

MobMod Lab 1

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I. GRID-LIKE NETWORK

Comparing the simulations' results with and without rerouting, and with static and dynamic lights, we can observe that:

- Running vehicles (Fig. 1):
 - **Rerouting** decreases a lot the number of vehicles, and thus the congestion, as it allows vehicles to select different routes in a more efficient way
 - **Dynamic lights** allow faster decongestion, as we can see particularly well in cases without rerouting.
- CO₂ emission and fuel consumption (Fig. 2, these are highly correlated to the running vehicles):
 - **Rerouting** decreases a lot consumptions and emissions, as well as congestion
 - **Dynamic lights** allow faster consumption and emission decreasing, as well as congestion.
- Time loss: this is decreased by both **Rerouting** and **Dynamic lights**, as well as congestion
- Simulation length increases when congestion increase, because vehicles take more time to get out of the grid. In this case, dynamic lights are more powerful than rerouting, timings are:
 - No rerouting, static lights: 12898s
 - No rerouting, dynamic lights: 4196s
 - Rerouting, static lights: 9576s
 - Rerouting, dynamic lights: 3835s

II. RADIAL NETWORK

A. Point 2

With rerouting, instead of passing through the three midpoints, the vehicle takes always the shortest path from S to D.

B. Point 3

With multiple vehicles, different routes are taken to avoid congestion. In particular, a lot of vehicles take the external route (D4 D5 D1 D2 D3). Moreover, there is usually a queue on C2D2 made by the vehicles coming from C2 and A2 (that's why a lot of them take the external route).

C. Mobility simulation

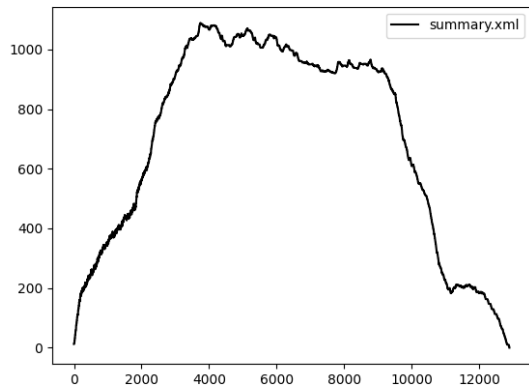
1) *Point 2*: The mobility is not congested, as usually there aren't queues at intersections.

We can see from Fig. 5a that the number of running vehicles is stable in time, and from Fig. 6a that the time lost is very low.

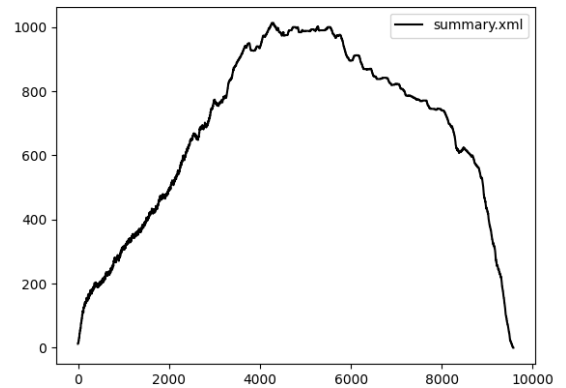
D. Point 3

To saturate the mobility, it is enough to increase the number of vehicles in the network by decreasing the immission frequency (one tenth of the original values, rounded down, have been used).

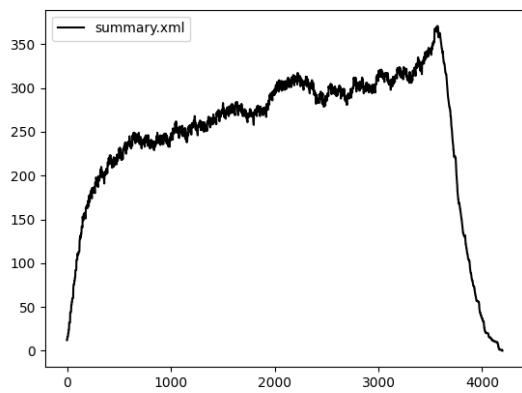
The greater number of vehicles causes a lot of queues in the simulations, which are reflected in the number of running vehicles (Fig. 5b) that never stabilizes, and in the time loss (Fig. 6b) which goes up to 5000s.



