

# TRANSPORT AND MOBILITY

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Transportation  
and robotics

## Description

Mobility and transport present major societal, environmental, economic and technological challenges.

In the cross-disciplinary area, we address mobility and transport at several levels: on the scale of a single mobile system (e.g. vehicle, motorised 2-wheeler, land or air robot, intelligent wheelchair, etc.), on the scale of systems of systems (fleet of several interacting mobile systems, multimodal mobility, last-mile logistics, etc.) and on a large scale (road traffic, intelligent infrastructure, analysis of mobility and impact data, integration of shared means of mobility with public transport, etc.) and on different scientific aspects and themes: control/command, multi-vehicle/robot cooperation or cooperation with humans, state estimation, diagnostics and fault tolerance, data fusion, modelling, graphs, optimisation, logistics, inclusive mobility, digital twins, etc.

## 'Emblematic' projects

- ANR LOCSP « Localisation sûre et précise »; ANR SOS « Auto-organisation adaptative et résiliente de flottes de robots hétérogènes par émergence collective pour une mission »; ANR ADELE (Allocation de ressources sous DEMandes incertaines en Logistique urbaine)
- PIA3-Equipex+ TIRREX
  - Main axis: Autonomous vehicle
  - Transversal axis: Digital infrastructure
- CPER RITMEA
- PEPR Agro-ecology and digital NINSAR
- Confiance.IA « Reliable AI for cyber-physical systems using control theory » in partnership with System X at Airbus
- Industrial contract CIFRE Autoliv « Modelling motion dynamics: combining theoretical models and experimental data models »
- European project SUM (Seamless shared urban mobility)

## Teams concerned

- ♣ **GT ToPSyS (Tolérance Pronostic Système de Systèmes):** PERSI, SoftE, ToSyMA
- ♣ **GT I2C (Interaction et Intelligence Collective):** BCI, SMAC
- ♣ **GT CO2 (Commande et Calcul Scientifique):** SHOC
- ♣ **GT OPTIMA (OPTimisation Modèles et Applications):**  
BONUS, INOCS, ORKAD, OSL
- ♣ **GT Image:** 3D SAM
- ♣ **GT SISE (Systèmes Informatiques Sûrs et Efficaces):** 2XS
- ♣ **GT DatInG (Data Intelligence Group):** MAGNET, SCOOL
- ♣ **Plateform:** PIRVI, PRETIL



## Transport and mobility

Today's environmental and socio-economic challenges, as well as new technological possibilities such as intelligent and connected vehicles and smart infrastructure, mean that transport and mobility are areas that are constantly changing and evolving. From the revolution promised by autonomous vehicles and smart cities to changes in travel patterns linked to energy availability, carbon footprints and the desire for change, mobility is at the heart of the challenges of today and tomorrow.

The 'Transport and Mobility' cross-cutting theme enables CRIStAL's researchers in automation, computer science, robotics and applied mathematics to exchange and collaborate on these issues by bringing together the specific expertise of the different thematic groups. Mobility and transport are explored at various levels, from the single mobile entity to large-scale systems such as road traffic. Our approaches encompass several scientific and thematic aspects in order to understand and improve mobility systems as a whole.

*On the scale of the individual mobile system*, we are particularly interested in the problems of control and command, dynamic modelling, fault diagnosis, prognosis, state estimation, localisation, etc.

*On the scale of multi-vehicle or multi-robot systems*, CRIStAL has particular expertise in cooperative estimation, control and diagnosis, multi-sensor data fusion, vehicle fleet optimisation, urban and last-mile logistics, robot swarms, multi-vehicle cooperation, self-organisation through fleet emergence and safety.

*Finally, on a large scale*, the research themes cover aspects such as traffic modelling and simulation, sensor networks and mobility, intelligent infrastructures, collective behaviour, analysis of mobility data, cybersecurity, use of learning and AI for decision-making, etc.

The aim is therefore to develop innovative technologies that improve the safety, efficiency and sustainability of mobility systems and are capable of adapting to the changing needs of users and environments. The members of CRIStAL's 'Transport and Mobility' cross-disciplinary theme are actively involved in the Land Transport and Mobility Research Federation (FR TTM CNRS 3733).