

Workshop | Traffic Simulations using SUMO

Conducted by

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10 August 2024

Plan

- Introduction to traffic simulations
- Check Installation
- Quick simulation: Ready, Set, Go!
- Know the basics
- Real world scenario



Introduction

During the Paris 2024 Olympic Games:



39

competition sites



10+ million

visitors



>185 kilometers

of reserved roads or lanes

PTV Logistics free 2024 Olympic Games route simulator

Based on the developer components in PTV Developer, you can now calculate, simulate, and visualize these temporary restrictions on the map and check whether they may affect your routes. In addition, the simulator dynamically calculates the best scenarios and alternative routes that avoid roads with reserved lanes. Just enter your start point and the stops!

Legend

- ☒ Prohibited Motorized Access
- ☒ Restricted Motorized Access
- ☒ Competition Venues
- ☒ Olympic Lanes
- ☒ Olympic Itineraries
- ☐ Traffic Incident

Vehicle

Profile: EUR_TRAILER_TRUCK

Waypoints

- Rue Génin, 93200, Saint-Denis
- Rue Lacordaire, 75015, Paris

Route

	Route 1 ?	Route 2 ?	Route 3 ?
travelTime	00h 46min	01h 22min	01h 23min
distance	17.869 km	17.869 km	16.549 km
Olympic Games considered for routing	✗	✗	✓
Olympic Games considered for traveltime	✗	✓	✓

Custom Road Attributes Restrictions

code_site	"YDM"
nom_site	"Stade Yves-du-Manoir"
category_id	"venue-olympic"
sports	"Hockey (HOC)"
start_date	"2024-07-27"
end_date	"2024-08-09"

[Link](#)

Give It a Go!

traffic-simulation.de

Time=120.4 s

Play Ramp-Metering Game

Flow: 4320 veh/h
Speed: 71 km/h
Dens.: 61 veh/km

Flow: 3600 veh/h
Speed: 79 km/h
Dens.: 45 veh/km

Flow: 4320 veh/h
Speed: 70 km/h
Dens.: 61 veh/km

road 1

road 2

0 km/h
20 km/h
40 km/h
60 km/h
80 km/h
100 km/h

30 80

Start

© Martin Treiber | Offline: sources at GitHub

MovSim

Book "Traffic Flow Dynamics"

Buch "Verkehrsdynamik"

Umleitung

Ramp Metering

Tests

Traffic Flow and General

Inflow: 4600 veh/h

Onramp Flow: 800 veh/h

Truck Perc: 10 %

Timelapse: 6 times

Car-Following Behavior

Max Speed v_0 : 108 km/h

Time Gap T : 1.4 s

Max Accel a : 0.3 m/s²

Lane-Changing Behavior

Politeness: 0.1 m/s²

LC Threshold: 0.4 m/s²

Right Bias Cars: 0.05 m/s²

Right Bias Trucks: 0.2 m/s²

- Click onto the road to disturb traffic flow
- Drag obstacles or construction vehicles to create new bottlenecks
- Drag traffic lights to the road and click on them to toggle between red and light
- In some simulations, you can change the road geometry by dragging
- Use the button repeatedly for more info

[Link](#)

