ARTS21 'International Activity'

Development of "Driving Intelligence Validation Platform" for ADS safety assurance

-SIP-adus activity in Japan-

Seigo Kuzumaki

Program Director of SIP-adus

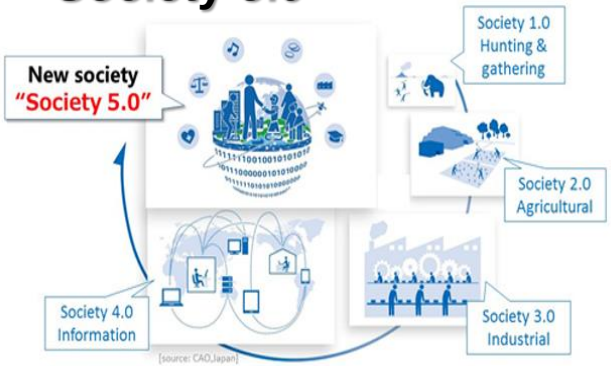
15 July. 2021

SIP ; Strategic Innovation Promotion Program adus ; Automated driving system for universal service

SIP Cabinet Office

SIP

Society 5.0



Strategic Innovation promotion Program

SIP 2nd FY2018～FY2022

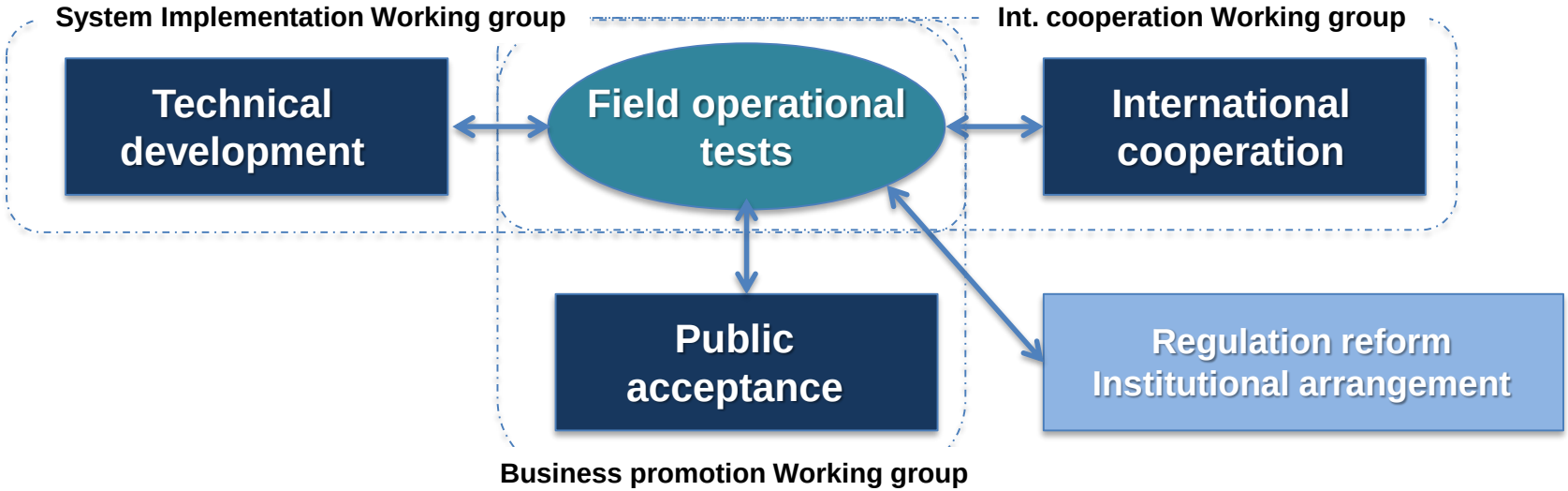
12 themes on going (SIP-adus is one of them)

adus ; Automated driving system for universal service

- Promote cross-sector and **industry-academia-government collaboration**
- Intensive R&D program from **fundamental research to practical and commercialization**
- Promote Regulatory reform

