Test Environments for Artificial Co-driver in Dreams4Cars

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Project purpose

• Develop a dream-like mechanism where robots interact to develop and improve their Perception-Action system with particular focus on critical scenarios.

• The trained PA system will then be transferred back to the “live” system, improving robot sensorimotor control in situations that have been dreamt.
CRF role in D4C

- Safety metrics
- Traffic rules
- Comfort
- Efficiency

Evaluation metrics

Integrated test systems

- MIL
- SIL
- HIL
- Test vehicle

Complexity
Test environment – ingredients

Vehicle & Road

Test environments

Sensor & Actuator

DSP & Control

Co-driver

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Test environments
Test environments

MIL
MIL

Vehicle & Road

Sensor & Actuator

DSP & Control

Simulation PC (CarMaker, Simulink)

Environment & Vehicle Sensors

Scenario Collection

Scenario Message

Co-driver

Measures Message

Application & Control

MIL, Actuators & Communication

Co-driver
Test environments

SIL
SIL
Test environments

HIL

Co-driver Unit

Signal Processing & Data Fusion

Fast Prototyping Unit Simulink

Application & Control

Sensors, Vehicle, Road, Traffic

HIL Unit, CarMaker, Simulink

Sensors Data

Commands

Scenario Message (UDP)

Manoeuvre Message (UDP)

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HIL
Test environments
Test Vehicle
Test Vehicle
Test Vehicle
Hardware setup – Co-driver

MIL

PC

UDP server

SIL/HIL/Vehicle

VBOX 3600

NVIDIA PX2

UDP server
Hardware setup – Sensor & Vehicle

Signal processing & Control

- MIL/SIL
- HIL/Vehicle
- PC
- dSPACE MABX II

Vehicle & Sensors

- Front radar, front camera, front lidar, side ultrasound sensors, blind spot radar, GNSS receiver, Electronic Horizon

- MIL/SIL
- HIL
- PC
- dSPACE SCALEXIO
- Real vehicle
- Vehicle

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Current status & further work

- Introduce more complex scenarios
- Evaluate metrics
- Simulations fidelity tests
  - Speed adaptation
  - Car following
  - Lane following
  - Overtaking
Conclusions

• Increasing testing complexity:
  ✓ Efficient software development
  ✓ Rapid debugging
  ✓ Reduced number of tests in real vehicle

• Excellent portability of code among the different environments:
  ✓ Same Co-driver software executed all the way from MIL to Test Vehicle
  ✓ Same Co-driver unit implemented all the way from SIL to Test Vehicle
  ✓ The Signal processing & Control are kept the same in HIL and Test Vehicle

Overall SW structure must be designed from the beginning in view of achieving and easing the workflow
Thank you for your attention!
Questions?