Introduction

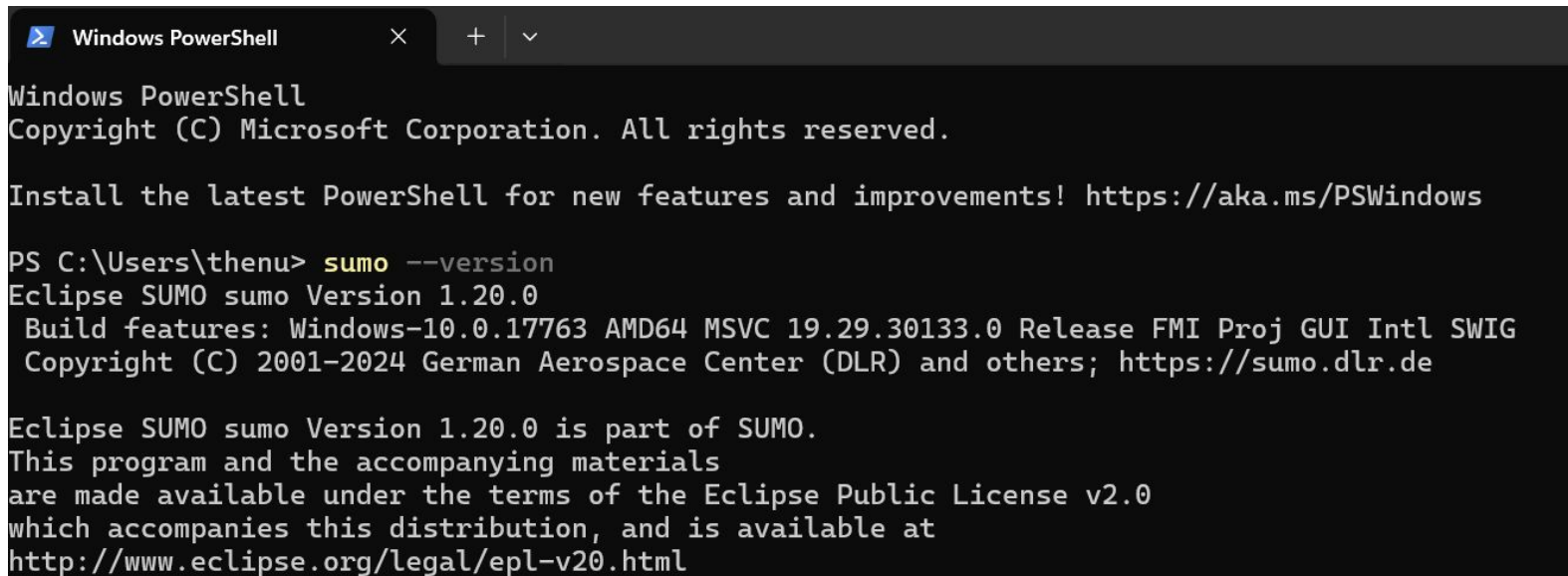
- **Why?**
 - Test behavior of a new system prior to its actual implementation
- **When to use?**
 - The problem statement is more complex to solve by using an analytical approach
- **Use cases**
 - Model existing systems
 - Estimate the impact of a future scenario
 - Simulate processes that are difficult / costly to implement
 - Try out large number of possible options before choosing the best

Introduction

- **Advantages**
 - No risk - Trial and error approach
 - Test hypothetical scenarios
 - Cost effective
- **Disadvantages**
 - Time consuming
 - Data collection, preparation
 - Model development
 - Calibration

Check Installation

- Install Python 3.x
- Install SUMO



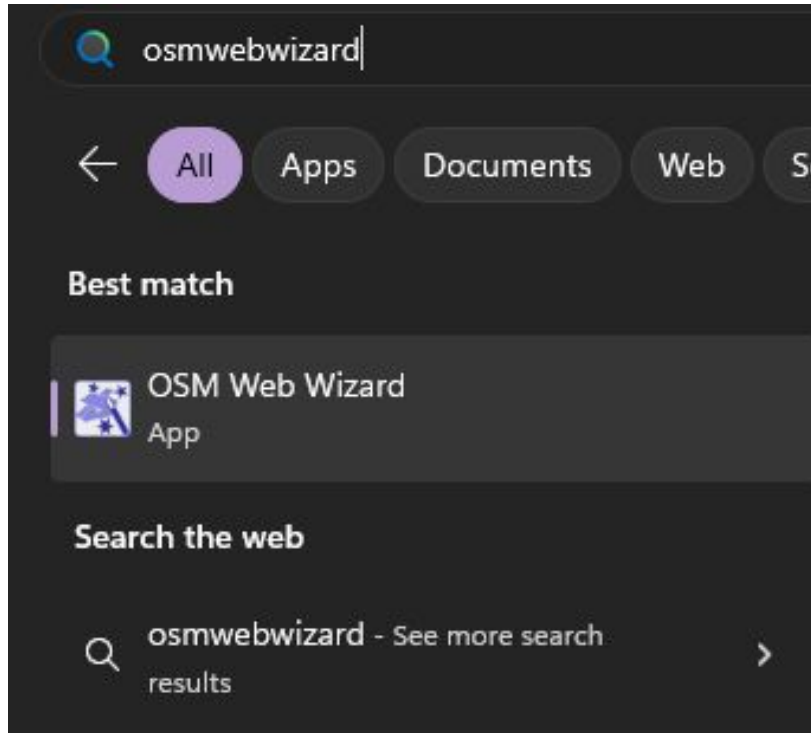
```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\thenu> sumo --version
Eclipse SUMO sumo Version 1.20.0
  Build features: Windows-10.0.17763 AMD64 MSVC 19.29.30133.0 Release FMI Proj GUI Intl SWIG
  Copyright (C) 2001-2024 German Aerospace Center (DLR) and others; https://sumo.dlr.de

Eclipse SUMO sumo Version 1.20.0 is part of SUMO.
This program and the accompanying materials
are made available under the terms of the Eclipse Public License v2.0
which accompanies this distribution, and is available at
http://www.eclipse.org/legal/epl-v20.html
```


