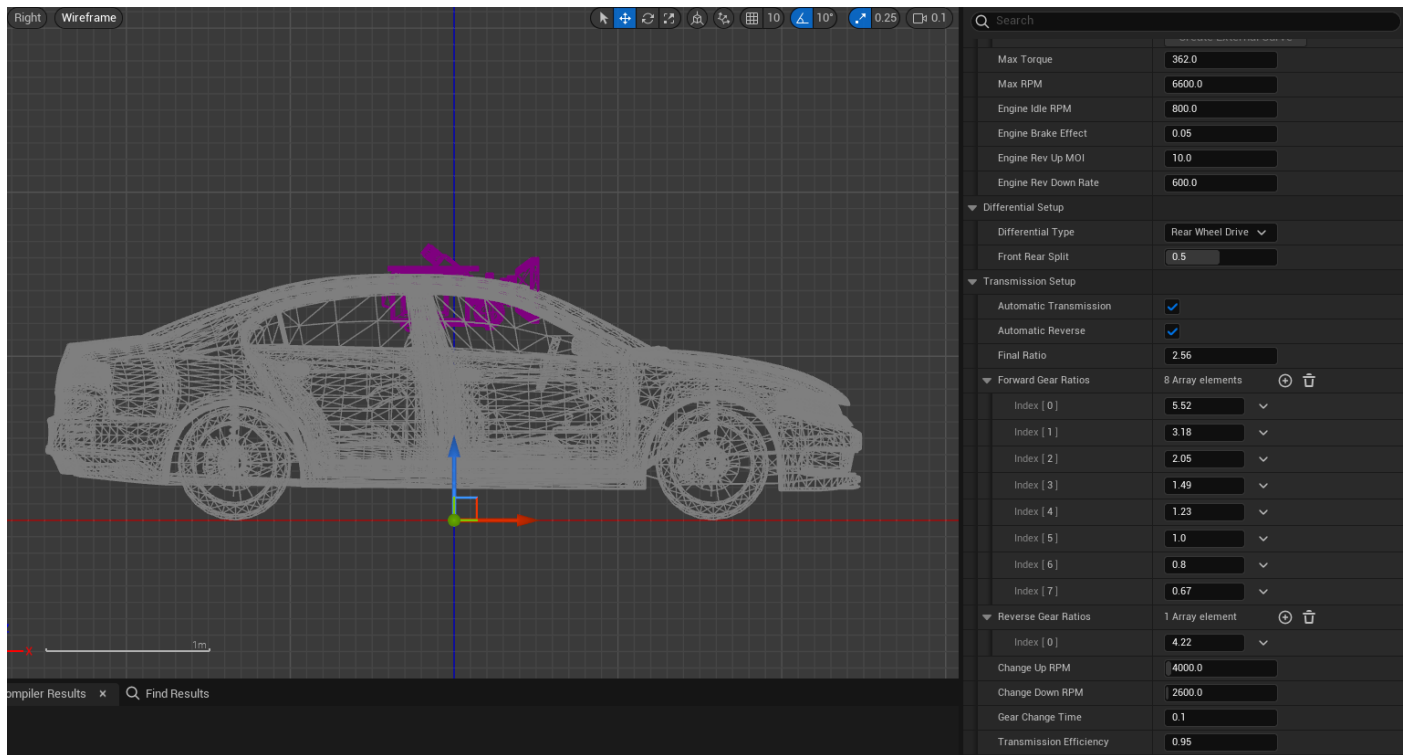
Numpad 1, 2: change ego model
