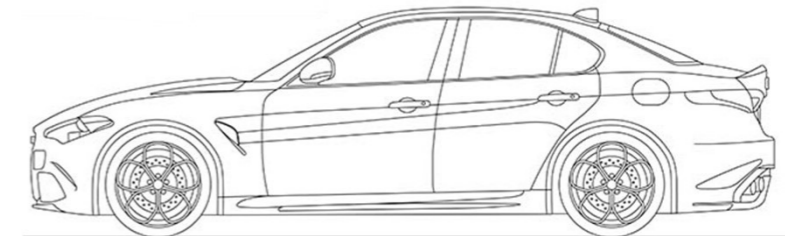# The future of the automotive industry

Author: Alessio Anticaglia, Luca Veneroso
Department of Industrial Engineering
Laboratory: V2D

UNIVERSITÀ DEGLI STUDI FIRENZE

**What is the future of the automotive industry?**
The answer to this question is not obvious, especially in this historical context, where the automotive is facing a transition due to the rising safety standards and the energy transition.
What is certain is that mechatronics and digitalization will have a central role in future road vehicles.
We, in our research group, are working strongly to speed up this evolution.

**1957**
*Components*
**0 lines of code**

**2022**
*Functions*
**10 – 100 million lines of code**

Mechatronic devices offer the possibility to customize the behavior of the vehicle in different situations in a very precise and flexible way. Advanced vehicle dynamics controls, safety-related functions, ADAS systems are just some examples of the many possibilities offered by these devices.
All these advanced vehicle functions are possible thanks to the data stream among all vehicle subsystems.

**Can we simplify this development process or make it smarter?**
**Is it possible to centralize in one unit all vehicle functions?**

With this aim in mind, I am working on a software tool that can help the integration process of all subsystems.
In this way, some operations could be automated and the control strategies definition process could be more straightforward.
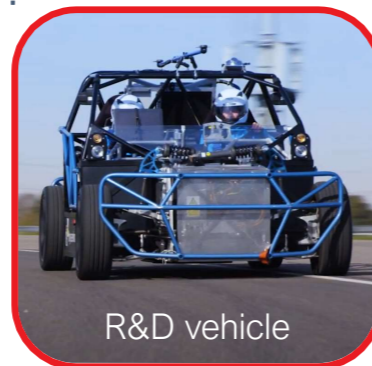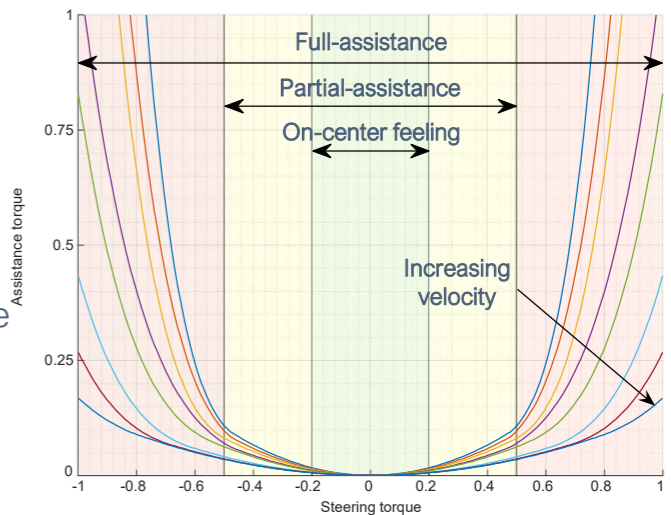
**R&D vehicle**

The goal is to shorten the time between conceptual ideas and tests.
This tool shall be suitable for both Hardware in the Loop simulators and Research & Development vehicles.

CCUR AutoHawk

Vehicle steering rack

Driver cockpit

Displacement sensor

Electric motors

**Hardware in the Loop simulator**

Electric power steer (EPS) enhance driving comfort reducing driver steering effort and improving safety and fuel consumption.
In recent years the EPS becomes a key system to implement Advanced Driver Assistance System (ADAS) and enable autonomous driving.
Actually the development of these systems is one of the most time-consuming activity during vehicle design process because of the need of many test related to control tuning, driver interaction and fault injection tests.

Full-assistance
Partial-assistance
On-center feeling
Increasing velocity
Assistance torque
Steering torque

**How can we speed up the developing process of autonomous vehicle steering algorithm and steering based vehicle functions?**
**Is it possible to create a single development device to simplify the steering system development?**

Answering to these two questions, I am developing an Electric Power Steer system which is suitable to speed up the development process providing an easy software interface to implement various vehicle functions and autonomous driving algorithm.
To support software developers during testing and control tuning the new system should be easy to integrate with Hardware in the loop steering test bench and R&D vehicles.

**Actuation**
- Enables highly automated driving till SAE-Level 5
- Steer by wire

**Electronic control unit**
- CAN communication protocol
- Open access ECU
- Position control
- Torque control

**Control logic**
- Basic assistance torque
- ADAS functions
- Autonomous steering

MECCANICA 42

Vote for this poster