ibeo.Reference

Enabler for Ground Truth Data Generation

Key Features

- Offers the complete toolchain from a single source
- Includes ibeo Auto Annotation software
  - Automatically annotates objects and lanes
  - Scalable due to cloud-compatible architecture
- Supports data of selected third-party LiDARs
- Allows for manual editing of objects and lanes
- Compatible with ibeo SyncBox Pro

Reference Toolchain

**STEP 1** Online Tracking and Recording

- 0% raw data
- 100% raw data

**Recording System**

- Hardware
  - LiDAR
    - ibeo LUX
    - Lane tracker SICK LMS
    - Third-party LiDARs*
  - Next Generation Fusion ECU
  - ibeo SyncBox Pro
  - IMU / GPS

- Software
  - ibeo ECU REF Software Bundle

**STEP 2** Offline Validation

- 0% GT** data
- 100% GT data

**ibeo Validation Bundle**

- ibeo Auto Annotation Software
  - Automatic object detection, classification & tracking
  - Automatic lane marking and road boundary detection (highway)
  - Automatic scenario detection
  - Cloud-compatible architecture due to Docker image
  - Intuitive graphical user interface
  - Data formats:
    - For objects .idc
    - For lanes .xodr

- ibeo REF Software Bundle
  - Visualization for scan point, object, and lane data
  - Editors for object, lane and scenario data
  - Interface software development kit (SDK)

*Selected third-party LiDAR hardware not in ibeo’s product portfolio; real-time object data not available
**GT = Ground Truth
System Architecture

The Ibeo Difference

**Third-party LiDAR Data Support**
- New Ibeo.Reference toolchain now supports selected LiDAR devices from other suppliers
- Offers increased flexibility through support of third-party LiDAR devices (e.g., 360° LiDAR on the rooftop)
- Enables simultaneous operation of different devices to accommodate any use case

**Object and Lane Editing**
- Quick and intuitive tools to increase object and lane quality of the reference data manually
- Enables modification of objects and lanes, such as position, orientation, and classification
- Applies changes to the entire object track instead of frame-by-frame editing

**Ibeo SyncBox Pro**
- Time management device that synchronizes all systems in the car to a single source of truth
- Able to function as leader clock or follower clock for each connected component or protocol
- Ensures data time quality of all systems in the car
- Supports all common time protocols (such as PPS & NMEA, gPTP/PTP, NTP, CAN) and can be configured to the use case accordingly
- Monitors synchronization status for various interfaces

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