LP-Research Inc.

LPPOS

GNSS / RTK / Odometry / IMU Fusion Navigation System

Dual-Antenna RTK + Vehicle Speed
+ 9-Axis Inertial Dead Reckoning
· Powered by FusionHub

LPPOS is an in-car tracking and navigation system, a tightly integrated precision positioning and orientation solution that fuses a dual-antenna multi-constellation RTK-GNSS receiver with a high-precision 9-axis IMU and odometer data through the FusionHub sensor fusion engine.
It delivers centimetre-level RTK positioning and true heading output in open sky, and maintains accurate, low-drift dead reckoning through GNSS outages, including tunnels, urban canyons, and under-highway environments, using wheel-speed-aided inertial navigation.

*All fusion performance figures are validated in-vehicle across highway and urban-canyon test drives.

PERFORMANCE

- RTK position accuracy : 0.8 cm + 1 ppm (H), 1.5 cm + 1 ppm (V)
- Heading accuracy (dual antenna) : 0.1° / 1 m baseline
- Velocity accuracy : 0.03 m/s
- GNSS outage* drift (Ios) : ≈0.5 m typical
- Fusion output rate : Up to 500 Hz
- RTK initialization time : < 5 s

* Dead reckoning accuracy varies with vehicle speed-input quality. Figures use a high-resolution laser velocity meter; lower-grade sources (e.g. CAN-bus speed) increase outage drift.

KEY FEATURES

- FusionHub fusion engine : Tightly-coupled GNSS/INS at up to 500 Hz, continuous through GNSS outages
- Dual-antenna RTK : True 0.1° heading ; no magnetometer required ; immune to magnetic interference
- Multi-constellation GNSS : GPS · BeiDou · GLONASS · Galileo · QZSS (1408 ch)
- Dead Reckoning : Wheel-speed / odometry aiding for tunnels, urban canyons, and underpasses
- High-precision 9-axis IMU : Dual-gyro (±400 / ±2000 dps)
- On-chip secure : Built in anti-jamming & anti-spoofing

APPLICATIONS

FusionHub serves as the common fusion backbone across automotive, robotics, survey, maritime, and extended reality with ready-made ROS 2, NMEA, and MQTT outputs for any platform.

AUTOMOTIVE

- ADAS / AD testing & validation
- In-vehicle VR/AR HMD tracking
- Highway & urban test drives

GIS / IoT / SMART CITY

- Mobile mapping
- Georeferencing
- Infrastructure inspection
- Smart city / Monitoring system

ROBOTICS / AGV

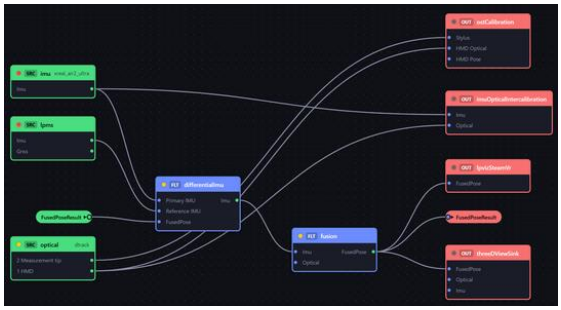
- AGV / AMR outdoor localization
- Last-mile delivery robots
- Construction site automation
- GNSS-denied dead reckoning

CORE SOFTWARE ENGINE: FUSIONHUB

Sensor Fusion Technology

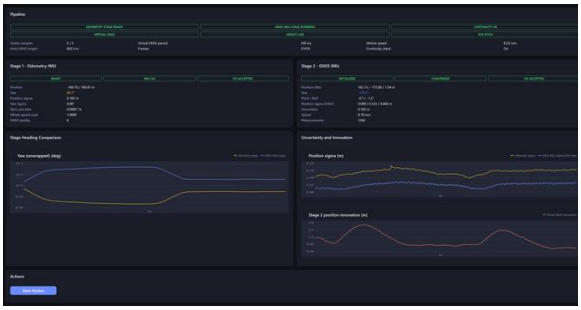
LPPOS is more than a GNSS/INS navigation module: it is a sensor-fusion-hub software.
FusionHub connects IMUs, RTK-GNSS, wheel odometry, and optical trackers, fusing all inputs through real-time Unscented Kalman Filters into a single continuous pose and navigation solution.
One engine, multiple sensor sources, deployed at the edge or on the desktop.

