



DEMO - A Simulation Framework for Multi-modal Commuting and Parking Optimization.

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1 Introduction

In the last decade, many efforts to solve traffic congestion and sustainable growth issues are going in the direction of research and investments in smart cities and consequently smart mobility. We use the proposed simulation framework is compatible with SUMO 1.1.0¹. We use it to study multi-modal commuting and parking optimization issues in a state-of-the-art large-scale mobility scenario, and we intend to demonstrate the ease of use and its capabilities.

2 Monaco SUMO Traffic (MoST) Scenario

The MoST Scenario [2] is a city-wide mobility scenario based on the Principality of Monaco and the neighboring French cities. It provides a state-of-the-art 3D playground with various kind of vehicles, vulnerable road users (pedestrians and two-wheelers), and public transports; the latter is based on buses and trains, with more than 20 routes with over 150+ stops. The mobility is built using the activity-based mobility paradigm and the 14 Traffic Assignment Zones (TAZs) provided by the scenario. The mobility represents a morning rush hour of an average weekday, with a population of 50K entities. The activity-based mobility generation uses multi-modal means of transports, and vehicles need to find a parking spot in order for the people to reach their destination. The scenario has 120+ parking area with a total capacity of 60K+ spots, and this information is retrieved from OpenStreetMaps² and the Monaco parking website³.

MoST Scenario is freely available on GitHub <https://github.com/lcodeca/mostscenario> under GPLv3 license.

¹The oldest SUMO version with all the required capabilities is 1.0.0.

²<https://www.openstreetmap.org>

³<https://www.monaco-parkings.mc>

3 Activity-based Mobility Generation for SUMO

In addition to the primary mobility generation provided by the MoST Scenario toolset, we are working on more complex personal trips plans. We implement the activity-based mobility model, where with the use of user-defined activity chains composed by a home location, at least a primary activity, and a variable number of secondary activities, it is possible to achieve elaborate trip plans. The location of these activities is based on their order in the chain and the given origin-destination matrix. The preliminary version of the Activity-based Mobility Generation for SUMO Simulator is already available on GitHub at <https://github.com/lcodeca/SUMOActivityGen> under EPL 2.0 license. This tool requires the latest features for multi-modal person trip definition provided (at the moment of writing) by SUMO only in the development version.

4 Python Parking Monitoring Library (PyPML)

The use of PyPML [1] with the additional TraCI API we implemented enables the study of large-scale parking management optimizations. The abstraction provided by PyPML allows flexibility in the implementation of various optimizations, focusing on the problem at hand, and not the data aggregation. The additional TraCI APIs are meant to provide the tools to easily actuate the optimization, with a focus on flexible multi-modal optimization strategies. For example, using this framework is possible to study the impact of various parking optimizations on time spent looking for a parking spot, pollution generated by cruising for parking, efficient usage of multiple parking areas, access and location of multi-modal hubs, and more.

PyPML is freely available on GitHub <https://github.com/lcodeca/pypml> under GPLv3 license.

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References

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