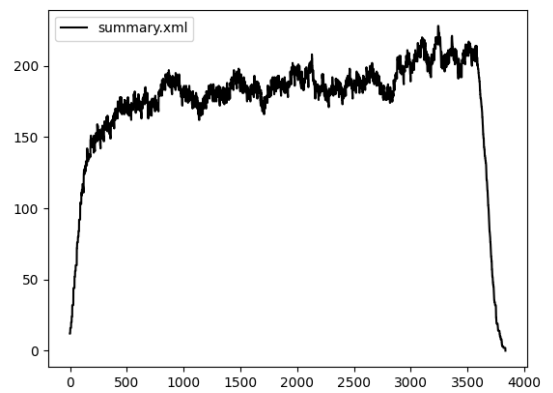
(a) No rerouting, static lights



(b) No rerouting, dynamic lights

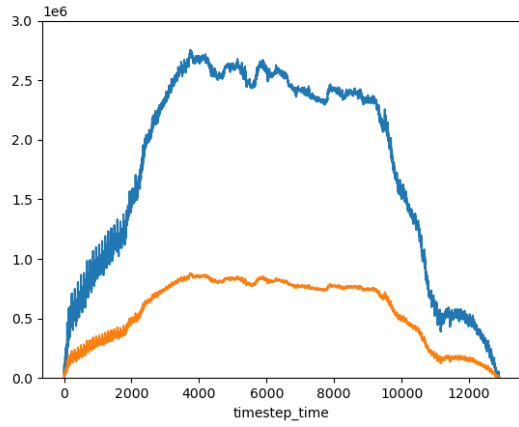


(c) Rerouting, static lights

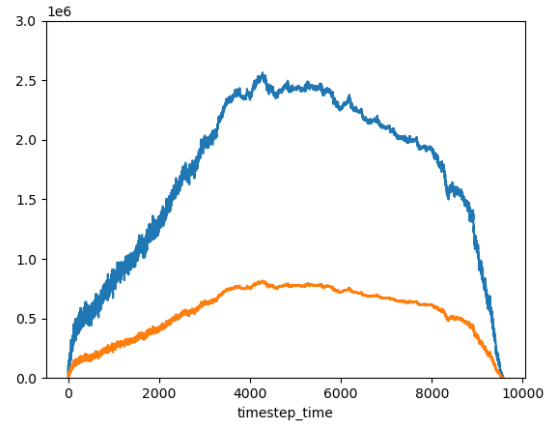


(d) Rerouting, dynamic lights

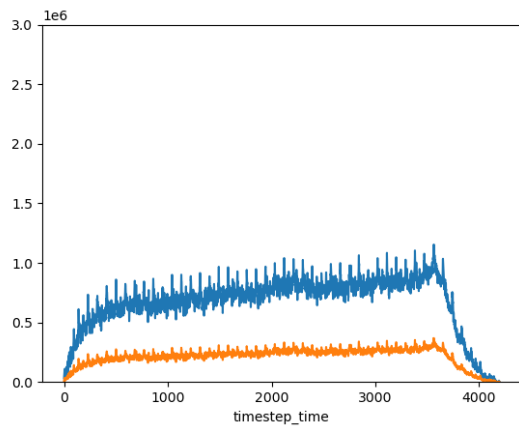
