

Logic-Geometric Programming, where joint motions of multiple agents are optimized to solve cooperative sequential manipulation tasks which require planning both at the symbolic and motion level.

<https://ipvs.informatik.uni-stuttgart.de/mlr/papers/15-toussaint-IJCAI.pdf>

<https://ipvs.informatik.uni-stuttgart.de/mlr/marc/source-code/16-LGP.tgz>

#### 6.1.4 *Propose yours*

## 6.2 MULTI-AGENT SYSTEMS

### 6.2.1 *Traffic with Autonomous Vehicles*

This project considers what will happen to the traffic in towns when a majority of vehicles become autonomous. Here we are not interested in the robotic problem of how to control the vehicles we want to understand how to improve traffic when a majority of cars are autonomous. See for instance

<https://www.youtube.com/watch?v=iHzzSao6ypE&t=148s>

or

[http://www.am-](http://www.am-lisboa.pt/101000/1/004072,012016/index.htm)

[lisboa.pt/101000/1/004072,012016/index.htm](http://www.am-lisboa.pt/101000/1/004072,012016/index.htm)

We consider several steps:

- model a complex enough circulation network including vehicles, traffic lights, autonomous cars and non-autonomous cars.
- research and implement the human factors that affect driving, e.g. reaction time, limitation on the communication
- study different forms of control architectures and its impact, e.g. local vs global
- study the impact of automatic coordination between vehicles
- study the impact of the percentage of autonomous cars in the circulation
- study other parameters such as the existence or not of traffic lights, the size and interconnection of the network, among others
- include priority vehicles and see if they can go fast
- study also different cost/payment system
- measure and compare under the different conditions : the number of accidents, traffic jams, average and maximum times, ...

You can use as initial model the Traffic Grid Netlogo example and extend it to include human factors such as the reaction time shown in the video and try to see if it is possible to remove the traffic lights.

### 6.2.2 *Logistics*

This project considers the transport of people or goods. We can consider  $N$  companies that received requests to transport different products from a location to another. Each truck has a limited capacity. We want to study how to improve the overall efficiency of such transport. We want to evaluate the coordination, formation of coalition, monopolies that can arise, the side-payment schemes that can emerge.