

METHODS AND TOOLS FOR INNOVATIVE TRANSPORT AND TRAFFIC MANAGEMENT

PhD in Civil and Environmental Engineering XXXVIII Transport Systems (ICAR/05)

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PURPOSE

The purpose of this research is to use the microsimulation environment to reproduce the characteristics of **automated vehicles** and to identify, in collaboration with LINKS Foundation, traffic regulation strategies, in urban areas, aimed at facilitating the incorporation of automated shuttles.

These virtual tests are necessary to generate **realistic edge scenarios** and to **validate new strategies before implementing them in reality**, and deploying **CCAM trials**. To create digital models were used two different micro-simulators: Aimsun Next and Simulation of Urban MObility (SUMO), so as to also have a comparison of the results produced by them.

In this contribution, a preliminary traffic management strategy investigated is the dynamic lane reservation.

METHODOLOGY

Preliminary work of model construction

The study is focused on a target area of SHOW project. The **rightmost lane** of corso Maroncelli could be **dynamically reserved** when the automated shuttle is approaching.



During the construction of traffic models in the SUMO and Aimsun Next micro-simulators, differences in the setting of some parameters were noticed, which can cause different results to be obtained.

Iterative process of model calibration

For this reason, have been carried out iterative process of setting the model's parameters to have two consistent models.





In addition to the scenario, with the dynamic lane reservation, two other **baselines** (Always/Never reserved lane) have been created.

Example: different stetting of the clearance parameter, that can cause differences between the number of

Creation and study of different use cases

In addition to the implementation of three different scenarios concerning the reservation of the rightmost lane of Corso Maroncelli other scenarios were created to test the dynamic lane effectiveness.

In both **Aimsun Next** and **SUMO** were created other three different scenarios based on different **traffic flow conditions**: (i) high, (ii) medium, (iii) low.

In **Aimsun Next**, furthermore, the following **use cases** are being analysed:

- Variation of shuttle passage frequency
- Variation of **reaction time** of the shuttle
- Lane closure



The same procedure was followed with both the Aimsun Next and SUMO micro-simulators.









Instead, in **SUMO**, a methodology for **rerouting** vehicles in the event of an accident is being analyzed.

VIRTUAL DETECTORS

Various detectors with different purposes have been inserted into the network.

Local observation

Specific detectors were placed to observe the differences between the flow parameters near intersection.





RESULTS

Both micro-simulators produced **results** concerning: delay time, number of lane changes, average speed, total travel time, headway measured by virtual detectors.



Dynamic lane condition

Specific detectors positioned along the shuttle route to identify it and consequently activate or deactivate the reserved lane for the automated vehicle.

FUTURE WORK

- Extend the area of simulation
- Implementation of the dynamic lane along the entire path of the shuttle and not only in a specific segment of the network
- Insert new features, as parking area, to make the simulation more realistic.
- Implementation and testing of new control strategies

time, compared to the never reserved condition, with medium flows.

PUBLICATIONS

- Bellini A., Cavallero A., Deflorio F., Caroleo B. (2023), *The use of dynamic lane reservation for autonomous shuttles in urban traffic*, presented at the Intelligent Transport Systems (ITS) European Congress 2023.
- Caroleo B., Cavallero A. (2023), *Trasporto collettivo a guida autonoma: l'esperienza di Torino*, WAVE - Smart Mobility Magazine n.1 "Smart Roads: la rivoluzione su strada", May 2023.
- Cavallero A., Deflorio F., Bellini A., Arnone M., *Dynamic lane reservation for autonomous shuttles: design and testing in microsimulation*, in preparation.