Quick simulation: Ready, Set, Go!





SUMO
SIMULATION OF URBAN MOBILITY

**Let's focus on
SUMO now**

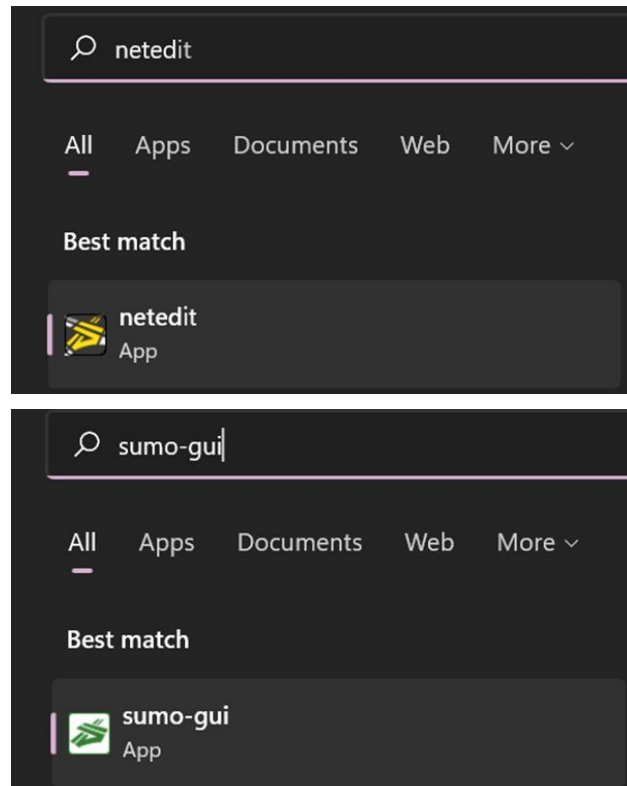
What is SUMO?

- Simulation of **U**rban **M**obility
- Open source (since 2001)
- Developed by Institute of Transportation Systems at German Aerospace Center (DLR)



Understand Available Tools with SUMO

- **Netedit** - Network Editor
- **SUMO GUI** - Visualize your Simulations
- **File Types**
 - **.net.xml** - describes the traffic-related part of a map, the roads and intersections the simulated vehicles run along or across
 - **.rou.xml** - define vehicle types, vehicle demand, routes etc.
 - **.add.xml** - Additional files
 - **.sumocfg** - Configuration file (combines everything together)





SUMO
SIMULATION OF URBAN MOBILITY

`<Hello World/>`

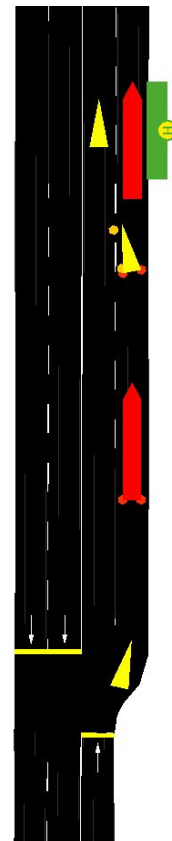
...

