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 **performance and reliability envelope beyond legacy solutions,** for safer and more comfortable stress-free parking experience. 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, 1.3 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 attributes 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. Targeting premium L2/L2+ automated parking and parking assist, LVP-H supports advanced applications including **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.
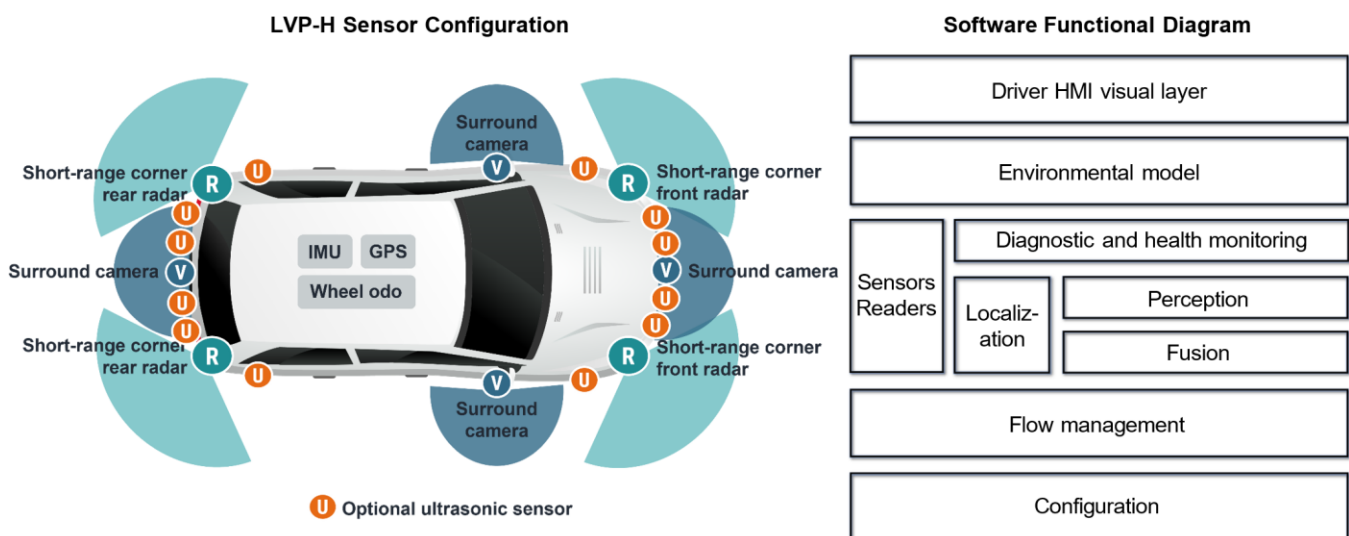
LVP-H A-sample is planned for Q3 2023, targeting vehicle SOP in 2025/6.

Target Applications

- High-performance multimodal parking perception solutions.
- Safety: AEB VRU & AEB triggering (by static obstacles 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, 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 1.3 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	Global scene attributes detection for ODD analysis support
	Sensor coverage and health monitoring
Operating system	Linux
Interfaces	Sensors: ROS2
	Vehicle odometry: CAN
	GPS, IMU: CAN
	Environmental model: ROS2, ECAL

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 5 m
NHTSA test scenarios	TBD

LVP-H Features Roadmap Schedule

- LVP-H functional demo: 2023 (all layers, excluding explicit road markings model's layer)
- Extended road markings: 2024 (extended parking space attributes)
- Embedded platform: 2024
- Premium safety: 2025
- Extended ODD: 2025

Certifications

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

Availability

- A-sample: Q3 2023
- B-sample: Q2 2024
- C-sample: 2025
- Target vehicles: SOP 2026