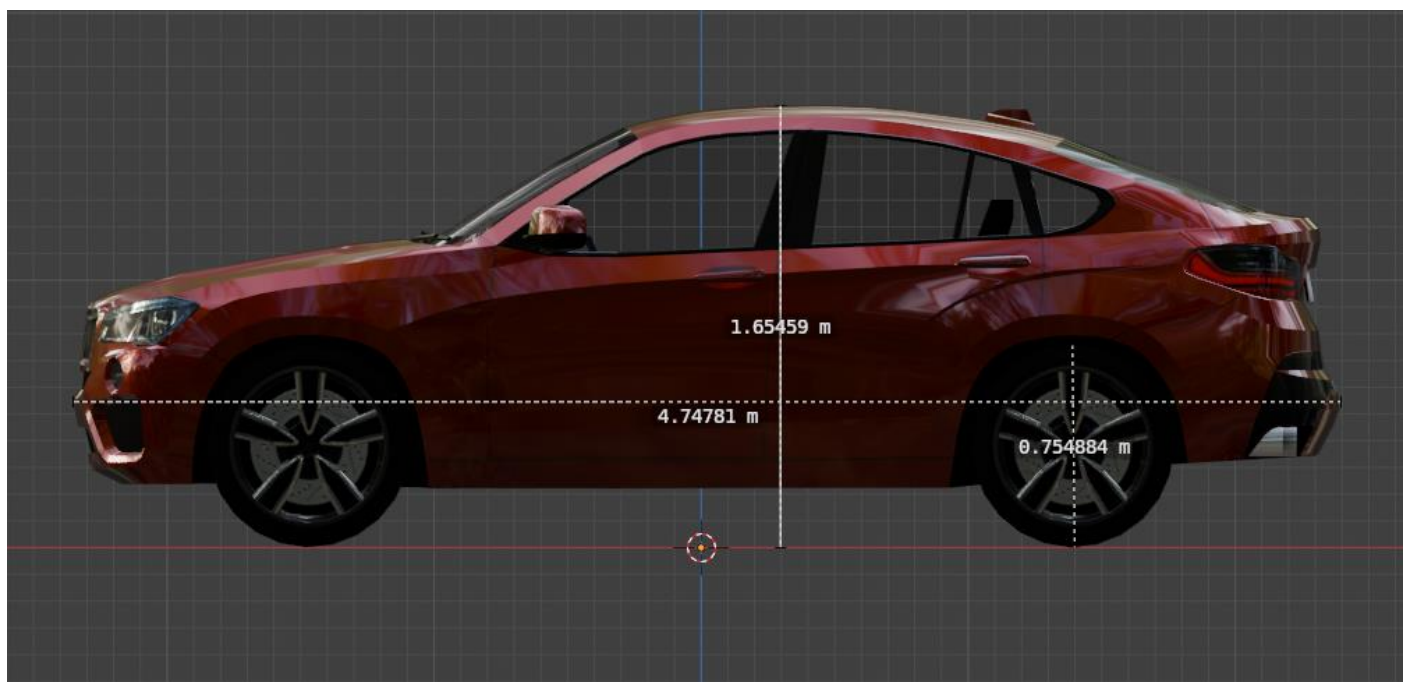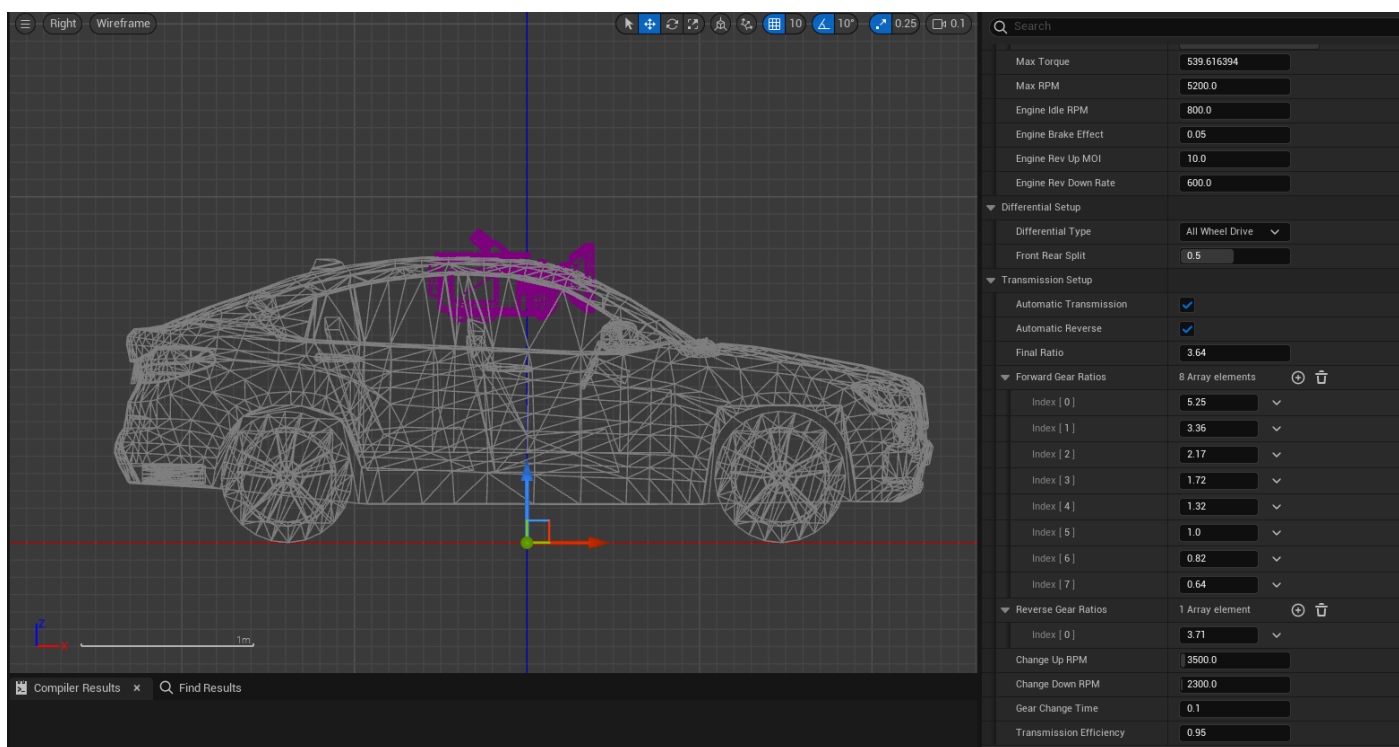
P: Pause