Focus themes

【4 pillars】

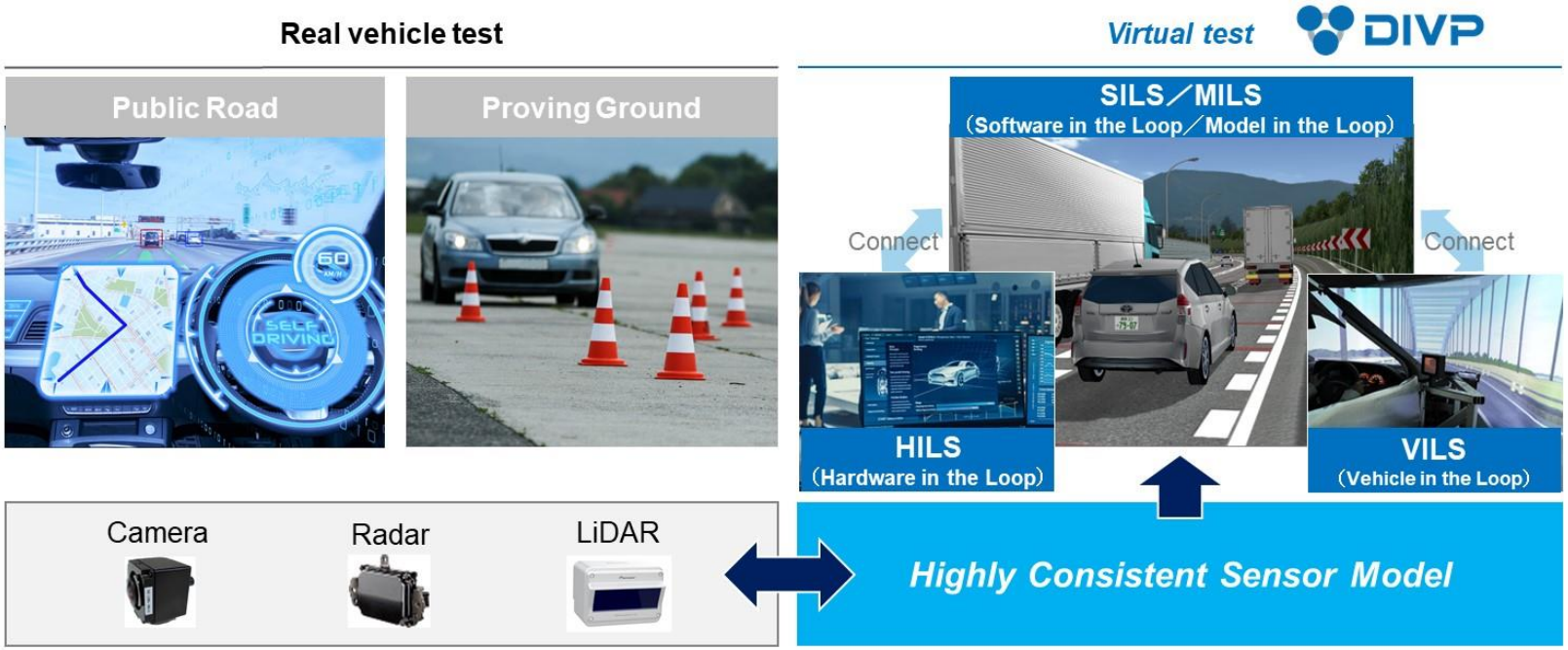


【Focus themes】

（Ⅰ） Traffic environmental information (Dynamic map)
（Ⅱ） Traffic environmental data portal
（Ⅲ） Virtual validation platform for ADS safety assurance
（Ⅳ） Evaluation methodology of Intrusion detection system

Evaluation in virtual space

Project focus ; Precisely Duplication from Real to Virtual, and Verification of highly consistency between sensor model and real testing.

