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IMPROVING ADAS VALIDATION WITH MBT

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AGENDA

- What is an ADAS ?
- ADAS Validation
- Implementation
- Using the Results
- Applicability against Standards
- To Conclude





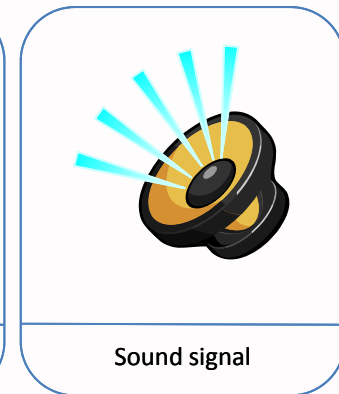
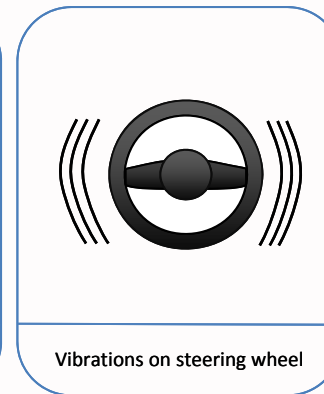
WHAT IS AN ADAS ?

Advanced Driver Assistance Systems

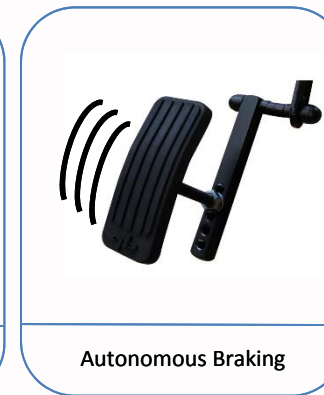
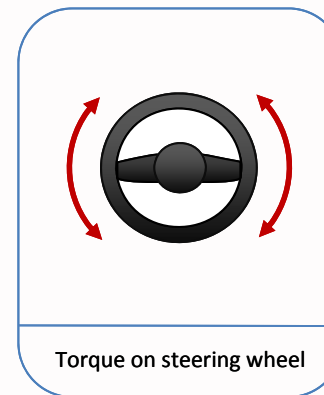


What is an ADAS ?

- ADAS missions :
 - Warn the driver



- Take control of the vehicle



What is an ADAS ?

- More and more functions are available :
 - Lateral guidance :
 - LDW (Lane Departure Warning), LKA (Lane Keeping Assist)
 - Longitudinal guidance :
 - AEB (Autonomous Emergency Braking)
 - Park the car :
 - PA (Park Assist)
 - Adapt the front light source :
 - AFS (Advanced Front-lighting System), AHA (Adaptive High beam assist)
 - Regulate the speed of the car :
 - ACC (Adaptive Cruise Control)
 - And so on...





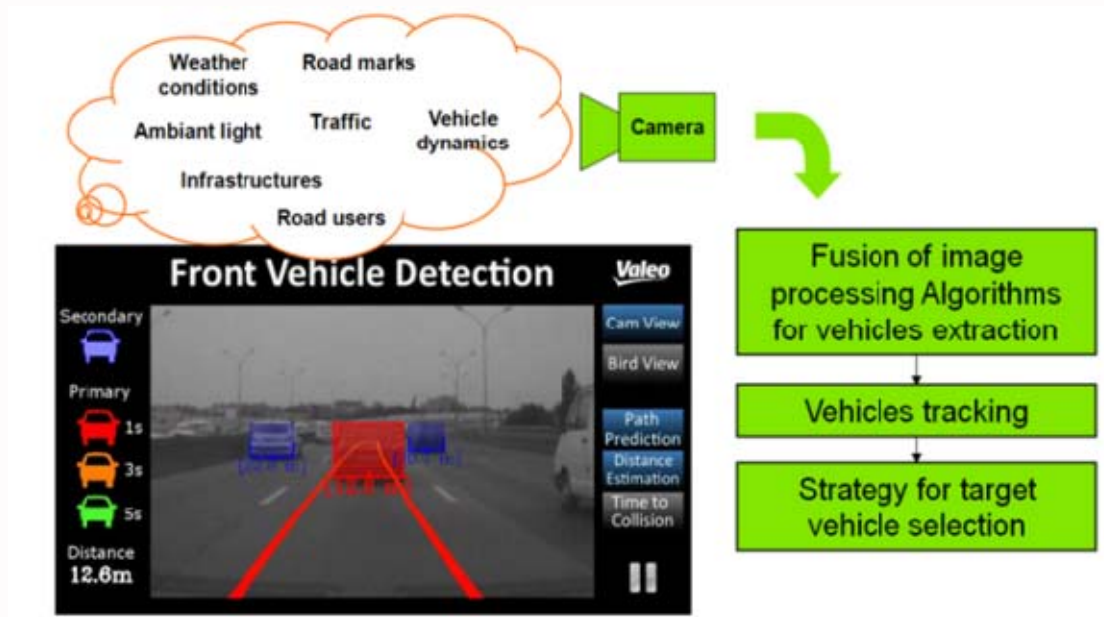
ADAS VALIDATION

How validate an ADAS ?



