



Contributions to the development of safe and accurate localisation solutions: The LOCSP project

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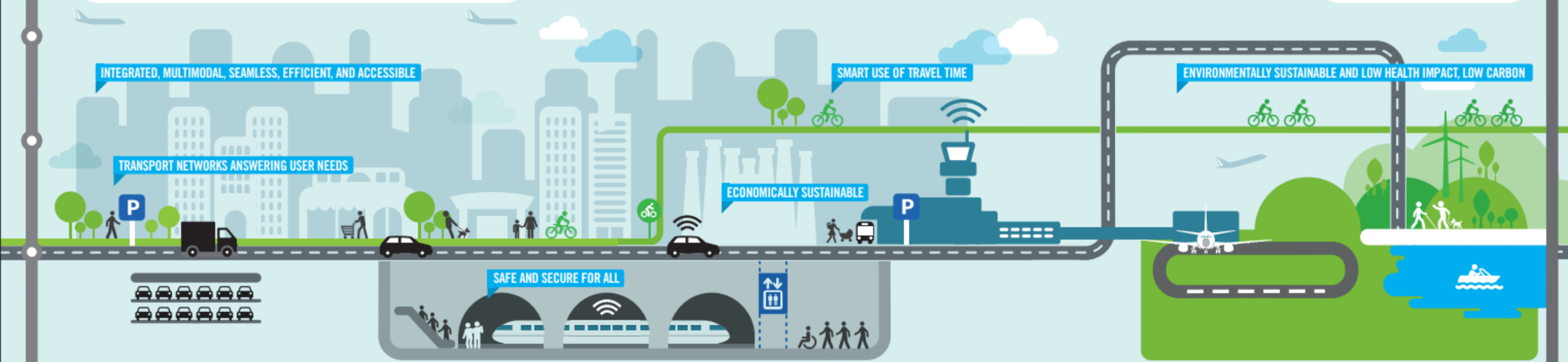
Context

Future ITS and their localisation requirements



TOWARDS TRANSPORT IN 2030

TRENDS, DRIVERS, TECHNOLOGIES

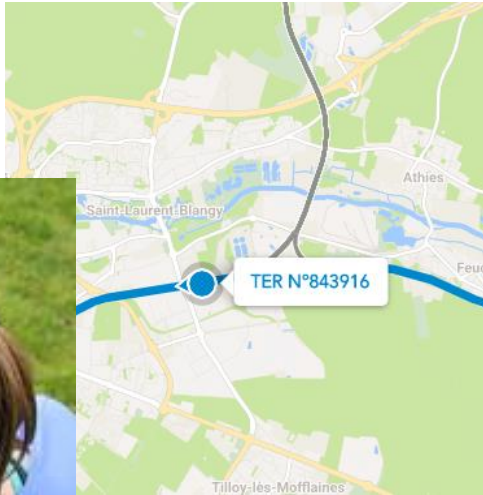


TECHNOLOGY

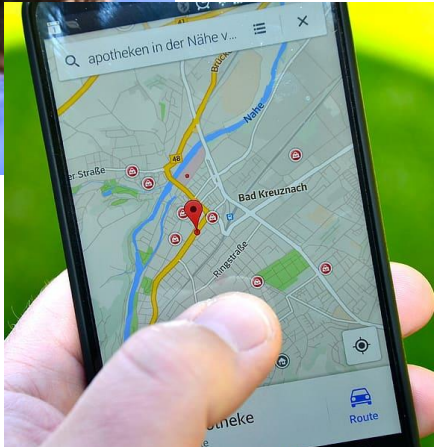
- ROBOTICS
- ADVANCED ALTERNATIVE FUELS
- HYPERLOOP
- SMART SYSTEMS
- INTELLIGENT TRANSPORT SYSTEMS
- SMART ENERGY FLOWS
- LIGHT PERSONAL VEHICLES
- LIGHT MATERIALS
- MEGA AIRCRAFT
- 3D PRINTING
- BIO FUEL
- BATTERY TECHNOLOGIES
- ELECTRIFICATION
- ARTIFICIAL INTELLIGENCE
- INTEROPERABILITY
- BIG DATA
- POSITION BASED INFORMATION**
- E-TICKET
- DRONES
- SMART ENERGY GENERATION AND STORAGE
- CHARGING E-VEHICLES WHILE DRIVING
- AUTOMATION
- SOLAR ENERGY
- STORE AND GIVE ENERGY TO THE NETWORK