Know the basics

Guide/0_know_the_basics

Instructions

- **.net.xml**
 - Create an intersection
 - Increase the lane count
 - Add traffic signals to the intersection
- **.rou.xml**
 - Define a vehicle type named 'car'
 - Create a route
 - Create a car flow
- **.add.xml**
 - Add a bus stop
 - Add a bus trip
 - Add a bus flow
- Combine everything to a **.sumocfg** file
- Run the simulation



Introduction to Work with Command Line

- Often, a great tool when you are working heavily with SUMO
- Helps to
 - Open files
 - Run SUMO related scripts
 - Run simulation without GUI



SUMO
SIMULATION OF URBAN MOBILITY

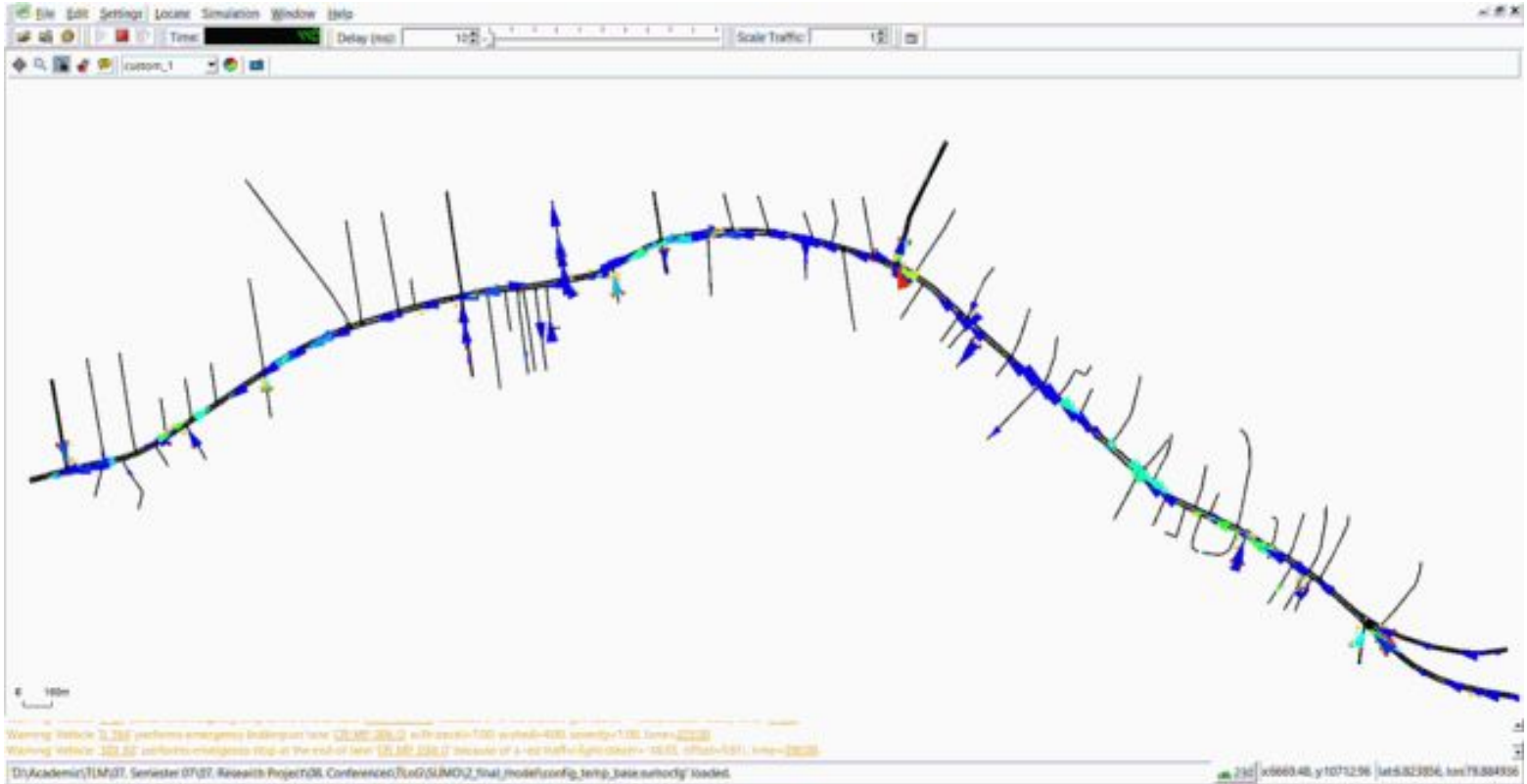
<Hello Colombo/>

Real world scenario

Guide/1_real_world_simulation



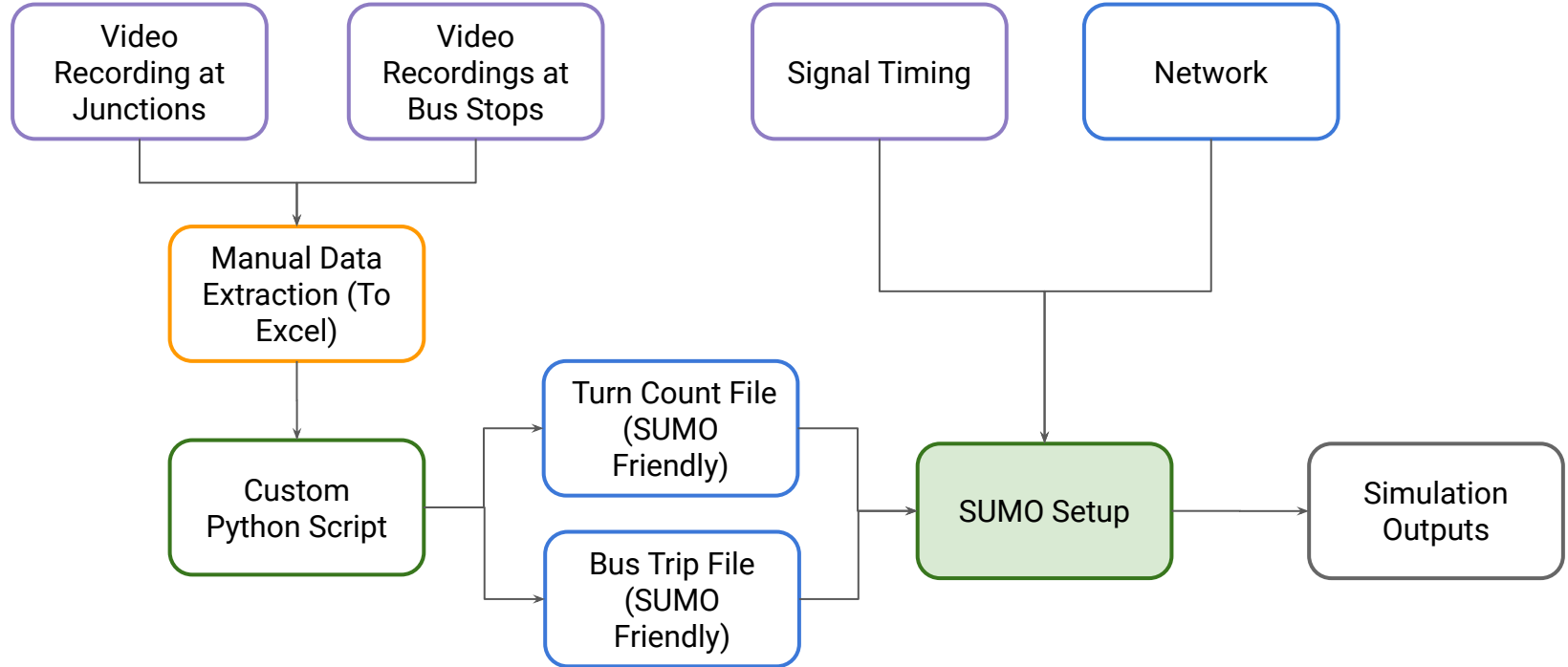
Real World Scenario



Case Study - Cross Junction to Maliban Junction

- **Aspects to look at**
 - Network
 - Accuracy of the vehicle counts
 - General vehicles (Count by **time interval**, **location**, **movement type**, **vehicle type**)
 - Busses (**bus route**, **bus type**, **bus stop**, **stop duration**)
 - Signal timing

