



**POLITECNICO
MILANO 1863**

DriSMi Driving Simulator Lab



DriSMi

BIG LAB

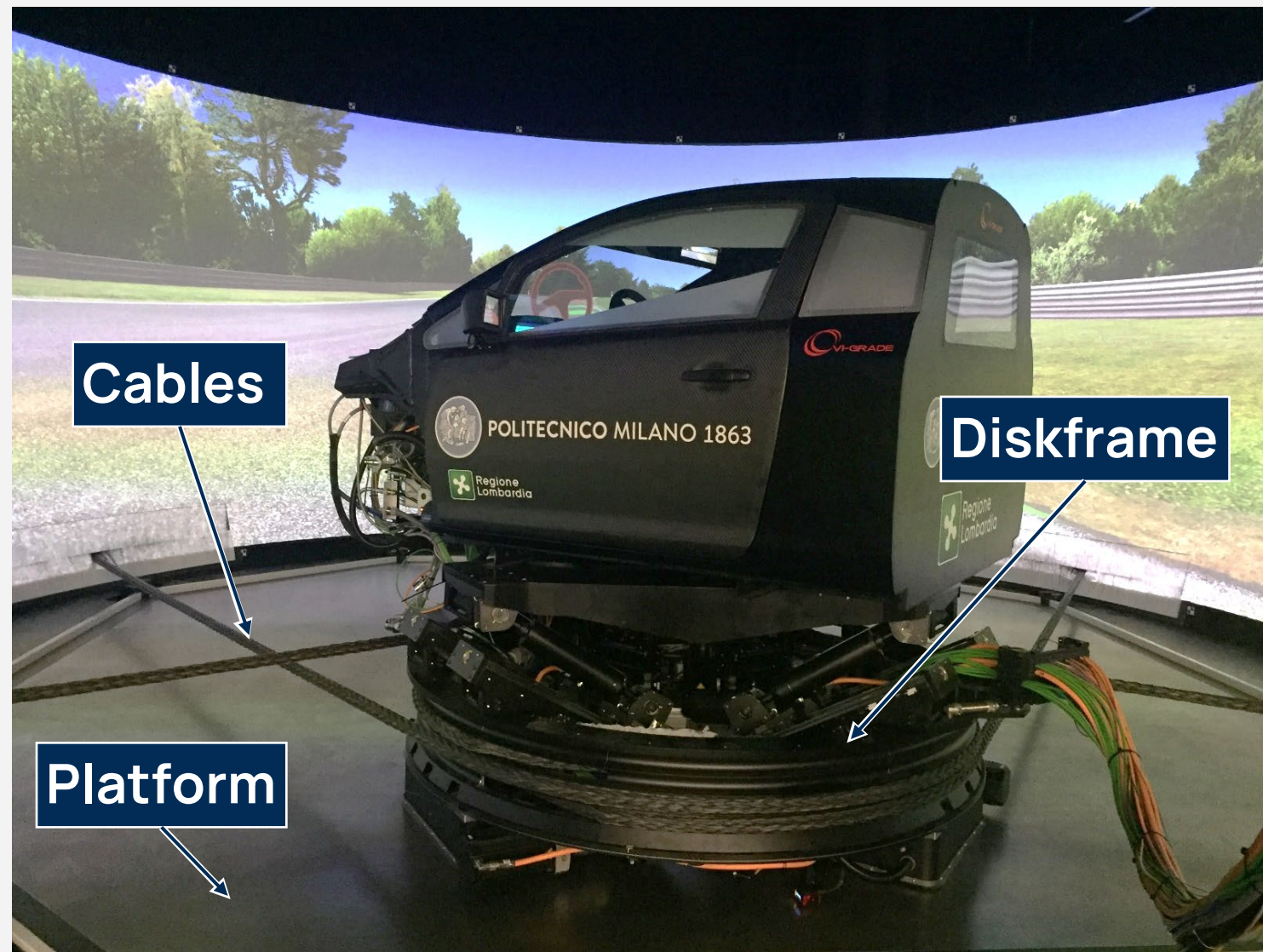


DriSMi: Dynamic Driving Simulator of Politecnico di Milano

- Innovative **cable-driven** DiM400 Dynamic Driving Simulator engineered by VI-Grade
- Used for performance studies of vehicles and subsystems related to:
 - New Material & Component Design
 - Ride & Handling
 - Active Safety Systems (ADAS)
 - Automated and Connected Vehicles
- The laboratory was created thanks to a substantial investment from the Government of the Lombardy Region
- The project has been promoted by the Lombardy Mobility Cluster

A cable-driven dynamic driving simulator

- DIM400 is mid-size dynamic driving simulator: **the platform is 6x6 m**
- It is based on a patented new technology allowing the movement of the diskframe through cables
- This solution allows for **more workspace** with respect to conventional solutions (electric-actuators)
- In addition, **translations and rotation** of the diskframe **are decoupled** throughout the platform