Localisation solutions

GNSS in every day's life



Our everyday's app work with GNSS



Localisation solutions

GNSS in Railway applications (or other land transportation systems!)



AVAILABILITY?



ACCURACY?



INTEGRITY?

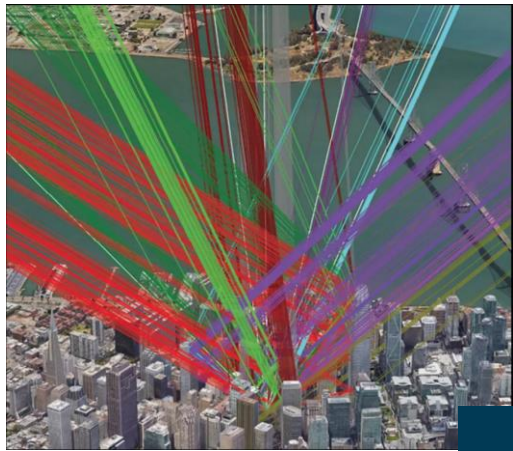




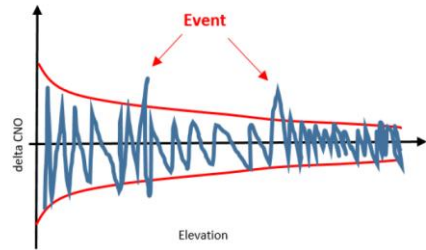
Localisation solutions

A wide range of solutions

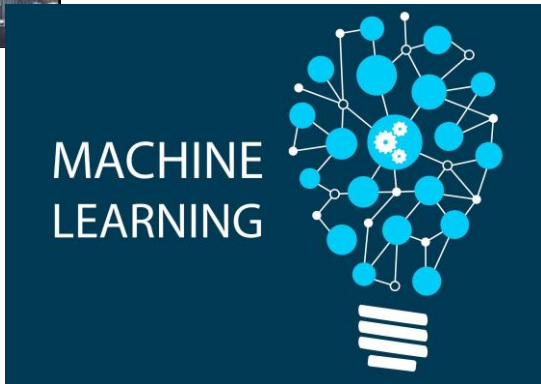
Enhance GNSS performances



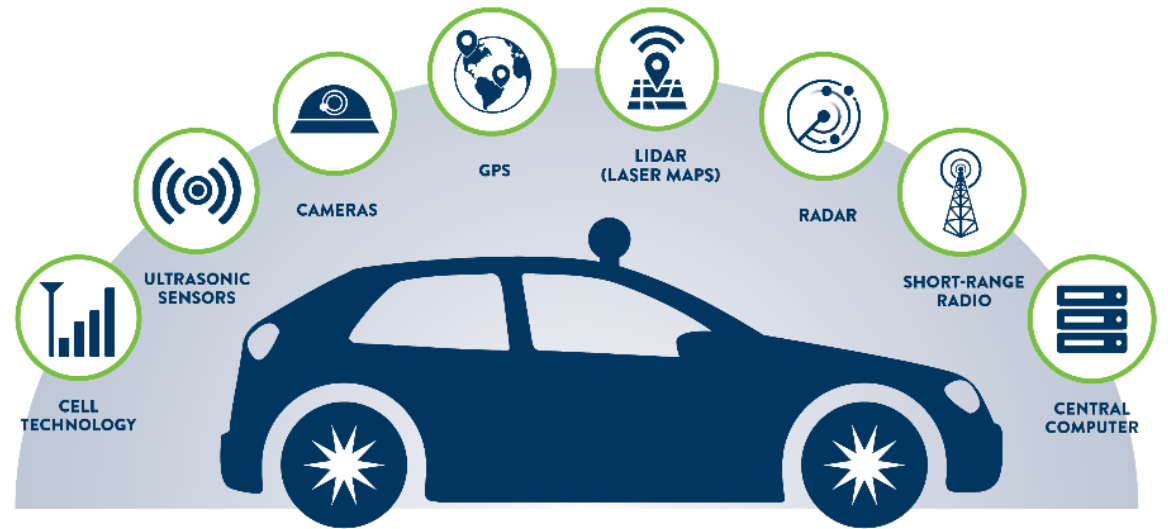
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Fault detection and exclusion



