PRODUCT BRIEF

LeddarTech®

LeddarVision™ LVP-H

Comprehensive Surround-View Premium ADAS L2/L2+ Automated Parking and Parking Assist Low-Level Fusion and Perception Software Stack

Product Overview

LVP-H is a comprehensive fusion and perception software stack supporting premium ADAS L2/L2+ automated parking and parking assist applications, including **intelligent parking assist (IPA), remote parking assist (RPA)** and **maneuver assist (MA).** Based on **LeddarVision™ low-level fusion (LLF) and perception technology,** sensor modalities are optimally combined, pushing the **performance and reliability envelope beyond legacy solutions,** for safer and more comfortable stress-free parking experience. The LVP-H enhances **valid parking detection probability to over 95% with low false detections in challenging ODDs and environments** and provides superior dynamic and static object detection for enhanced safety, including support to **advanced NHTSA IPA safety scenarios.**

LVP-H utilizes a **4V4R** sensor configuration, having four fish-eye cameras with 190° FoV, 2 Mpx resolution and four short-range corner radars with support to **extension of up to 12 ultrasonic sensors.** Sensor configuration and stack are designed to support a comprehensive stand-alone parking assistance application. Implementation on a domain controller with access to all sensor modalities allows to maximize the benefit of low-level fusion for increased performance and reliability.

LVP-H implements a complete stack handling sensors' interface, calibration and synchronization, sensor fusion, dynamic and static object detection and classification, valid parking space detection, accurate 3D static environment modeling, continuous filtering and stabilization of objects and static environment, parking attribute detection, visual and vehicle odometry interface and ego-motion localization, providing a comprehensive environmental model and HMI visualization API to parking applications.

LVP-H environmental perception implements multi-layered environment modeling, including 3D static environment modeling layer, object detection modeling layer and parking detection modeling layer. Together, these layers enable continuous parking place validity check, perception algorithmic redundancy for more reliable and stable parking detection, and better flexibility to apply configurable parking space detection to multiple vehicle sizes. Multimodal low-level fusion's **inherent sensor redundancy** provides **early warning in safety scenarios** (e.g., visually occluded objects) and more reliable operation in cases of degraded (e.g., dirty lens), failing or conflicting sensors (e.g., false alarms from radars in dense parking environments), false alarms from objects visually reflected (e.g., from glass walls), as well as in cases of adverse scenarios and environments (e.g., blinding light).

LVP-H is part of the LeddarVision product family supporting ADAS evolution with a comprehensive product roadmap and growing features support. The LVP-H is also available in an upgraded version, LVP-H^{+}, which targets all applications enabled by LVP-H and additionally supports advanced automated parking applications such as **trained parking assist (TPA), garage parking assist (GPA)** and **reverse assist (RA).** Extended perception and positioning include advanced localization and mapping, extended ODD operation and enhanced driving HMI to support the special needs of low-speed automated driving applications. Future **LeddarVision Unified (LVU)** product will provide **unified support to ADAS and parking applications,** combining the Surround (**LVS**) and Parking (**LVP**) product families to maximize the advantage of E/E architecture centralization trend, extending convergence of centralized processing into a single and unified environmental model for better applications development scalability and costs.

LVP-H "A" sample is planned for Q4 2024, targeting vehicle SOP in 2027.

