get it right®

virtual systems & controls

Pro-SiVIC™

A platform for modeling and simulation of multi-frequency environments and multi-technology sensors

Applications

Road & Automotive Industry

Pro-SiVIC™ provides full virtual prototyping capabilities, delivering cost and time savings during the design, testing, integration and validation phases of advanced driving assistance systems.

Adaptive Cruise Control (ACC)

Typical ACC scenarios involving different vehicle speeds and lane changes can be used to test and improve the robustness of an ACC
algorithm. Through closed loop simulation, the Advanced Driver Assistance Systems (ADAS), running in its own environment, send acceleration/deceleration orders back to the simulator.

Automatic Emergency Braking

Custom scenarios can be created, involving multiple vehicles and different obstacles. Closed loop simulation can be performed within Pro-SiVIC™ to evaluate the effects of ADAS defined braking orders to the vehicle model. This dynamic model reproduces the change of pitch and roll variations, realistically reproducing the perception of the different sensors.

Lane Departure Warning

By using environments featuring a wide range of road curvatures and with interchangeable markings, the impact of marking quality on these scenarios can be studied.

Blind Spot Detection

Scenarios involving vehicle overtaking manoeuvers or parking manoeuvers can be defined. The impact of initial positions and speeds of mobile objects involved can also be studied.

Traffic Sign Recognition

Pro-SiVIC™ features a catalog of over 200 different road signs. Each sign's dimension and position can be precisely adjusted relative to other objects in order to evaluate to extreme situations of road sign detection and recognition.

Beam Commutation

The lighting engine of Pro-SiVIC™ is also suitable for night use cases and the study of automatic Beam Commutation systems. Vehicle headlights can be reproduced very accurately.

Virtual Testing of Lighting Systems

Pro-SiVIC™ offers a powerful direct lighting model. Multiple independent light sources can be simulated, as well as their shadows.
This lighting model allows dynamic test scenarios with complex lighting situations, in order to obtain quantitative metrics on lighting performance or a visual feedback on lighting systems.

General Overview

Road & Automotive Industry

ESI's Pro-SiVIC™ is a software platform to simulate multi-frequency sensors embedded on either static or dynamic devices, equipments and vehicles.

It includes:

- Generation of realistic simulated sensor raw data
- Assessment of sensor robustness and reliability
- Virtual prototyping of new and improved perception sensors
- Testing of perception algorithms and sensor settings
- Creation of numerous scenarios combining vehicles, obstacles, environment and sensors

Camera with optical and sensor model

Pro-SiVIC™ gives you the capacity to carry out realistic simulations in 3D virtual environments including infrastructures, road users, vehicle dynamics and multi-technology perception sensors. The interactive scenario editor allows for a quick and precise definition of critical or typical use cases. Highly dynamic scenarios are made possible with the animation capabilities and the event management system of the simulation engine.

Pro-SiVIC™ provides the means for virtual integration of a large range of perception sensors such as video cameras, laser cooperative sensors or GPS, thus providing a solution to:

- Work as a reference for sensor positioning and detection algorithms, providing control of environmental factors, traffic conditions and driving scenarios
- Safely study the integration of algorithms and control functions before their final implementation
- Analyze system performance and sensor robustness
- Visualize demonstrations of particular scenarios involving vehicles, humans, objects and environments
- Replay any scenario to compare sensors side-by-side
- Assess fault diagnosis and system reconfiguration to achieve degraded, or "limp-home", functionality

Main workflow in Pro-SiVIC™

Choose objects participating in the scenario: type of environment, 3D objects, sensors, ...

Scene graph linking (relationship between objects)

Configuration of objects and events (environment actors, sensors, dynamic models, ...)

Simulation execution and data production (sensors + reference data)

Packaged objects library

Scene edition

Configuration panel

Pro-SiVIC™

Sensor Data →

Ground truth info →

← Controls

Third party application

Benefits

- Benchmark, evaluate and validate a large range of perception sensors in multiple configurations
- Life-like generation of sensor raw data dramatically cuts down the amount of physical tests
- Unlimited scenario analysis to assess systems performance and reliability as well as risks of failure and defects
- Safely challenge system performance in scenarios presenting high risks for people and equipments
- Reduce development costs and time
- Explore and compare innovative solutions

Technical Capabilities

Simulation Engine

3D Simulation Engine
- Multi-sensor simulation
- High Dynamic Range rendering
- Dynamic lighting and complex shadows
- Handling of complex 3D objects with realistic materials

Scripting / Graphical User Interface (GUI)
- Assembly of scenarios from provided libraries
- Adjustment of scenario parameters
- Animation of mobile objects
- Definition of triggered dynamic event

Software Requirements
- Pro-SiVIC™ is available on: Windows platform up to 8.1
- Pro-SiVIC™ requires an OpenGL 3 compliant graphics card

Integration: Software Co-simulation
- RTMaps™ from Intempora (www.intempora.com) allows real-time signal acquisition through seamless integration with Pro-SiVIC™
- The Mathworks Simulink™ (www.mathworks.com) for control modeling
- DDS (Data Distribution Service) API enables interfacing with any C++ application

Integration: Real Time
- Pro-SiVIC™ architecture supports software and hardware in the loop applications
- System performance evaluation can be enhanced by a driving experience
- Oculus Rift ® integration enables a full 3D immersion