Hybridize with other sensors/data



<http://www.dot.state.mn.us/>



Objective 1

Contribute to the state of the art of fail-safe localisation solutions



2 main topics investigated in LOCSP

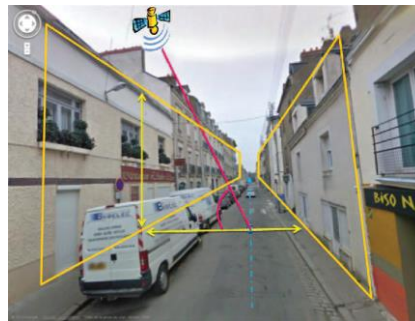
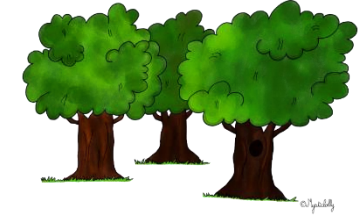
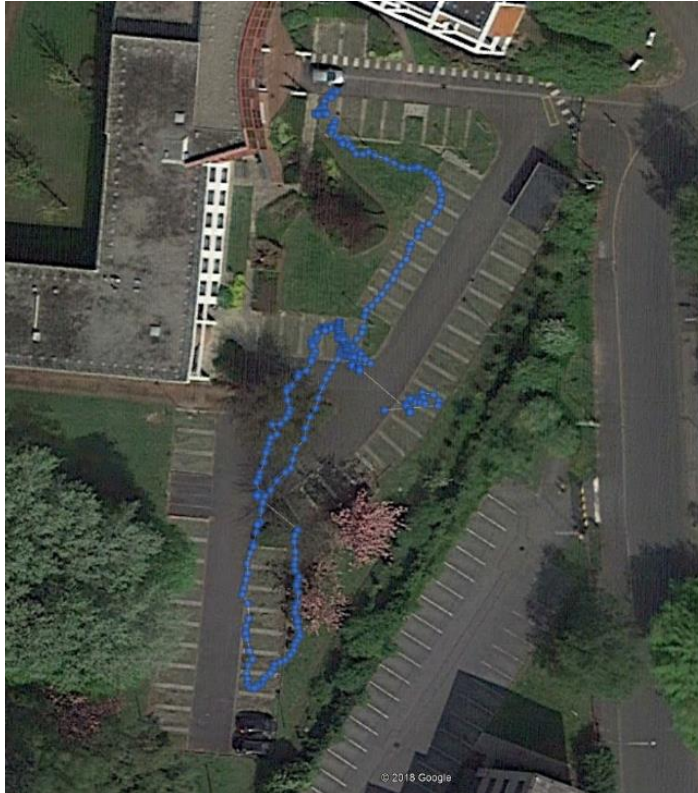
Interference detection and mitigation

Cooperative vehicles localisation using artificial intelligence



Objective 2: a shared database

Compare comparable things...



Bétaille & al. 2013



Yozevitch & al. 2016

Any research is evaluated on its own database.

It's difficult to compare!



Build a database to be shared, multi sensors, with faults
As a complement to first data available online...

