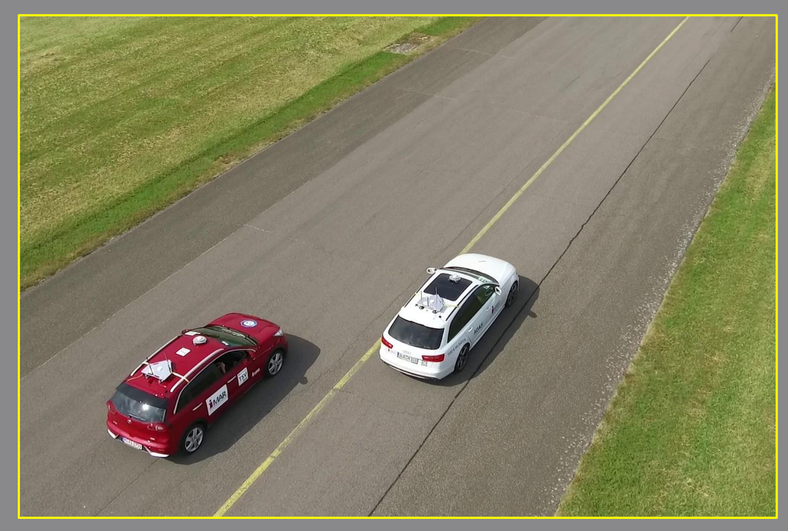
iSWACO-ARGUS

Repeatable & Efficient Vehicle Behavior Testing

SEAMLESS TOOLCHAIN FOR VEHICLE IN THE LOOP TESTING ON THE PROVING GROUND



iSWACO-ARGUS: Proving Ground Instrumentation for Efficient Testing of Highly Automated Driving Vehicles up to SAE Level 5

iSWACO-ARGUS is the solution to the challenge how to verify and homologate the safety relevant features of automated and autonomous driving vehicles of all SAE levels.

- **iARGUS-CMD**: Seamless work-flow from **scenario simulation** import (OpenScenario, CarMaker or similar) to **test execution**, surveillance, visualization and data export. Simultaneous **handling of 10++ objects**.
- Mobile setup, **easily and fast to be implemented** on arbitrary proving grounds. Generic interfaces.
- Capability to drive Traffic Simulation Vehicles like iMAR's **iTSV-KIA** via its integrated steering, throttle and braking actuators. Driving robots supported on demand.
- Capability to manage Soft Crash Targets (**SCT**) [from 4a, ABD, Humanetics / DSD, DRI etc. on demand] and Virtual Elements (**VE**).
- Includes professional INS/GNSS based vehicle localization with **iTraceRT-MVT** and **iDMN** mesh network or **4G/5G** based low latency communication.

iSWACO-ARGUS is designed to cover also the requirements of the **future ISO 22133-1 standard** "Road Vehicles - Test Object Monitoring and Control for Active Safety and Automated / Autonomous Vehicle Testing".

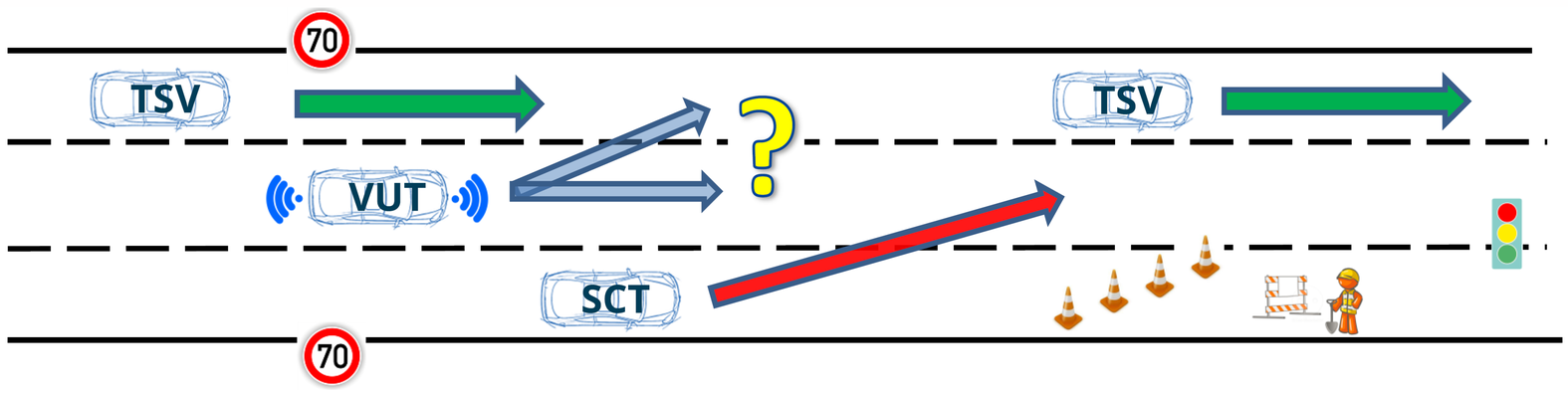
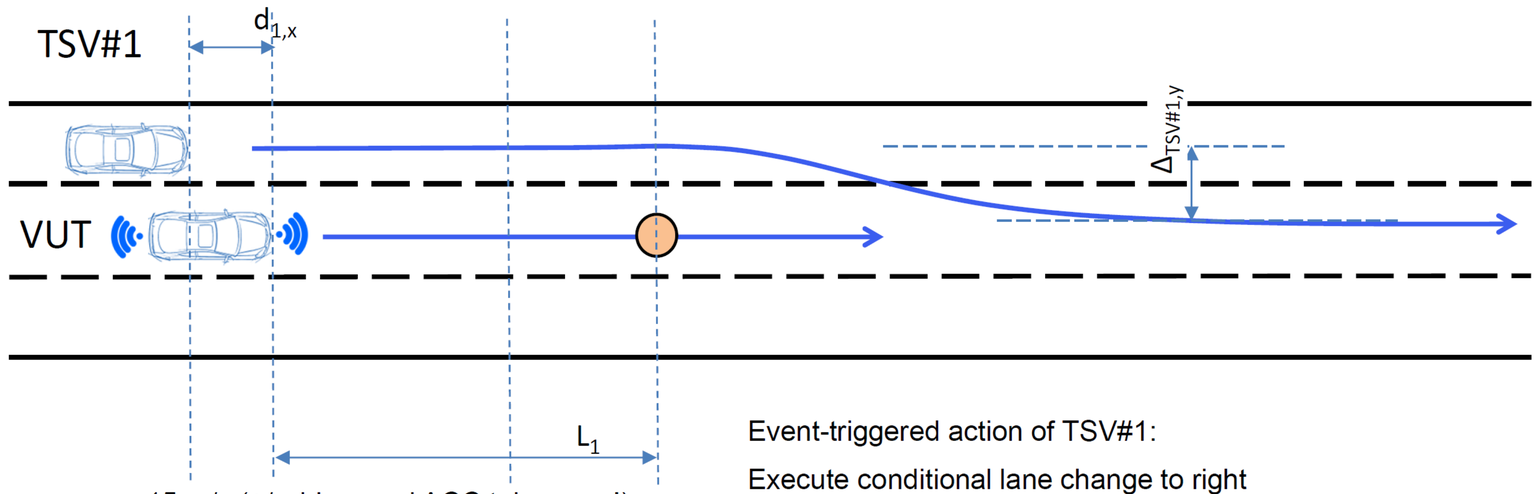