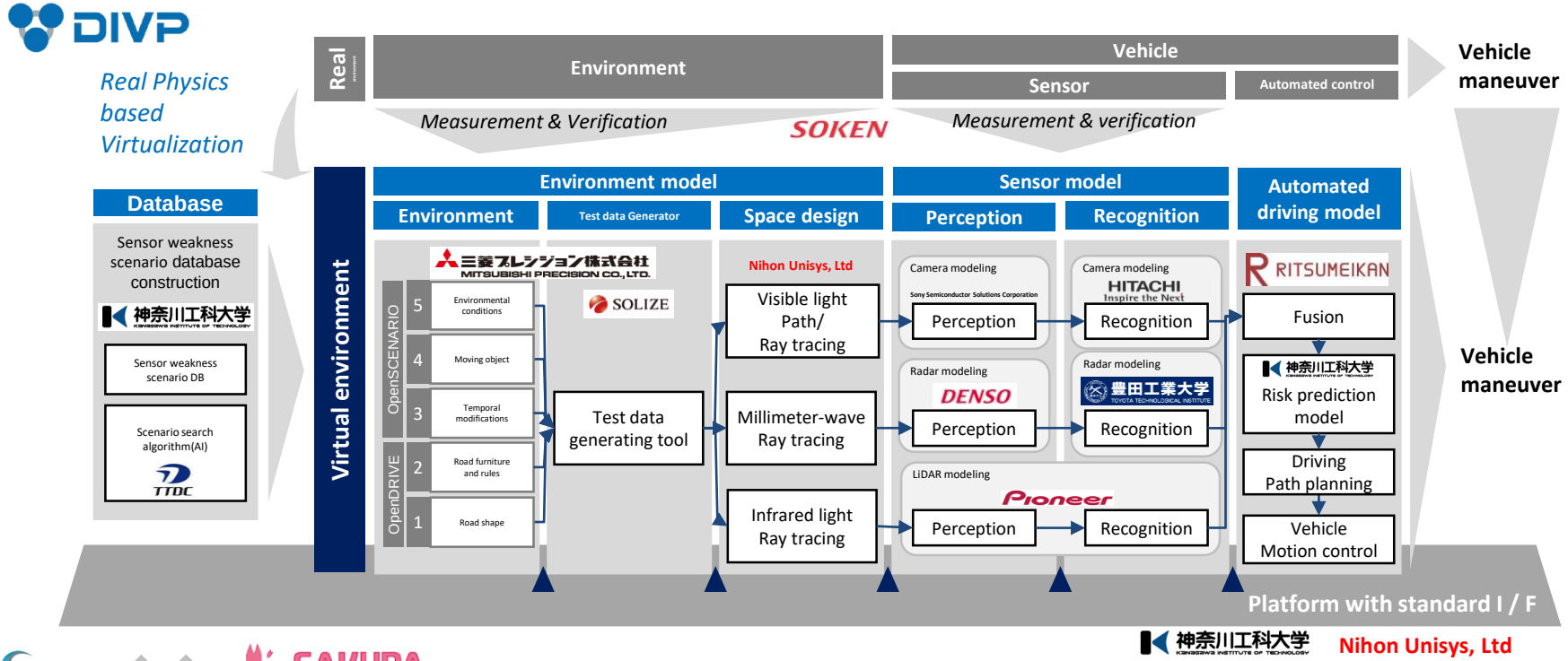


Source : Kanagawa Institute of technology, MITSUBISHI PRECISION CO.,LTD., DENSO Corporation, Pioneer Smart Sensing Innovations Corporation, Hitachi Automotive Systems, Ltd.

DIVP; Driving Intelligence Validation Platform

Project design

DIVP™ Consortium is established by 12 organization from industry and academia, and collaborating with the SAKURA project promoted by JAMA and JARI.