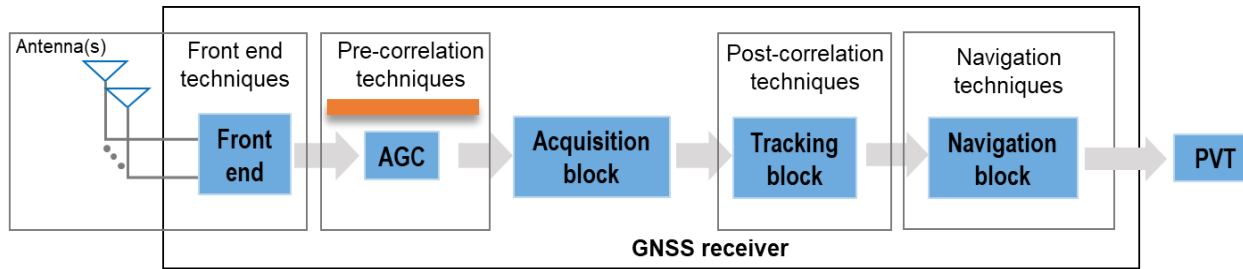


Interference detection and mitigation (1/2)

PhD Thesis, Syed Ali KAZIM



Different levels of action for interference mitigation:



Russia is jamming GPS satellite signals in Ukraine, US Space Force says

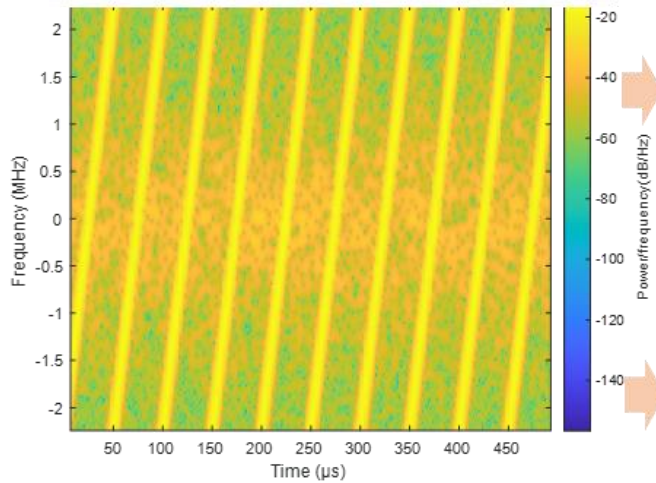


Interference detection and mitigation (2/2)

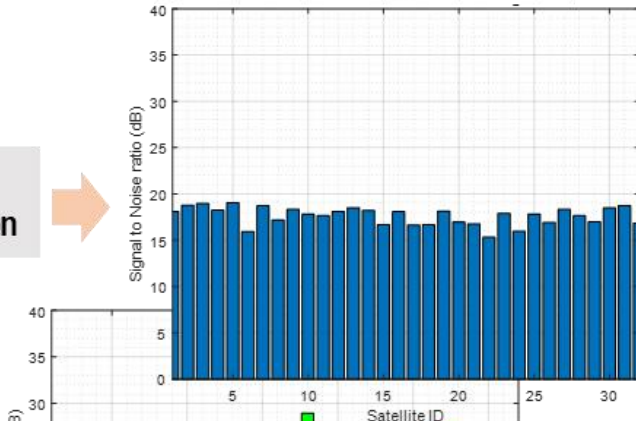
Example of results



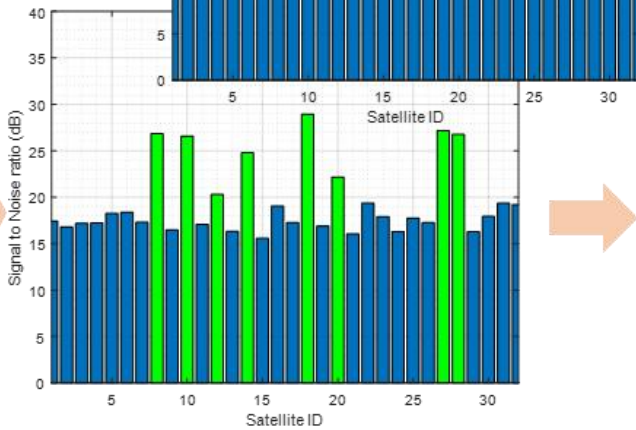
GNSS + interference (chirp)



