Planning automated public transport using traffic simulation

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Simulation of Urban MObility

• DLR’s open source microscopic transportation system simulation software
• Current version 0.27.1
• Under development since 2001, with the explicit goal to simulate even large cities / areas in real-time
• Current limitation for real time simulation: the city of Berlin
• SUMO comes with a full-fledged suite of helper programs that do setting up, running, and controlling such a simulation
• Most important of those tools is TraCI which allows to control a running SUMO simulation from outside via programs in various languages
• Active community with roughly 22,000 downloads annually, and about 1,000 requests (and answers!) on the mailing list.
SUMO – what can be run? (applies to any other simulation package)

• Exaggeration: any moving object in a city can be simulated with SUMO

• But we are close:
  • Cars,
  • Busses,
  • Persons in these,
  • Bicycles,
  • Pedestrians,
  • Ships,
  • Trucks, trailers, and the containers in these
SUMO – what can be done?

• Planning and evaluation / assessment
  • Traffic management
  • Infrastructure changes
  • Public transport
  • New technologies (e.g. vehicular communication, automated transport systems)

• **But it needs travel demand from external sources**
• Optimization
  • Traffic lights
  • Routing
  • Emissions

• Traffic forecast (short-term mostly)
• Data fusion for traffic surveillance
SUMO – The components

• SUMO: Simulation without graphical Interface
• SUMO-GUI: Simulation with graphical Interface
• NETCONVERT: Importer for road networks
• NETEDIT: visual network editing
• OD2TRIPS: Importer for O/D matrices
• JTRROUTER: Router based on junction turning percentages
• DUAROUTER: Router based on dynamic user assignment
• DFROUTER: Router based on induction loop data
• MAROUTER: Macroscopic router based on C/R function
• ACTIVITYGEN: Synthetic demand generator
• TraCI: Interface to change the simulation on run-time
SUMO – You can have it all, but...

- Just download it from http://sumo.dlr.de
- Have a look at tools/import/osm/server.py
- Running it, gives you a nice headstart, a complete scenario with a few clicks
- Of course, nothing is for free:
  - It runs, but corrections are urgently needed:
    - Network
    - Infrastructure
    - Demand
TraCI – Traffic Control Interface

• Controlling the simulation with a few lines of code
• Everything at your fingertips
  • Vehicle behavior
  • Traffic lights
  • Routing
  • Traffic demand
• SUMO runs as a server
• Clients available
  • Python, Java, C++, Matlab

```python
def run():
    """execute the TraCI control loop""
    traci.init(PORT)
    # we start with phase 2 where EW has green
    traci.trafficlights.setPhase("0", 2)
    while traci.simulation.getMinExpectedNumber() > 0:
        traci.simulationStep()
        if traci.trafficlights.getPhase("0") == 2:
            # we are not already switching
            if traci.inductionloop.getLastStepVehicleNumber("0") > 0:
                # there is a vehicle from the north, switch
                traci.trafficlights.setPhase("0", 3)
            else:
                # otherwise try to keep green for EW
                traci.trafficlights.setPhase("0", 2)
    traci.close()
```
SUMO for Podcars

- CityMobil demonstrator Rome
- Simulating the parking space
- Evaluating travel times, emissions

Ask Jörg Schweizer about SUMOPy
Automated and Connected Driving

• Reality is getting closer to the simulation
  • Remote control everything
  • Models behaving like ACC controllers

• Ready to use external frameworks for V2X
  • Platooning applications
Institute of Transportation Systems / DLR

Current Version: 0.27.1
Website / Download: http://sumo.dlr.de/
Contact: sumo@dlr.de

It's Open Source so contributions are welcome!

Annual SUMO conference in Berlin:
08.05. – 10.05.2017