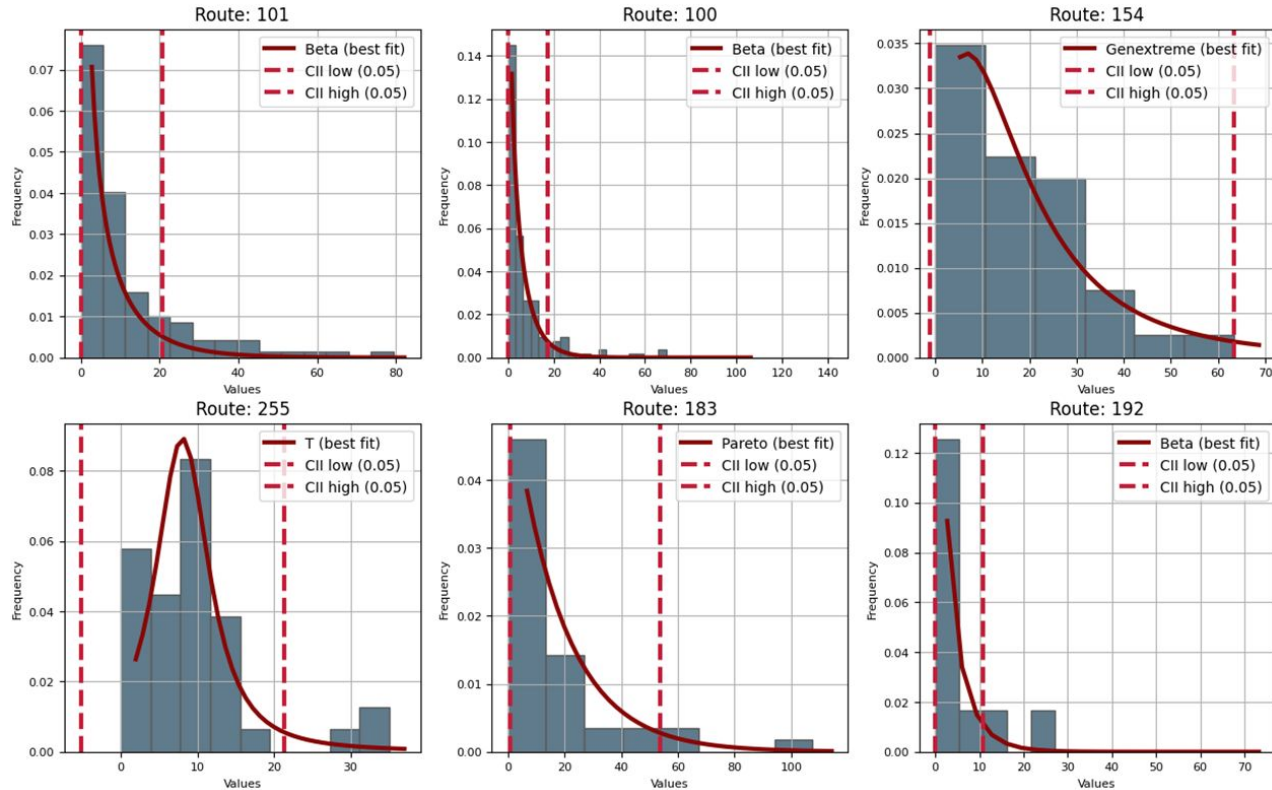
Case Study - Our Approach



Case Study - Data Collection



Case Study - Realistic Bus Trips



This figure shows the distribution of bus dwell times for each bus route



Q&A

Contact us

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Could be an issue