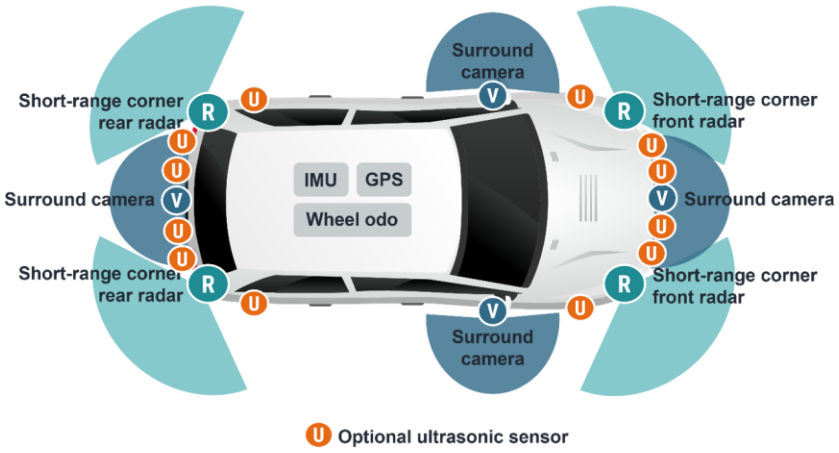
Target Applications

- High-performance multimodal parking perception solutions.
- Safety: AEB VRU & AEB triggering (by static obstacle detection and USS sensors in low-speed environment).
- Driving: L2/L2+ parking assist, including IPA (outdoor/indoor support and parallel/perpendicular/diagonal parking), MA, RPA and driver HMI (bird's-eye view visual layer with perception data overlay).

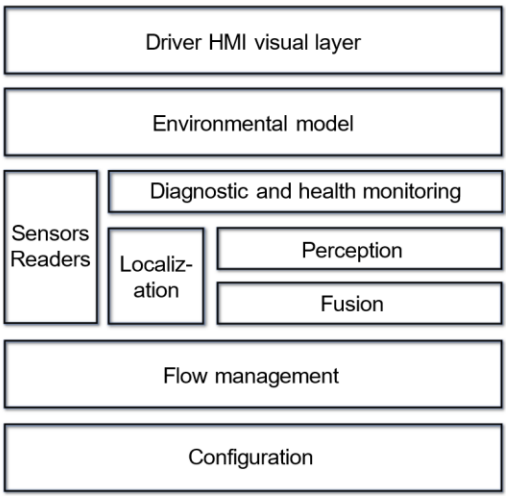
Hardware Platform

- Sensor configuration: 4V4R + 12 USS (optional)
- Fish-eye cameras: Four fish-eye 2.0 Mpx, 190° x 150° FoV (Ficosa ADAEX eE or similar)
- Corner radars: Four short-range corner radars (Continental SRR520 or similar)
- Ultrasonic sensors: Eight to twelve sensor system (sensor type: TBD)
- SoC/memory: TBD
- ECU: TBD

LVP-H Sensor Configuration



Software Functional Diagram



Software Stack Features

Fusion	Radar-camera ─ ultrasonic low-level fusion online sensor calibration validation and update Camera fusion into single bird's-eye view (BEV) visual layer for driver HMI
Perception	Dynamic and static 3D object detection and classification, including vehicles and VRUs Occupancy grid with 3D static environment model Valid parking space detection with attributes Road markings detection Complete model elements continuous tracking and stabilization, 15 FPS output
Positioning	Ego-motion, GPS, IMU and vision-based odometry
Supported ODDs	Weather: clear, light rain Illumination: day / lowlight / night with streetlights Parking locations: roadside and public parking lots, including uneven surfaces Ground surface types: asphalt, concrete, brick

	Parking space attributes: parking lock, wheel stopper, disabled/electric car parking ODD extended to cover NHTSA parking test scenarios
Environmental model	Objects (3D, classification), occupancy grid (2.5D grid with ground and obstacle altitudes), parking space (validated for target vehicle) and ego-motion data in vehicle coordinates
Premium safety	Detection of global scene attributes to support ODD analysis Sensor coverage and health monitoring
Operating system	Linux

Targeted Perception Key Performance Indicators (KPIs)

Parking space detection	Valid parking spaces: recall 95%, precision 95%
Object detection	AEB relevant vehicles/VRUs: recall 99%, precision 99.9% Static objects: recall 99%, precision 99%
Object measurements	Dynamic objects accuracy: typ. std 10% of range @ up to 30 m; typ. std 5% of range @ up to 10 m
3D occupancy grid	Height accuracy: typ. std 0.05 m @ up to 1.5 m
NHTSA test scenarios	TBD

LVP-H Features Roadmap Schedule

- LVP-H functional demo: 2024
- Embedded platform: 2025
- Premium safety: 2025
- Extended ODD: 2025

Certifications

- ASPICE: Developed according to ASPICE L2, targeted by Q3 2024.
- ASIL-B certification targeted.

Availability

- “A” sample: Q4 2024
- Target vehicles: SOP 2027