Visual Pipeline Builder



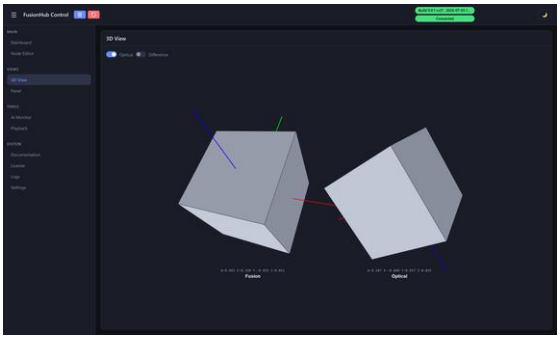
Wire sensors, filters, and outputs in a browser-based node editor, hot-reloaded without restarting

Per-Application Dashboards



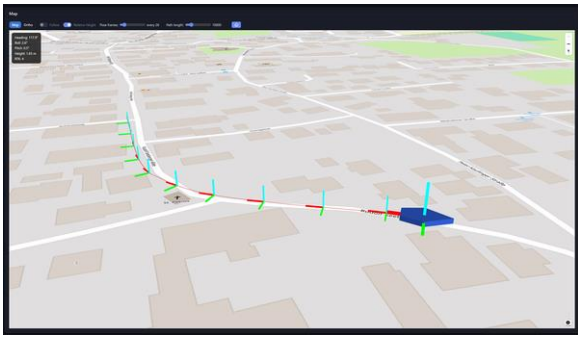
Dedicated status pages for vehicle fusion, marine heading, sensor control, calibration, and more

3D Visualization



Live fused orientation rendered against the reference sensor

Live Map & Views



Vehicle plotted as a 3D marker with track, heading, and RTK status

Field-Tested Filters	GNSS+IMU, odometry + IMU, full vehicle fusion, marine heading, and IMU + optical
Friendly GUI Setup	Typed ports, auto-generated property panels, and no custom drivers to write
Ready-Made Outputs	ROS 2, NMEA, MQTT, VRPN, DDS, and WebSocket
Deploy Anywhere	Single native binary on Windows, Mac, or Linux ; GUI or headless at the edge
AI Interface	Built-in MCP server lets AI agents read live navigation state ; AI Monitor watches pipelines and answers questions in plain language

LPPOS SPECIFICATION

RTK Fix Data + Dead Reckoning (DR)

Position accuracy (RTK, aided)	Horizontal 0.8 cm + 1 ppm Vertical 1.5 cm + 1 ppm (RMS)
Heading (yaw) accuracy (dual antenna)	0.1° per 1 m antenna baseline (RMS)
Velocity accuracy	0.03 m/s (RMS)
Position drift in full GNSS outage (pure DR)*	~1.1 %/km sustained (highway, laser-velocity input) ; median end-position error 0.9 / 3.2 / 12 m at 100 / 300 / 1000 m outage
Position RMS over 1 km GNSS outage*	~12 m median over 1 km (1.2 %/km) ; ~1 m for typical sub-60 s tunnel gaps
Positioning in urban canyon (intermittent RTK)	0.66 m RMS / 1.5 m 95th pct at 62–100 % RTK availability ; RTK-float dead-reckoning 0.5–0.8 m at fix return
Heading hold through GNSS outage	Median heading drift 0.4–1.0° over 30–60 s ; re-anchors on RTK recovery
RTK initialization time	< 5 s typical · reliability > 99.9 %
Fusion output rate	Up to 500 Hz (configurable 5–500 Hz), IMU-rate propagation

* Dead reckoning performance depends on the quality of the vehicle speed input (wheel-speed / odometry). Figures shown use a high-resolution laser velocity meter ; lower-grade sources such as CAN-bus speed increase outage drift (≈3× on tested data).

GNSS / RTK Receiver

Position accuracy(DGPS, aided)	Horizontal 0.4 m · Vertical 0.8 m (RMS)
Position accuracy(single point)	Horizontal 1.5 m · Vertical 2.5 m (RMS)
Architecture	1408 tracking channels · dual RTK engine
Constellations / signals	GPS L1C/A L2C L2P L5 · BeiDou B1I B3I B1C B2a B2b · GLONASS G1 G2 · Galileo E1 E5a E5b E6 · QZSS · SBAS
Positioning modes	Single point · DGPS · RTK · PPP (B2b / E6-HAS / QZSSL6) · standalone high-precision
Cold start / re-acquisition	< 30 s cold start · < 5 s initialization
GNSS data rate	Up to 20 Hz (RTK + heading)
Correction / data formats	RTCM v3.x input · NMEA-0183, Unicore output
Anti-jamming / anti-spoofing	On-chip jamming & spoofing detection

Inertial IMU Sensor

Sensor configuration	9-axis MEMS IMU with on-board sensor fusion (AHRS)
Gyroscope	Dual: #1 3-axis ±400 dps (24-bit) · #2 3-axis ±1000/±2000 dps (16-bit)
Gyro bias / orientation stability	#1 4°/hour · #2 6°/hour
Gyro noise density	#1 0.002 dps/√Hz · #2 0.004 dps/√Hz
Accelerometer	3-axis ±2/±4/±8/±16 g (16-bit)
Magnetometer	3-axis ±2/±8 gauss (16-bit)
Orientation range / resolution	Roll ±180° · Pitch ±90° · Yaw ±180° · 0.01° resolution
Output data	Raw data · Euler angles · Quaternion
IMU data rate	5–500 Hz