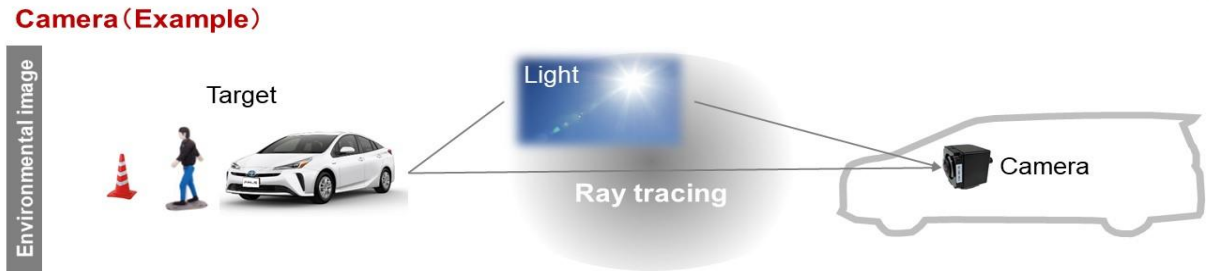


神奈川工科大学 Nihon Unisys, Ltd

SIP SAKURA Safety Assurance KUdos for Reliable Autonomous Vehicles

SAKURA project ; Safety Assurance KUdos for Reliable Autonomous Vehicle project
JAMA; Japan Automobile Manufacturer Association JARI; Japan Automobile Research Institute

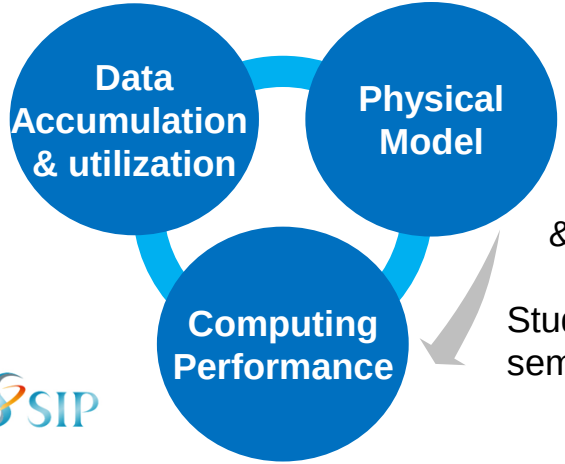
Scope & Objective



DIVP™ Driving Intelligence Validation Platform

DIVP™ scope

Trinitarian approach



Platform implementation

&

Study reasonable semiconductor spec

DIVP™ Objectives

- ***Open Standard Interface***
- ***Reference platform with reasonable verification level***
- ***E & S pair model based approach***
  (E : Environmental model, S : Sensor model)

Camera Simulation output

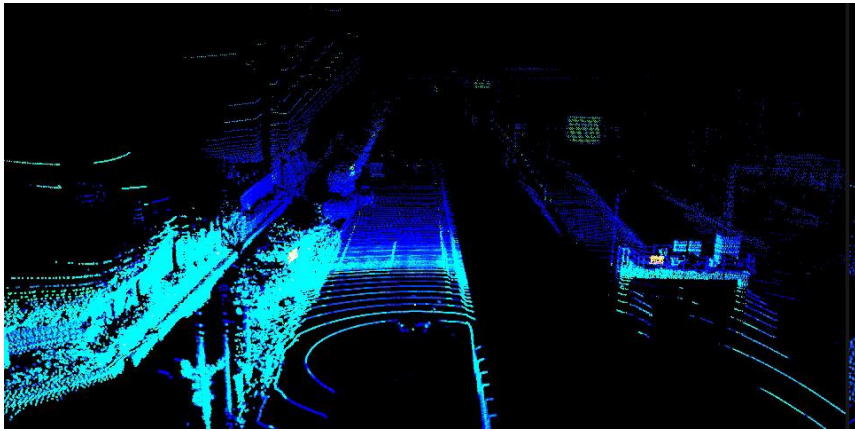
The camera model simulates spectral characteristics that are input to semiconductors such as CMOS, rather than the RGB is human eyes friendly.

Real movie　　SIM output　(Clear sky)