Figure: *Test scenario to test the Vehicle Under Test (**VUT**) with fully automated guided Traffic Simulation Vehicles (**TSV**) and Soft Crash Targets (**SCT**) under realistic traffic scenarios on the proving ground, including Infrastructure Elements (**ISE**) like construction areas, traffic lights or traffic signs and Virtual Elements (**VE**)*

Complex Conditional Lane Change Scenario (PEGASUS):
conditional lane change of TSV#1, when the TSV#1 has reached a distance of L1 in front of the VUT.



$v_{VUT,x}$ = 15 m/s (+/- driver and ACC tolerance !)
$v_{TSV\#1,x}$ = $v_{VUT,x}$ + 2 m/s (adaptive controlled) („master - slave")

Event-triggered action of TSV#1:
Execute conditional lane change to right
with attributes: $v_{TSV\#1,x}$ = const. $\Delta y_{TSV\#1,y}$ = +3.7 m
$a_{TSV\#1,y}$ = +2.44 m/s², T = 2.4 s
as soon as $d_1 \geq L1$ becomes initially true

Action 2 s after the lane change has been executed:
$v_{TSV\#1,x}$ = braking with -3 m/s² down to 0 m/s

Expected action of automated guided VUT: It should follow the TSV#1 and stop at the end

Figure: *Dedicated complex test scenario with conditional actions, defined – among others – within the German PEGASUS project (www.pegasusprojekt.de) as an example for iMAR's iSWACO-ARGUS capabilities.*

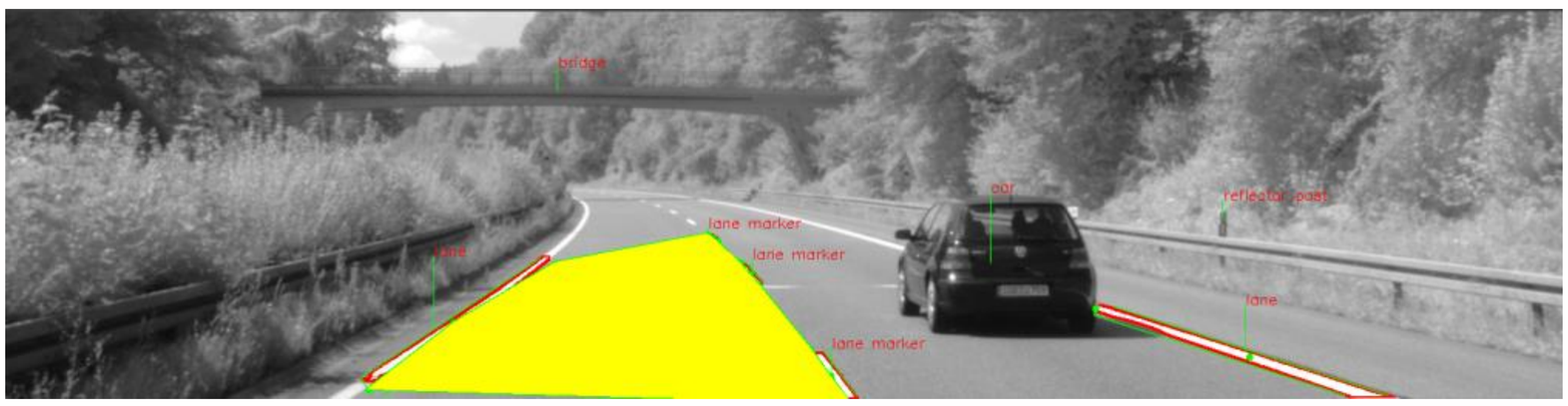


Figure: Environment perception using machine vision, based on deep learning (by iMAR's iARGUS-MV)

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