Electrical, Physical & Environmental

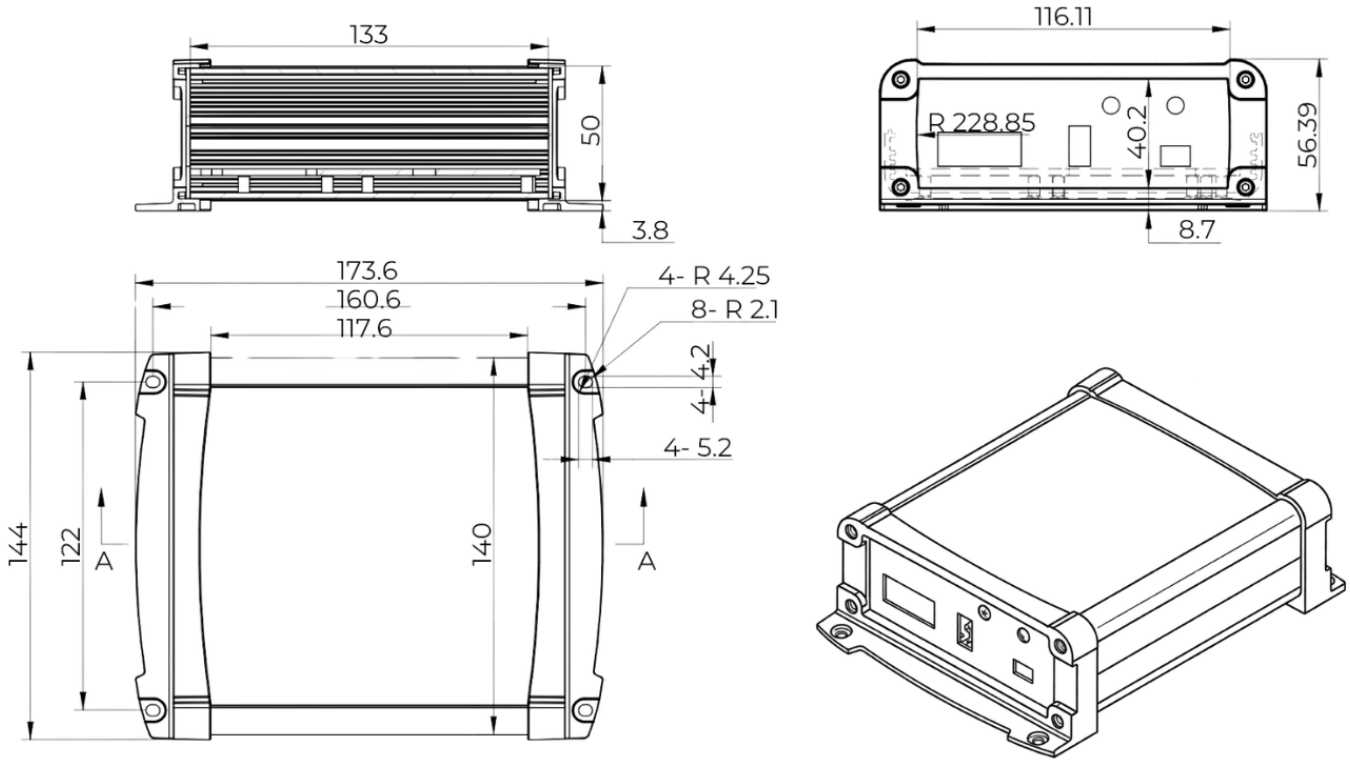
Input power	9 – 18 V DC
Hardware data to host interface	USB Type A
Operating temperature	−20 °C to +80 °C
Vehicle / odometer Input	CAN BUS (DB9 connector)
Antenna connector	2 × SMA Female — GPS front & rear (dual- antenna)
Enclosure materials	Aluminium

Data Interfaces & Software

Fusion software	FusionHub — real-time GNSS/INS tightly-coupled fusion, wheel-speed / odometry aiding
Fusion output	Position (lat/lon/alt) · velocity · heading · attitude · raw data of IMU · GNSS status, etc.
GNSS interfaces	Serial COM port
IMU interfaces	USB express
Aiding inputs:	CAN BUS (vehicle speed / odometer)

* Physical, power and environmental values are for the individual GNSS and IMU components. Integrated LPPOS enclosure, power budget and connector configuration depend on the delivered system variant. Specifications subject to change; RTK / DGPS / single-point / heading / velocity / initialization / GNSS environmental figures per the GNSS receiver product brief, IMU figures per the IMU sensor datasheet (performance at +25 °C).

LPPOS DIMENSIONS



CONTACT US

www.lp-research.com

info@lp-research.com

LP-RESEARCH INC.
+81 3 6804 1610
RE-FLAT #201, 3-10-4 Motoazabu, Minato-ku,
Tokyo, 106-0046, Japan