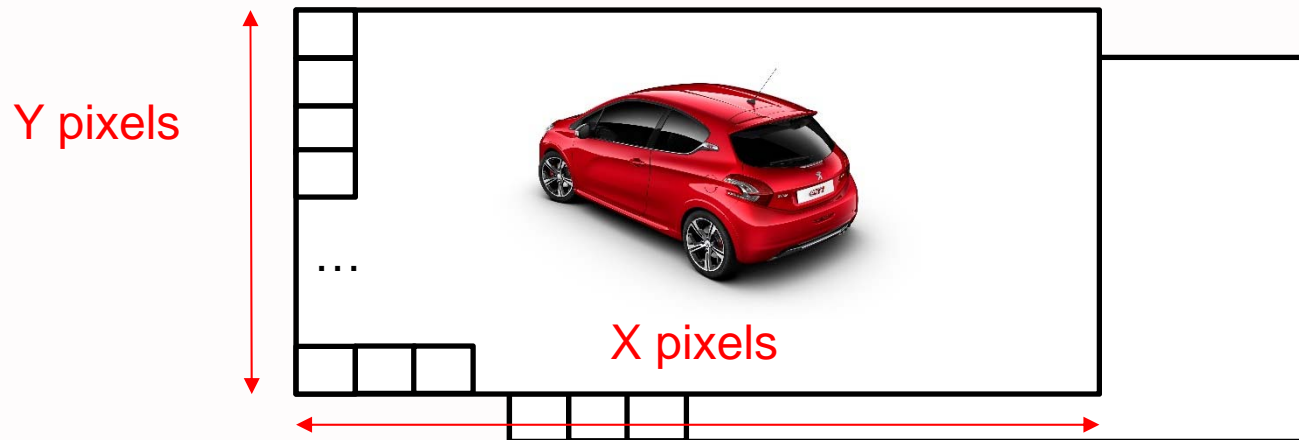
The ADAS Validation

- The System under Test :



The ADAS Validation

- Signal sent by the camera :



- Need to reduce the number of possible stimuli

The ADAS Validation

- ADAS Validation by driving test
 - Use of video sequence libraries



- But this has many drawbacks : Driving situations
 - are limited
 - have a bad representativeness
 - are costly



IMPLEMENTATION

The COVADEC Methodology





Implementation

- Purpose :
 - Prove that the ADAS behavior is compliant with safety goals
 - Validate the reliability of the ADAS function
- How :
 - By using a sufficiently representative test campaign to measure if the safety goals are achieved





Implementation

- Terminology :
 - Influent Parameter : Parameter of ADAS environment which has an influence on ADAS behavior and response
 - Test Case : Short video sequence for which for each Influent Parameter a value is selected from one of the possible Equivalence Classes
 - Equivalence Class : A set of values associated with an Influent Parameter for which the ADAS behavior and response are assumed to be the same





Implementation

- Pre-requisites :
 - System Under Test : ADAS with camera sensors
 - Identification of influent parameters and associated probabilities (usage profiles)
 - It must be possible to simulate influent parameters
 - Probabilities distributed in such a way that there are a lot of duplicate test cases
 - ADAS algorithms must be available at a level (HIL, MIL, SIL) for which simulation is available





Implementation

- Phases :
 1. Identification of influent parameters
 2. Identification of dependencies between parameters
 3. Identification of statistical profiles and equivalence classes
 4. Identification of reliability goal
 5. Construction of a test model
 6. Generation of test cases
 7. Execution of test cases on simulation tools
 8. Identification of problem cases
 9. Conclusion on reliability objectives





Implementation

- Methodology goals :