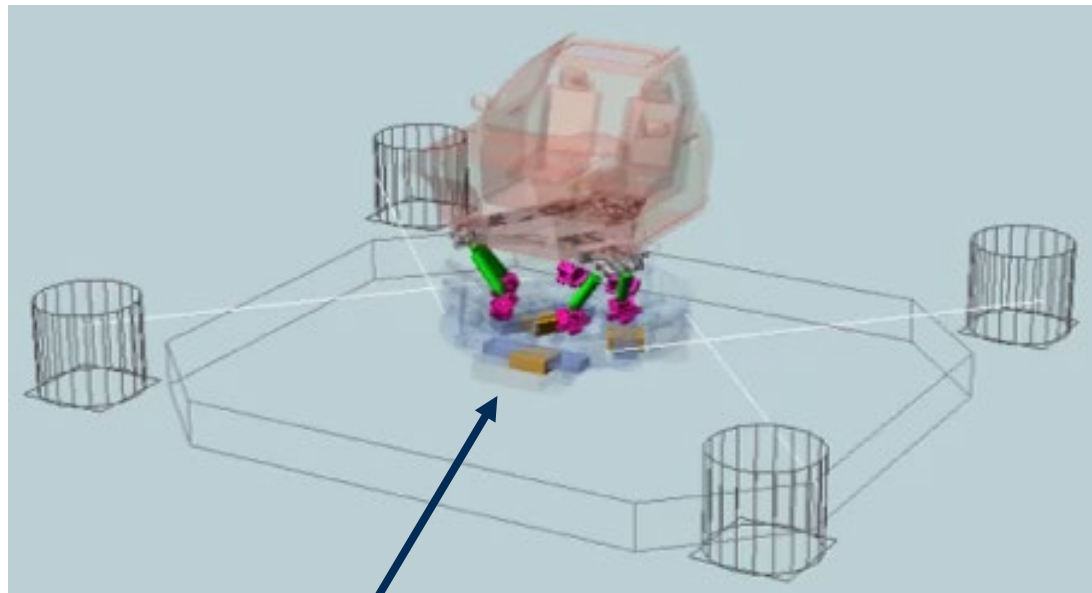


Performances of DriSMi



- The architecture allows increased workspace, meaning **larger accelerations**: up to **1.5 g** in longitudinal/lateral direction, **2.5 g** in vertical direction.
- **Less tilt coordination** and better perception of lateral sliding
- Bigger heave (**z: $\pm 280\text{mm}$**) for a better vertical feel
- Manouvers like double lane change can be simulated in **1:1 scale**
- Overall latency $\approx 20\text{ ms}$

DriSMi main features: diskframe movements



Diskframe **moved by 4 cables** over a 6x6 m horizontal surface: 3 DOFs, **bandwidth ~3 Hz**.

Thanks to **3 airpads**, the diskframe slides over the platform

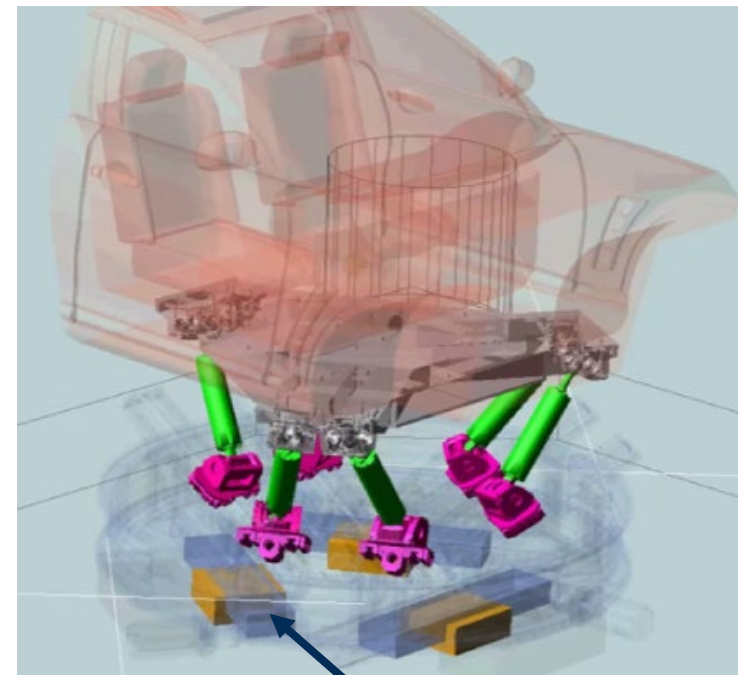


DriSMi main features: hexalift and ICS



Hexalift moving with the diskframe **adding** further **6 dofs** to the cockpit; **bandwidth ~30 Hz**.