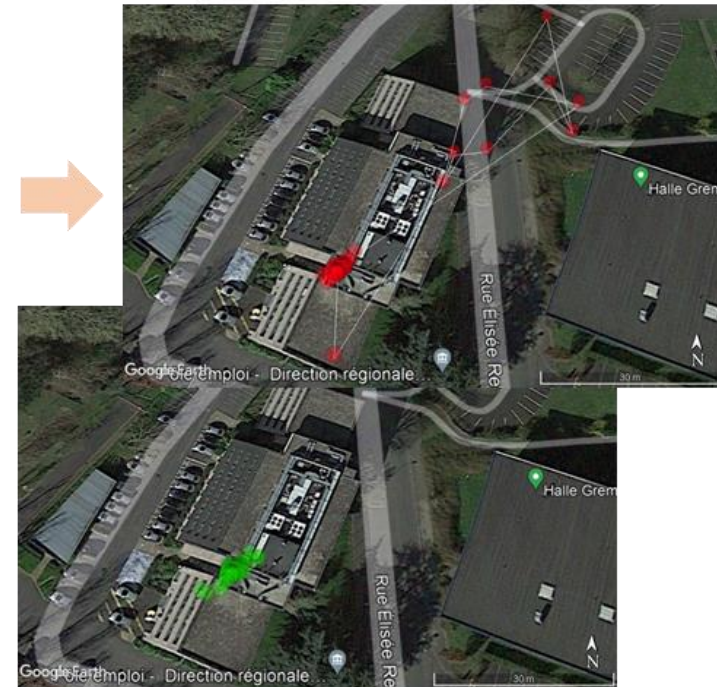
No Mitigation



ANF



Position estimated



Other recent results: Syed Ali Kazim, Juliette Marais, Nouridine Aït Tmazirte, Interferences in Safety-Critical Land Transport Application: Notch Filtering vs Wavelet Transform, an experimental analysis, ION GNSS+ 2022, Denver, CO.