Fig. 1: Summary: running vehicles



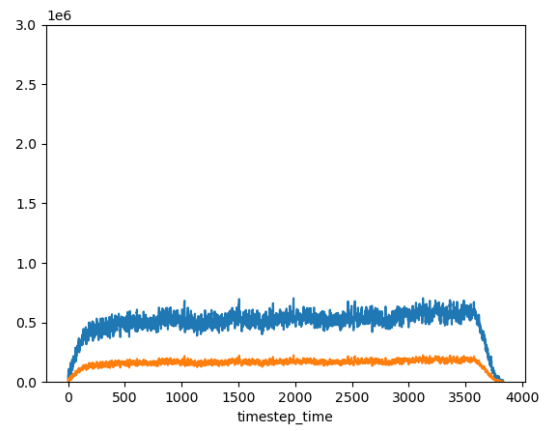
(a) No rerouting, static lights



(b) No rerouting, dynamic lights

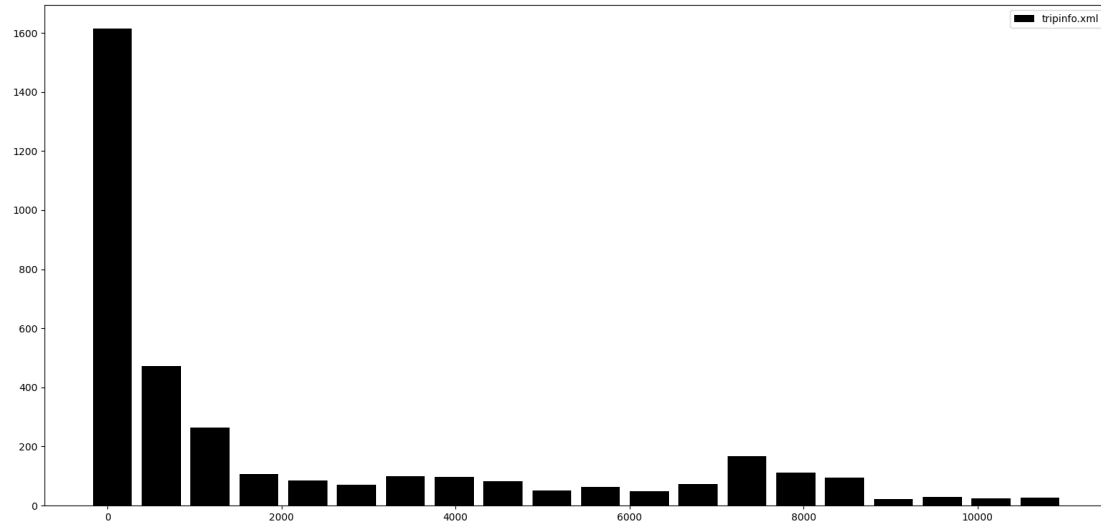


(c) Rerouting, static lights

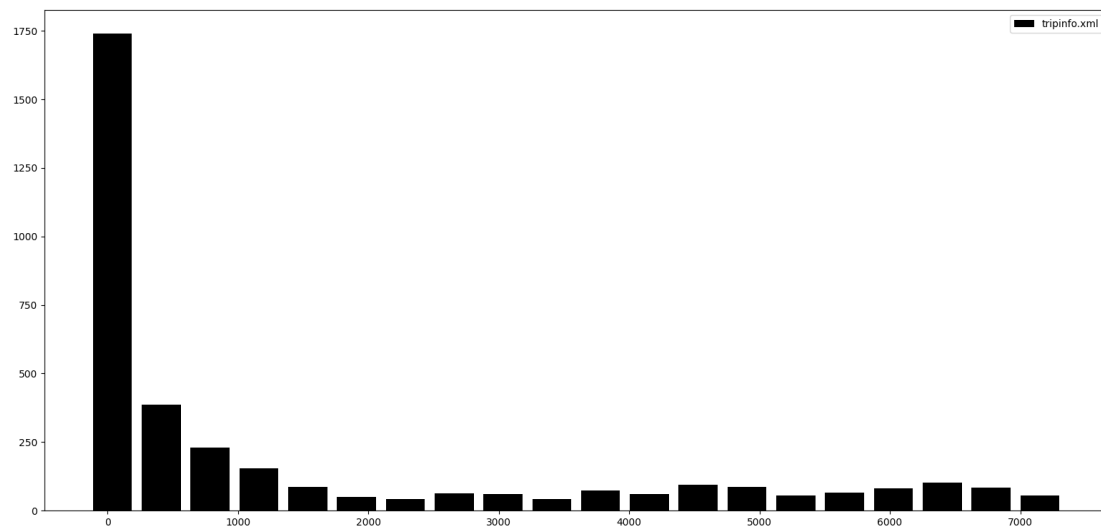


(d) Rerouting, dynamic lights