# Vehicle 3D Models

## 1. Ego Vehicles
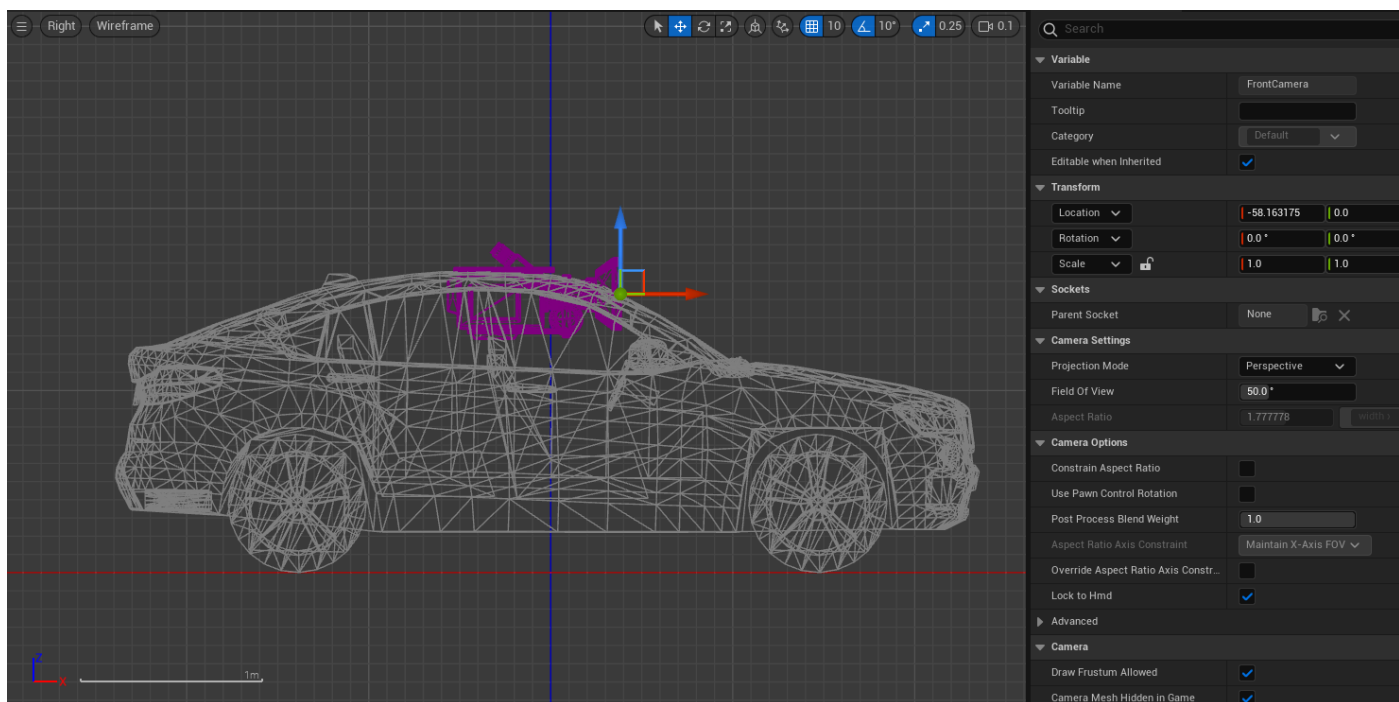
Sedan model 1

## 2. Target Objects



Length x Width x Height in meters

Sedan 1
4.35x1.68x1.34

SUV 1
4.6x1.8x1.7

Bus
8.22x2.3x2.79

Bicycle
1.93x0.68x1.82

Motorbike
2.57x0.9x1.79

Pickup 1
5.18x1.8x1.69

SUV 2
4.76x1.9x1.74

Truck
8.5x2.48x3.07

Man
0.34x0.47x1.87

Child
0.25x0.34x1.22

Dog
1.45x0.35x0.85

# Communication with Adas TestSim via TCP

## A. Commands to control Adas TestSim

1/ StartSimulation -> Adas TestSim starts to send out vehicle data

2/ SetEgoSpeed_x -> x in km/h

3/ SetEgoSteering_x_y -> x in rad, range -3.14 to 3.14, y is steering angle speed in rad/s, range 0 to 6.283, set 0 to change steering angle instantly

4/ SetEgoBrake_x -> x range 0..1

5/ SetEgoGas_x -> x range 0..1

6/ EnableEgoAutoSteer -> set ego steering angle to 0 before using this command, only works with maps that have guiding spline

7/ DisableEgoAutoSteer -> only works with maps that have guiding spline

8/ SetEgoAcceleration_x -> x in m/s2

9/ SetEgoPosition_x_y_rot -> x in m, y in m, z in degree

10/ SpawnObject_x -> x in [SedanModel1, PickupModel1, SuvModel1, SuvModel2, Motorbike, Bus, Truck, Bicycle, PedestrianMan, PedestrianChild, Dog]

11/ SetObjectPosition_id_x_y_rot -> id is object spawn order, first spawn is 0, second spawn is 1, etc., 255 is invalid