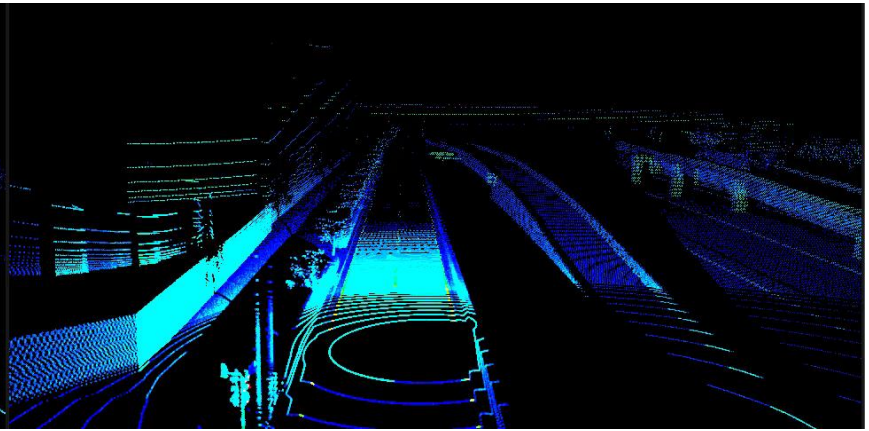
Lidar Simulation output

Lidar model simulation has a good coincidence with real Lidar output.
It is possible to evaluate environmental disturbances such as background light.

Real Lidar output

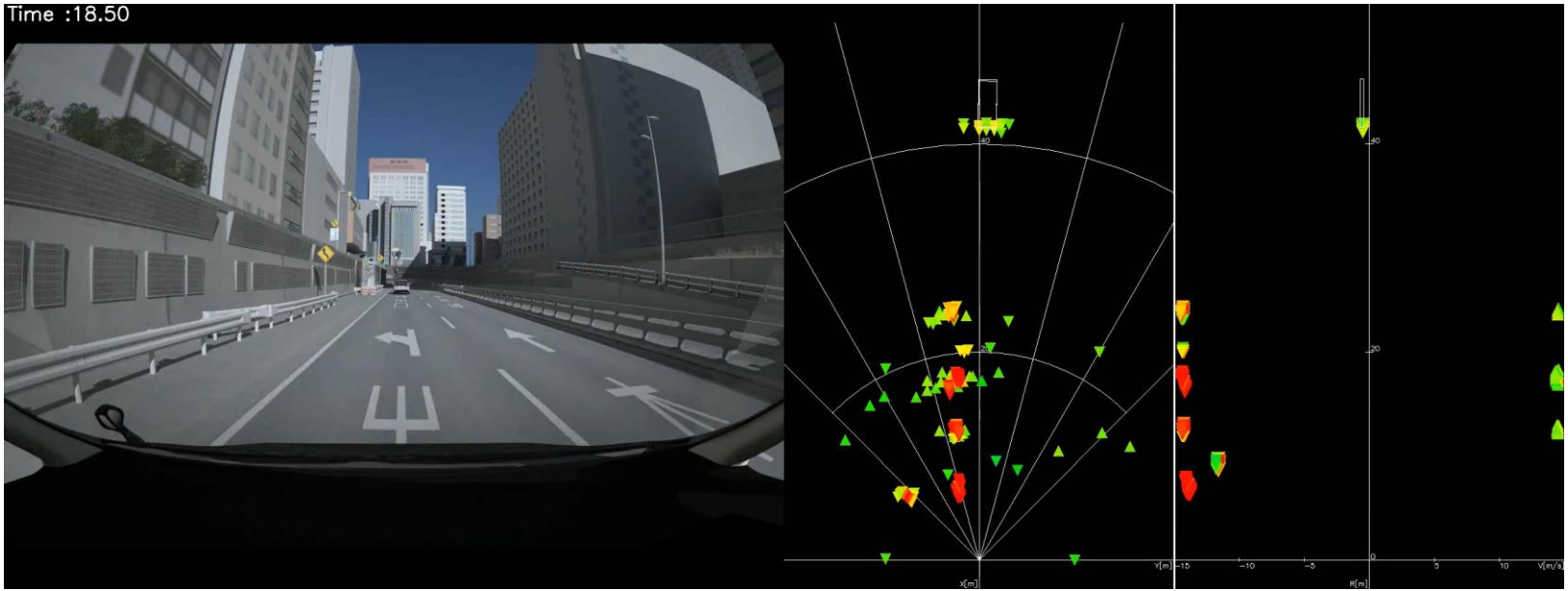


Lidar model simulation output



Millimeter wave radar Simulation output

Radar is the most difficult sensor for modeling. Three reflection models are defined and used according to the behavior of radio waves at reflective targets.