Fig. 2: Emissions: CO₂ and fuel

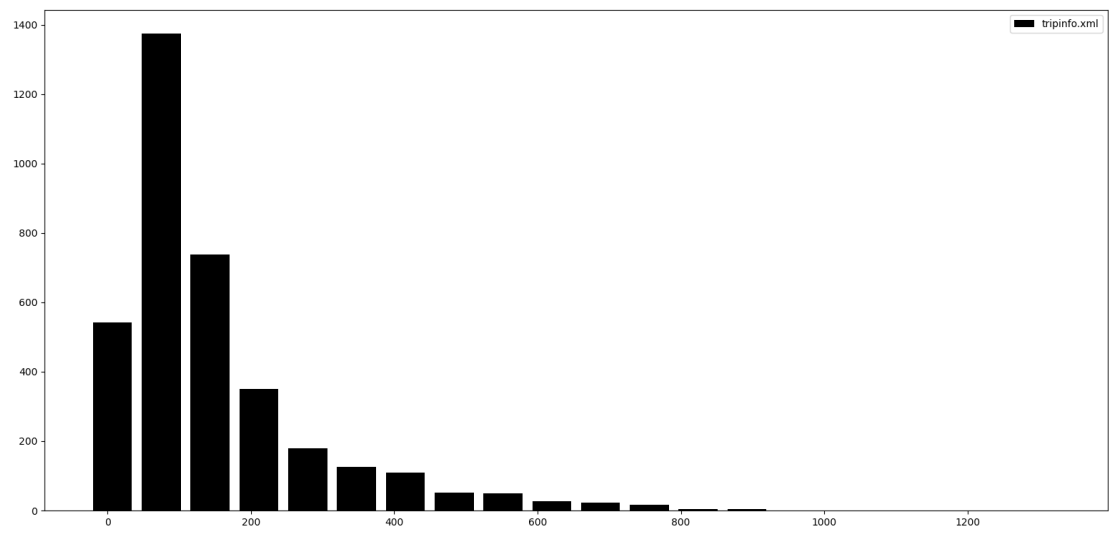


(a) static lights

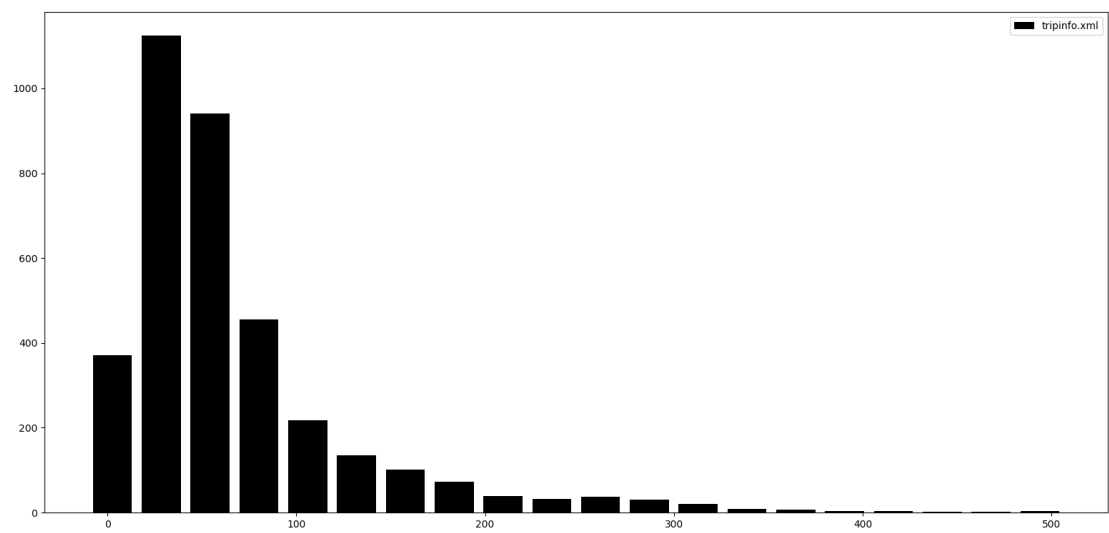


(b) dynamic lights

Fig. 3: Tripinfo: time loss, no rerouting

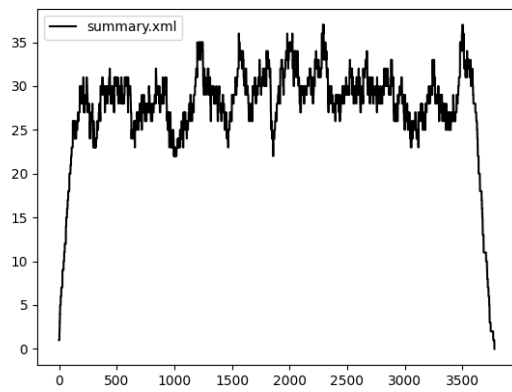


(a) static lights

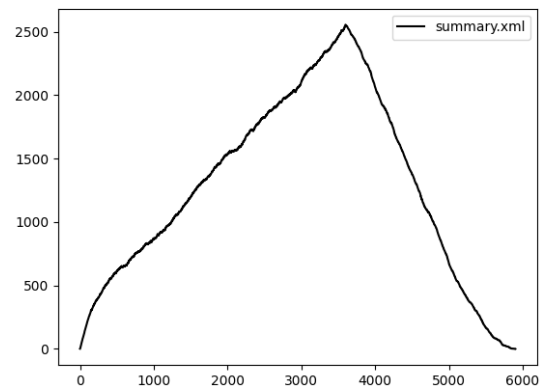