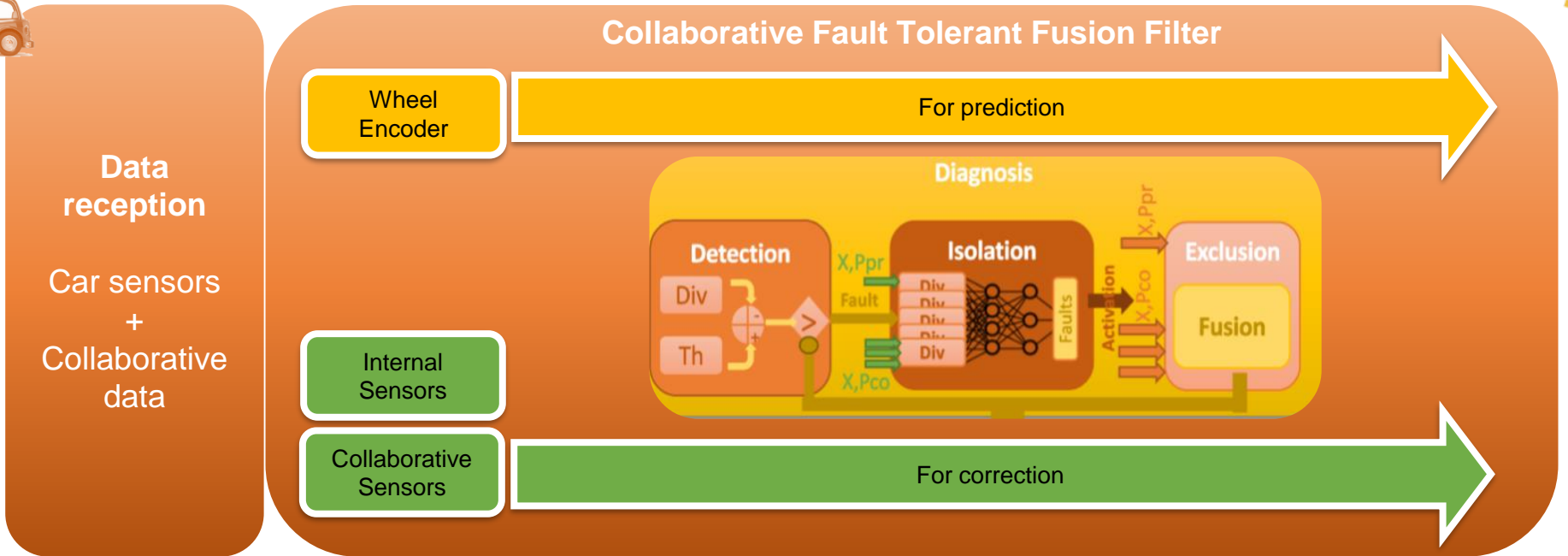


Cooperative vehicles localisation using artificial intelligence (1/2)

PhD Thesis Zaynab El Mawas



A diagnosis model generated by learning the different patterns of fault



A digital twin to generate scenarios and data for AI-based model

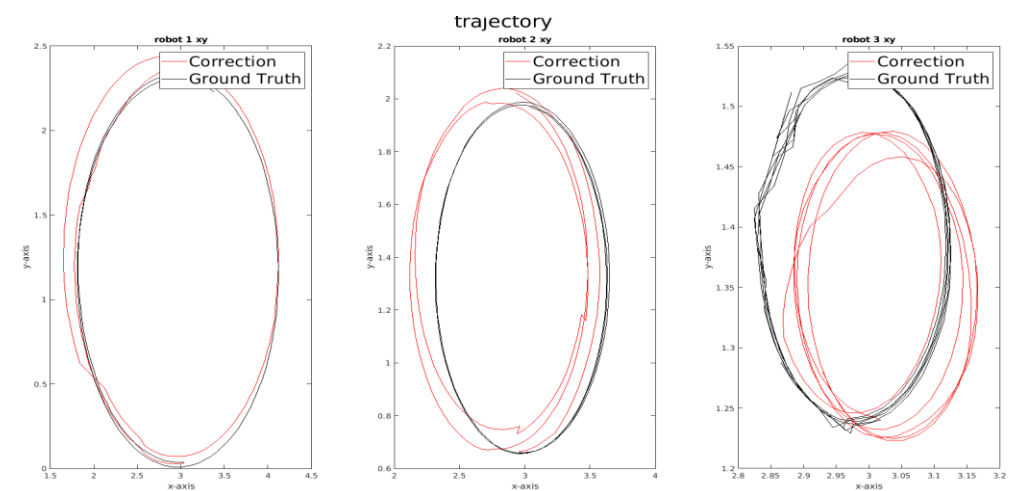
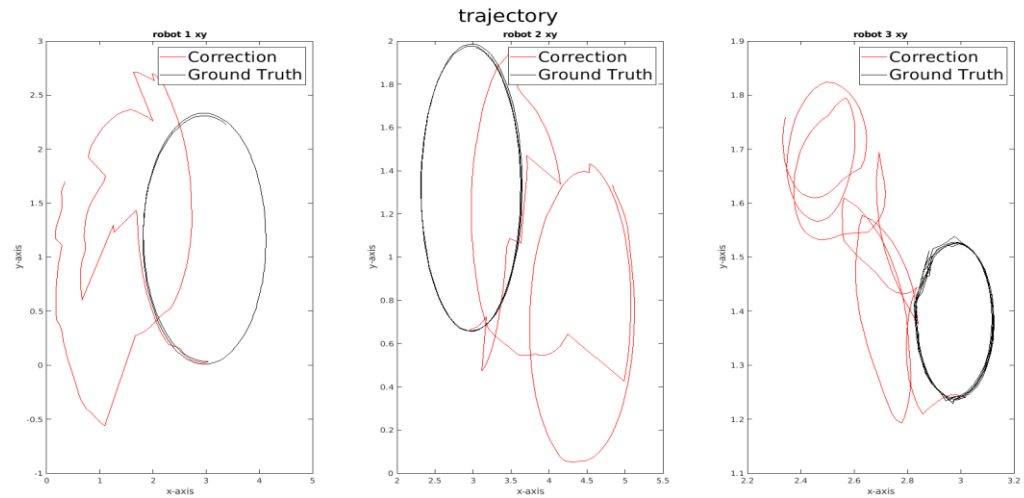
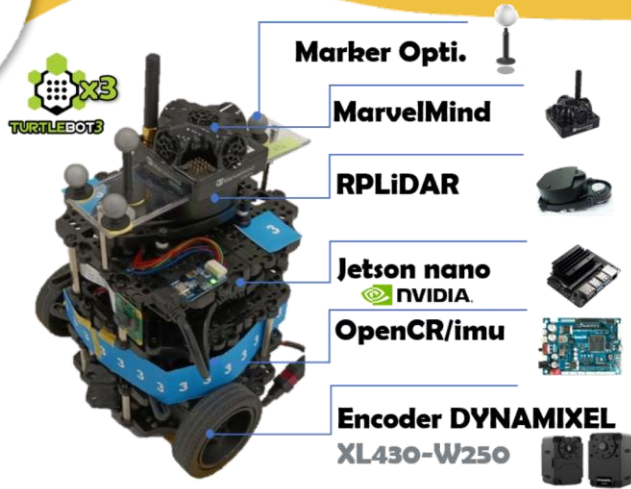