Metropolitan express way (C1 Hamazakibashi JCT→Edobashi JCT)

Environmental modeling (Camera)

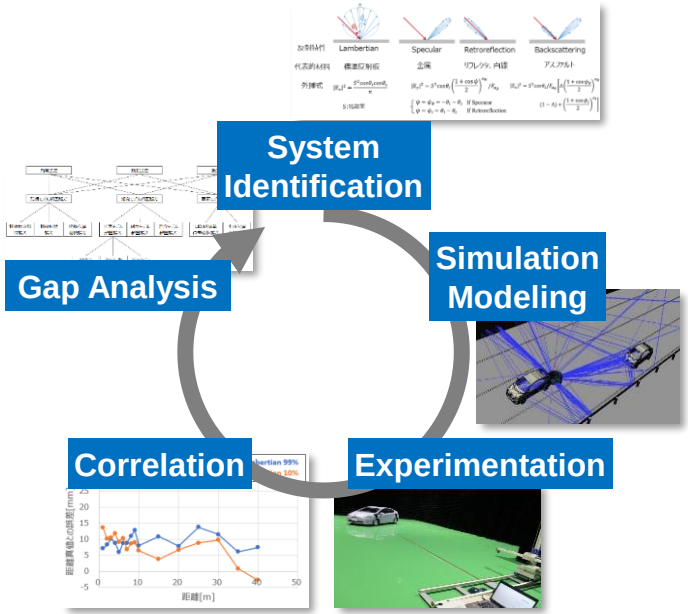
HDR (High Dynamic Range) camera model can provide sufficient visibility for recognition even in the dark condition in the tunnel, weak visible light with intense backlight at the approaching exit.

Light model of Metropolitan Expressway tunnel

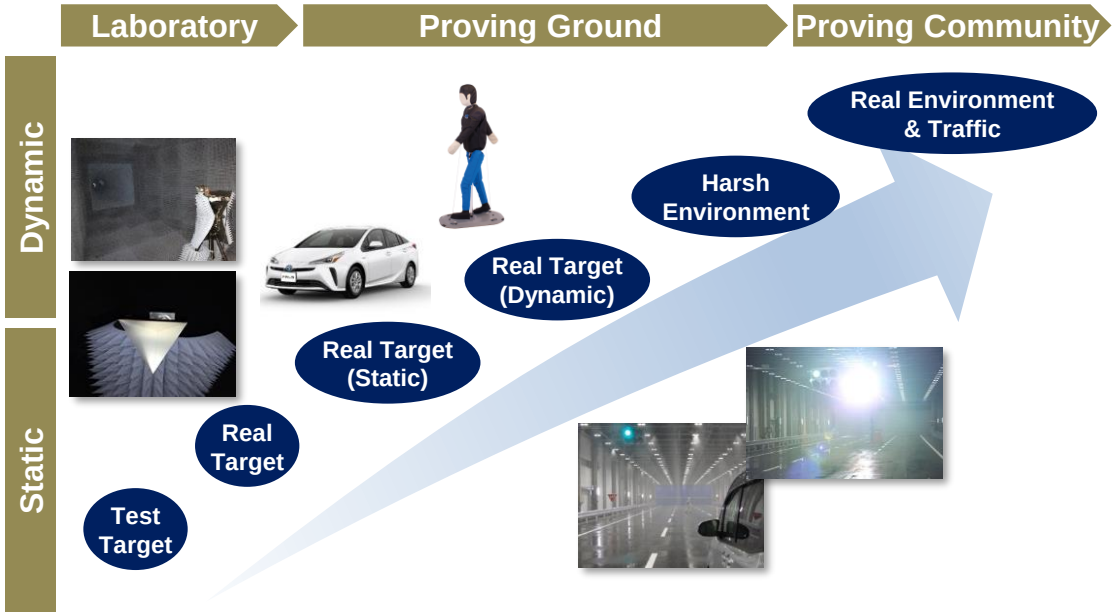
Rain adhesion model on windshield

Approach & Roadmap

Real physics based approach



Enhancement roadmap

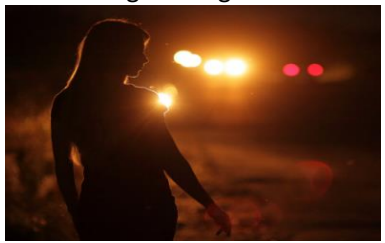


DIVP™ propose to model enhancement roadmap to meet user needs

Sensing weakness scenario

Reflection of wet road surfaces

Lost pedestrians due by backlight in night scene



Multi-path by bridge pier structure

Multivehicle multipath

Attenuation of light and radio waves due to rainfall

Lost objects due by backlight

False recognition due to high reflection paint

Underpass multipath

Motorcycles

Source : SOKEN, INC

FOT2021 in Tokyo water front area

To create sensor simulation virtual proving ground by measuring real proving ground using MMS(*)