- Build quickly
- on request
- and with reduce cost

a test campaign equivalent to hundreds of thousand kilometers

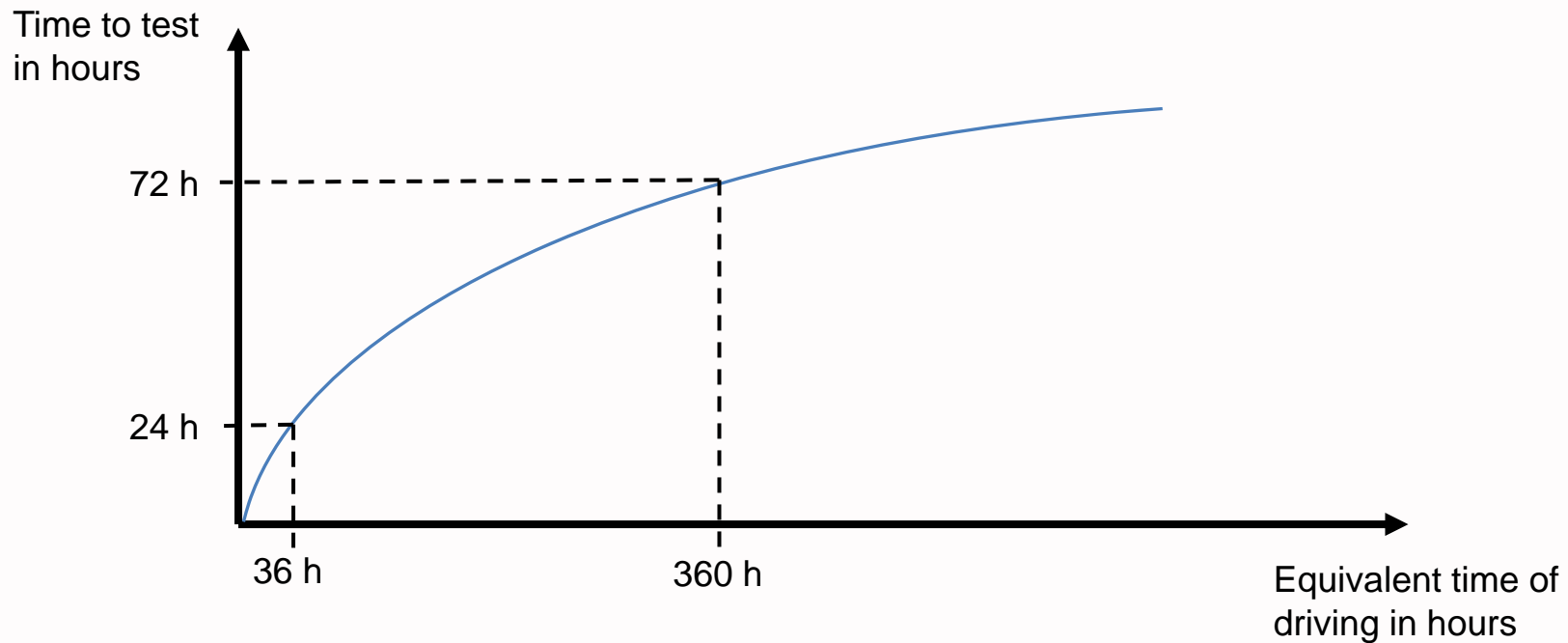
- With Good representativeness of :

- Road environments
- Weather conditions



Implementation

- Test effort reduction :





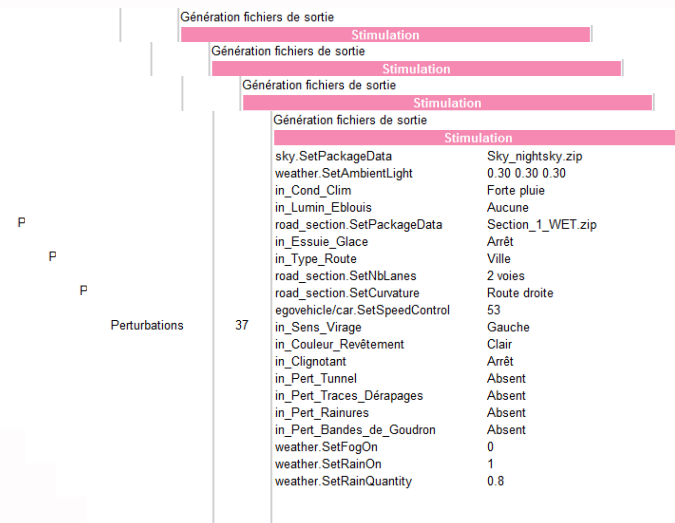
USING THE RESULTS

How the test campaigns database can be used

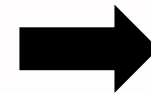


Using the Results

- Results are test campaigns with a set of test cases representative of thousands of kilometers of driving