8 on-board shakers (bandwidth ~200 Hz) to reproduce vibration coming from the engine or road irregularities



Inertial compensation system (ICS)

DriSMi main features: realism and immersivity



- **Active belts/active seat** mimic the effects of **sustained** longitudinal/lateral **accelerations**
- Provided with **active steering** for a realistic feedback and simulate active steering control systems
- Provided with **active brake** to reproduce the proper pedal feeling and the effect of active controls like ABS
- **5 speakers** inside the cockpit reproduce the noise sources inside and outside the vehicle

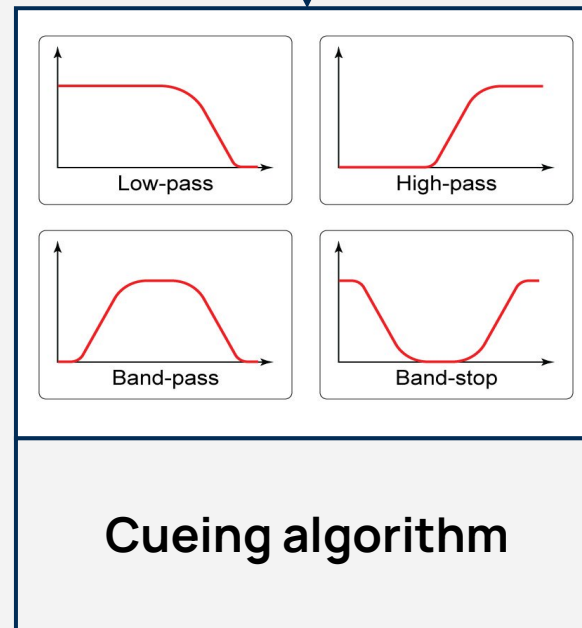
Cueing algorithm

The cueing algorithm receives inputs from the simulated vehicle and applies filters to the degrees of freedom (DOFs) to generate outputs, which correspond to the simulator's movements.

It reproduces the accelerations according to the workspace available.



Large motion
from the
virtual world



Simulator motion

DriSMi additional sensors: Instrumented Steering Wheel

- Real-time acquisition of **forces, moments and grip force** at each hand
- Specifically **designed at Politecnico di Milano**
- Can be adapted and improved for specific projects



DriSMi additional sensors: Biotelemetry



EEG



Questionnaires



Eye-Tracker



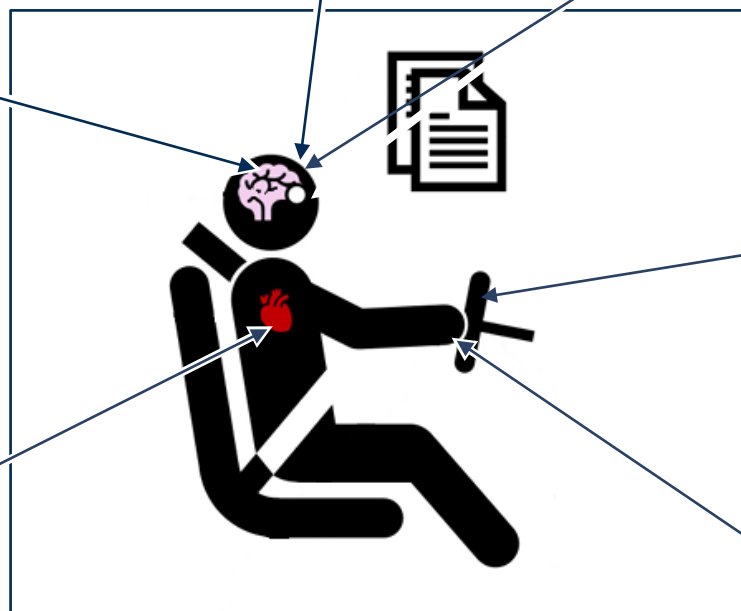
Instrumented
Steering Wheel



ECG



Skin Conductance



Simulation environment

- Racetrack
- Urban
- Highway
- Every weather condition



Projects: HL4IT

Interaction of
Humans with Level 4
automated vehicles
in an Italian
environment -
analysis of the
Takeover Request



01

Roundabout with
roadworks



02

Highway viaduct
with wind gust



03

Suburban road
with fog

Projects: Hydroplaning

Application of an
**active control
strategy** to improve
vehicle behaviour
during **hydroplaning
condition**

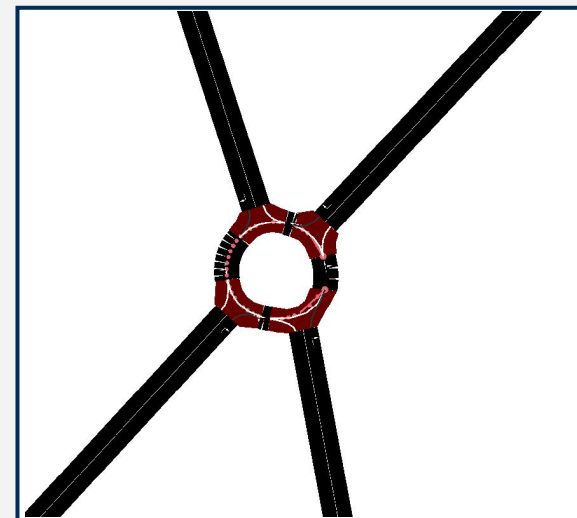


Projects: AI@EDGE

Analysis of **mixed traffic condition** (autonomous and human driven vehicles) in a **roundabout scenario** with **smart infrastructures** and **artificial intelligence**



Real world



Traffic simulator



Virtual world

Thanks your attention



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Contatti

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