MMS: mobile Mapping System

International Cooperation

DIVP® and VIVALDI(German consortium) launched joint project named VIVID from Nov-2020, Targeting to simulation-based ADS safety assurance

Key objectives

- **Simulation and test chains: Fidelity metrics**
- **Complementary methods from simple to realistic: SiL, HiL, ViL, FoT**
- **Multi-sensor platforms: Radar, lidar, camera**
- **Open interfaces: Scenario generation, sensor and environmental models, co-simulation**
- **Building a reference architecture => creating a knowledge base**

Jointly study toward,,

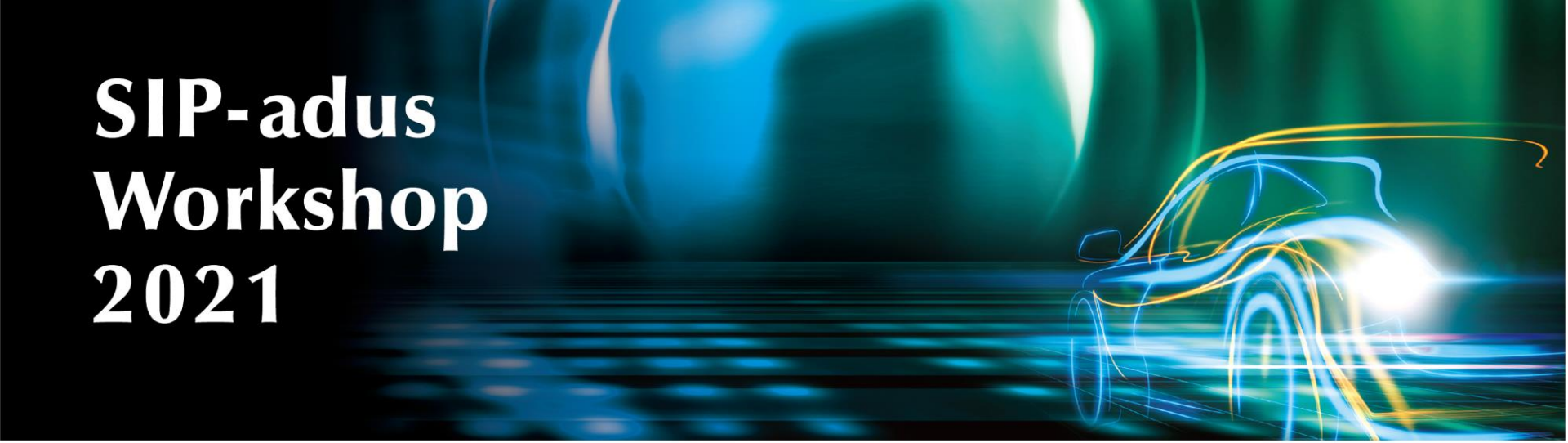
- **How safe is safe enough?**
- **How realistic is realistic enough?**

Key contributors

: VIVALDI

TECHNISCHE UNIVERSITÄT ILMENAU, KIT, Hochschule Kempten University of Applied Sciences, TECHNISCHE UNIVERSITÄT DARMSTADT, Mercedes-Benz, Continental, AVL, IPG, blickfeld LiDAR / scan your world, DLR, jama Japan Automobile Manufacturers Association, DIVP

SIP



- **Plenary Sessions :**
  November 09-10, 2021 (Virtual conference)
- **Breakout workshops :**
  schedule to be announced for each theme

For further information, please visit our website
https://en.sip-adus.go.jp/evt/workshop2021/