(b) dynamic lights

Fig. 4: Tripinfo: time loss, with rerouting

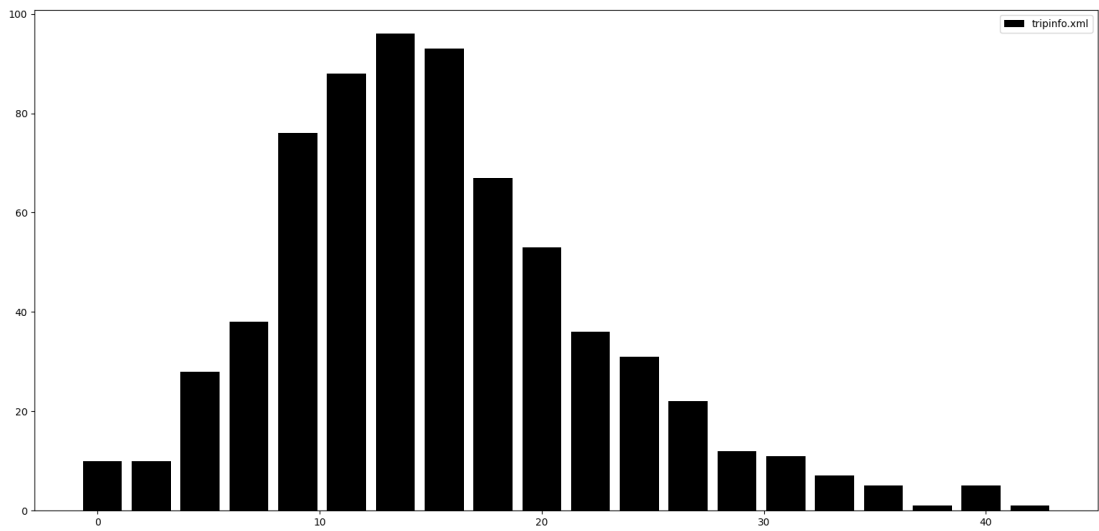


(a) non-congested

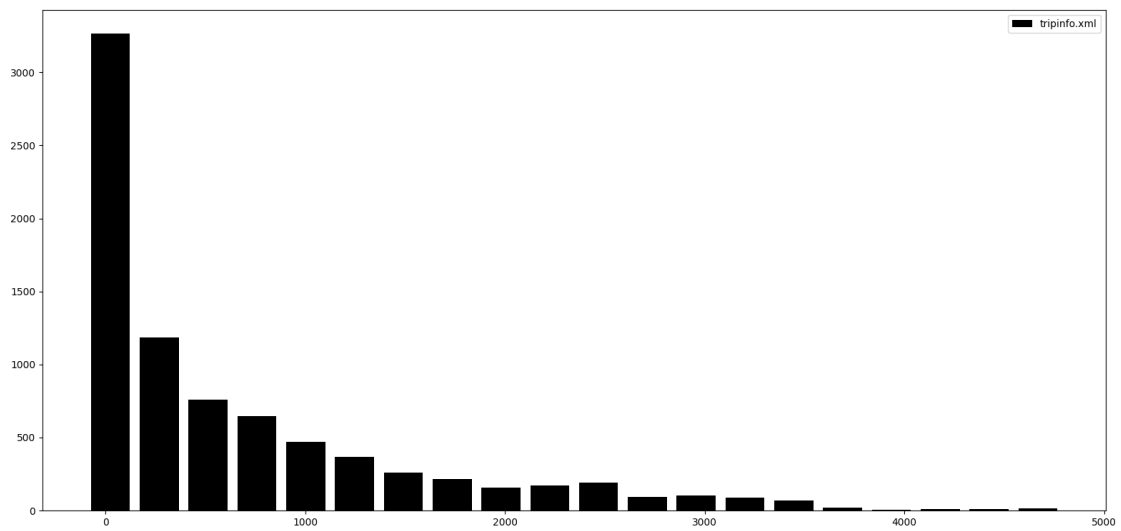


(b) congested

Fig. 5: Spider: running vehicles



(a) non-congested



(b) congested

Fig. 6: Spider: time loss