Hardware scalable according to desired performance

Libraries

Perception Sensors
- Video and fisheye camera
- 3D laser scanner, multi-layer lidar
- Short/mid range radar
- Ultrasonic sensor
- GPS

Proprioceptive Sensors
- Inertial Navigation System
- Odometer
- Car and road ground truth

Communication
- Beacon

Odometer, INS | Radar | Laser rangefinder

Vehicle Dynamics
- Car dynamic model provided
  - Shock absorber (stiffness, viscosity)
  - Tire grip modeling
  - Chassis roll, pitch and head
  - Mass
- External car dynamic model can be used

Environment
- Driving scenes: Highway, Countryside, Urban, Test tracks
- Background objects: Vegetation, Buildings, Street equipment, Road signs

Road User
- Vehicles: various models available
- Pedestrians

Customer Portal
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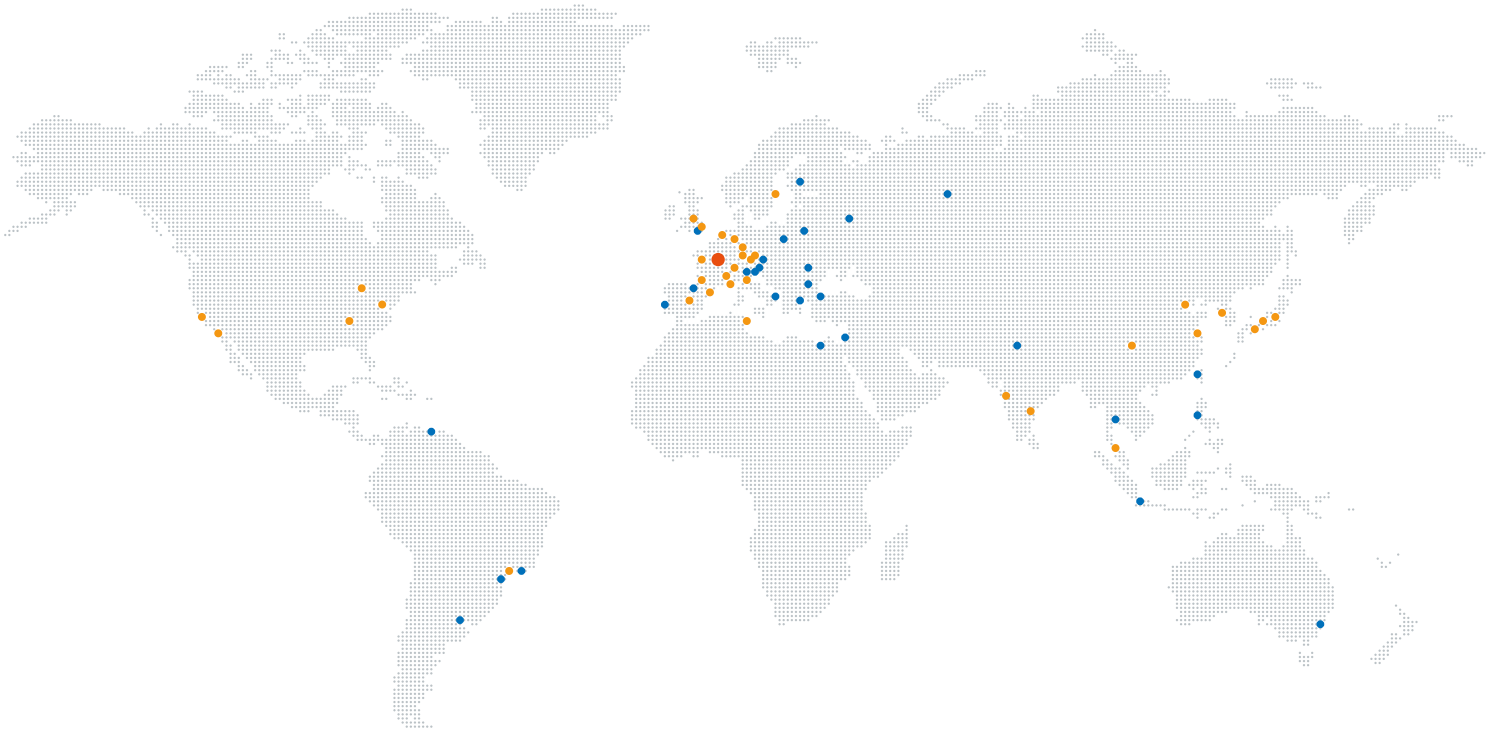

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ABOUT ESI GROUP

ESI is a world-leading provider of Virtual Prototyping software and services with a strong foundation in the physics of materials and Virtual Manufacturing.
Founded over 40 years ago, ESI has developed a unique proficiency in helping industrial manufacturers replace physical prototypes by virtually replicating the fabrication, assembly and testing of products in different environments. Virtual Prototyping enables ESI's clients to evaluate the performance of their product and the consequences of its manufacturing history, under normal or accidental conditions. By benefiting from this information early in the process, enterprises know whether a product can be built, and whether it will meet its performance and certification objectives, before any physical prototype is built. To enable customer innovation, ESI's solutions integrate the latest technologies in high performance computing and immersive Virtual Reality, allowing companies to bring products to life before they even exist.
Today, ESI's customer base spans nearly every industry sector. The company employs about 1000 high-level specialists worldwide to address the needs of customers in more than 40 countries. For further information, visit www.esi-group.com.