- CARLA: open-source simulator
- Trajectory sources: Visual display of the two vehicles trajectories
- Stella NGC HIL: GNSS simulation software
- Ucenter & RxControl

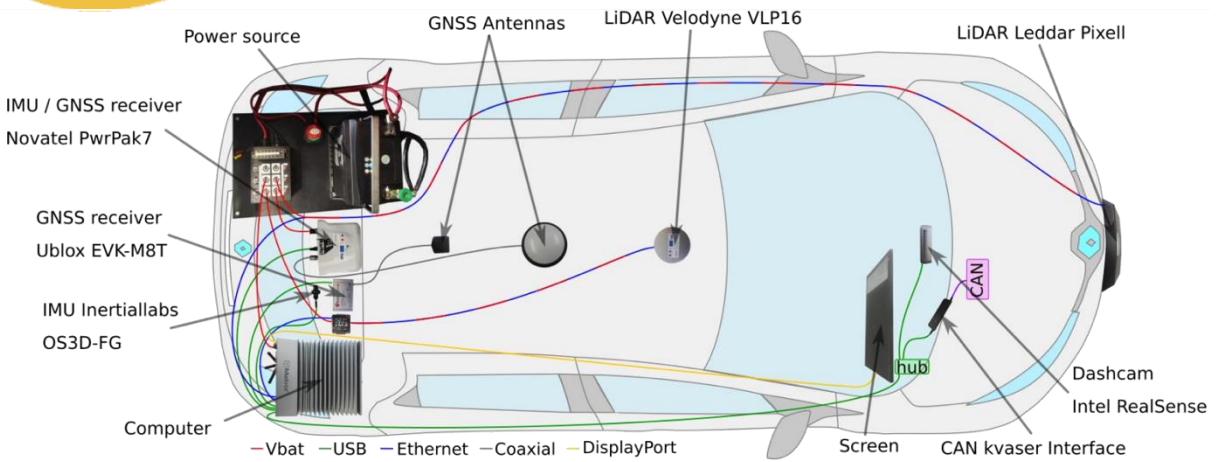


Cooperative vehicles localisation using artificial intelligence (2/2)

Example of result with robots



Experiments and database building are in progress!





Thank you!



<https://locsp.univ-gustave-eiffel.fr/>

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