12/ EnableControlObject_id_x_y_z -> id is object spawn order, x is desired speed in km/h, y is desired steering in rad, z is brake in 0..1

for characters (PedestrianMan, Dog): there is no brake implementation, if you want to stop a character, the only way is to set speed to 0

for characters (PedestrianMan, Dog): don't use rotation to change movement direction, use desired steering instead

13/ DisableControlObject -> free all controlled objects

14/ RestartMap -> restart current map

15/ OpenMap_x -> x is map name: StraightRoadMap, CrossRoadMap, MixedRoadsMap_A, MixedRoadsMap_B, TestTrackMap_A

16/ FrontCamera -> change to front view

17/ In order to spawn a traffic sign at runtime, need 3 steps:
   a) Create a pole with one traffic sign using command SpawnTrsBegin
   b) In case you need more than one sign on a pole, keep adding one sign a time using SpawnTrsContinue
   c) Inform Adas TestSim to spawn a traffic signs with given information using SpawnTrsEnd

SpawnTrsBegin_CountryCode_TrafficSignName_TrafficSignShape_PoleX_PoleY_PoleZ_PoleYaw_PolePitch_PoleRoll_TrafficSignZ_ TrafficSignScaleX_ TrafficSignScaleY_ TrafficSignScaleZ

SpawnTrsContinue_ TrafficSignName_TrafficSignShape_TrafficSignZ_ TrafficSignScaleX_ TrafficSignScaleY_ TrafficSignScaleZ

SpawnTrsEnd

TrafficSignShape is enum -> 0: Round, 1: Triangle, 2: Square, 3: Diamond, 4: Octagon, 5: Rectangle