Generate database of computer-generated images

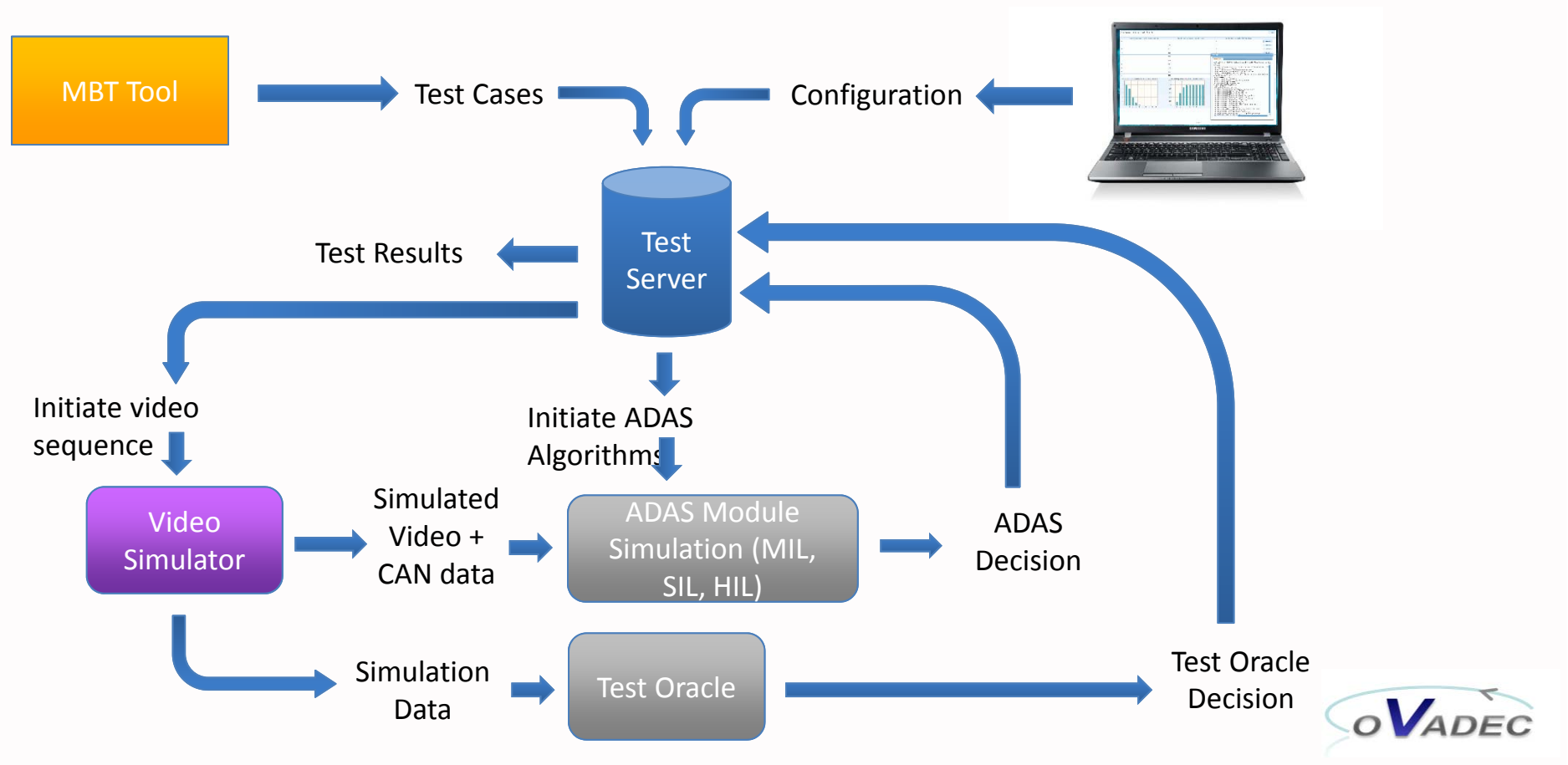


Provide input for the selection of the test drives



Using the Results

- Use for test automation :





APPLICABILITY AGAINST STANDARDS

Conformance with automotive safety standards





Applicability against Standards

- ADAS are not covered by the ISO 26262 standard (Road Vehicles – Safety) :
 - “ISO 26262 does not address the nominal performance of E/E systems”
 - ADAS errors are not security-related events as defined by ISO 26262





Applicability against Standards

- A new automotive standard (ISO 26262 evolution) is currently being prepared :
 - For ADAS
 - For autonomous vehicle
- The COVADEC project is, with other R&D projects, used to integrate new concepts and prepare for this future standard.





TO CONCLUDE

Conclusion





To Conclude

- The proposed methodology shall be one of the one of the methods provided by the future standards
- It will not replace real driving test, but would be used to maximize efficiency of test validation
- What we are seeing today is the beginning of an era where cars will become more and more autonomous





Thank you

Questions ?



<http://www.covadec.org>