CountryCode follows ISO 3166-1 alpha-3

Example:

```
"SpawnTrsBegin_JPN_SpeedLimit60_0_10_-5_0.1_-90_0_0_2.4_1_1_1"
"SpawnTrsContinue_RestrictionEnds_5_1.8_1.6_1.0_0.4"
"SpawnTrsEnd"
```

The above commands will spawn this traffic sign



## B. Decode the data sent from Adas TestSim

Data encoding rule

Data type length: float 4 bytes, integer 4 bytes

Order

 1 - ego speed (float, km/h)

 2 - ego gear (integer)

 3 - ego engine RPM (float)

 4 - ego master cylinder pressure (float, bar)

 5 - ego longitudinal acceleration (float, m/s2)

 6 - ego lateral acceleration (float, m/s2)

 7 - ego yaw rate (float, deg/s)

8 - steering angle (float, rad)

9 - steering angle speed (rad/s)

10 - number of objects (1 byte)

11 - object ID (1 byte)

12 - object type (1 byte; enum type -> 2: Car, 3: Motorbike, 4: Truck, 5: Bus, 6: Bicycle, 7: Pedestrian)

13 - dx relative to ego (float, meter)

14 - dy relative to ego (float, meter)

15 - dz relative to ego (float, meter)

16 - vx relative to ego (float, m/s)

17 - vy relative to ego (float, m/s)

18 - yaw angle relative to ego (float, deg)

19, 20, 21, ... -> repeat data from 11 to 18

# Appendix

## 3D Models Source and Unreal Marketplace assets

"Lowpoly Generic SUV Police" (https://skfb.ly/oQJFT) by mk2design is licensed under Creative Commons Attribution (http://creativecommons.org/licenses/by/4.0/).

"Lowpoly Generic SUV" (https://skfb.ly/oQJPW) by mk2design is licensed under Creative Commons Attribution (http://creativecommons.org/licenses/by/4.0/).

"Generic civil service vehicles pack" (https://skfb.ly/orDHz) by Comrade1280 is licensed under Creative Commons Attribution (http://creativecommons.org/licenses/by/4.0/).

"Generic passenger car pack" (https://skfb.ly/6sUFy) by Comrade1280 is licensed under Creative Commons Attribution (http://creativecommons.org/licenses/by/4.0/).

"1990 Fatboy inspired Cruiser Motorcycle" (https://skfb.ly/otv7o) by Alpha One is licensed under Creative Commons Attribution (http://creativecommons.org/licenses/by/4.0/).

"Scanned 3D People Pack" ([https://renderpeople.com/free-3d-people/](https://renderpeople.com/free-3d-people/)) by Renderpeople

"Generic Sedan Car" ([https://skfb.ly/oIOJC](https://skfb.ly/oIOJC)) by Márcio Meireles is licensed under Creative Commons Attribution ([http://creativecommons.org/licenses/by/4.0/](http://creativecommons.org/licenses/by/4.0/)).

[https://www.unrealengine.com/marketplace/en-US/product/tcp-socket-plugin](https://www.unrealengine.com/marketplace/en-US/product/tcp-socket-plugin)

[https://www.unrealengine.com/marketplace/en-US/product/roadsign-bp](https://www.unrealengine.com/marketplace/en-US/product/roadsign-bp)

[https://www.unrealengine.com/marketplace/en-US/product/17c2d7d545674204a7644c3c0c4c58ba](https://www.unrealengine.com/marketplace/en-US/product/17c2d7d545674204a7644c3c0c4c58ba)

[https://www.unrealengine.com/marketplace/en-US/product/twinmotion-construction-vehicles](https://www.unrealengine.com/marketplace/en-US/product/twinmotion-construction-vehicles)


## Vehicle dynamics

Torque curve creator:

[https://www.lamertonsimulation.com/torque_curve_input.php](https://www.lamertonsimulation.com/torque_curve_input.php)

Gear shift

[https://www.blocklayer.com/rpm-gear](https://www.blocklayer.com/rpm-gear)

Average deceleration

[https://www.sae.org/publications/technical-papers/content/2023-01-0616/](https://www.sae.org/publications/technical-papers/content/2023-01-0616/)