Physically basedsynthetic data generation pipeline

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Pipeline overview

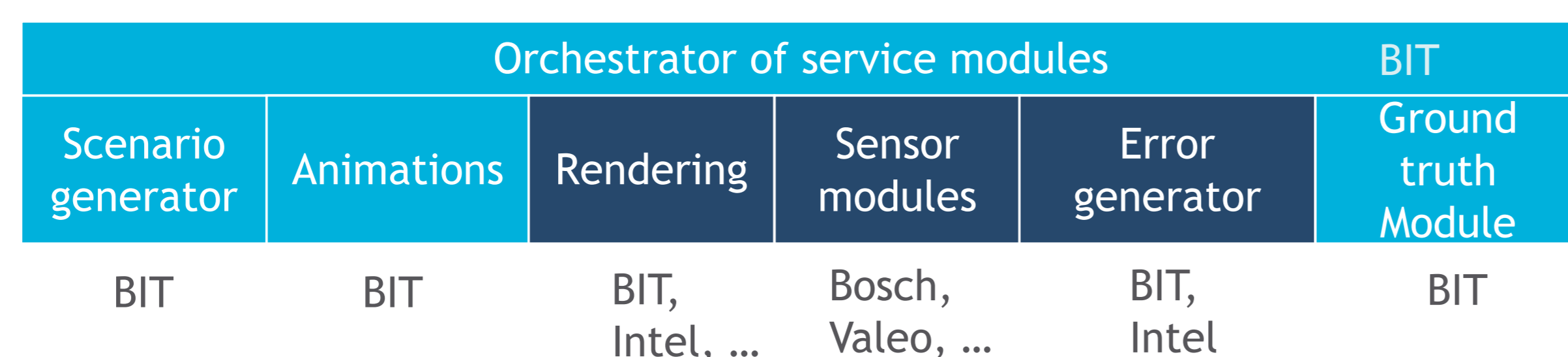| Orchestrator of service modules					BIT
Scenario generator	Animations	Rendering	Sensor modules	Error generator	Ground truth Module
BIT	BIT	BIT, Intel, …	Bosch, Valeo, …	BIT, Intel	BIT

Figure 1: Joint module operation of the pipeline

Left to right: processing steps from an abstract description to a meta world with animated scenarios and labels.
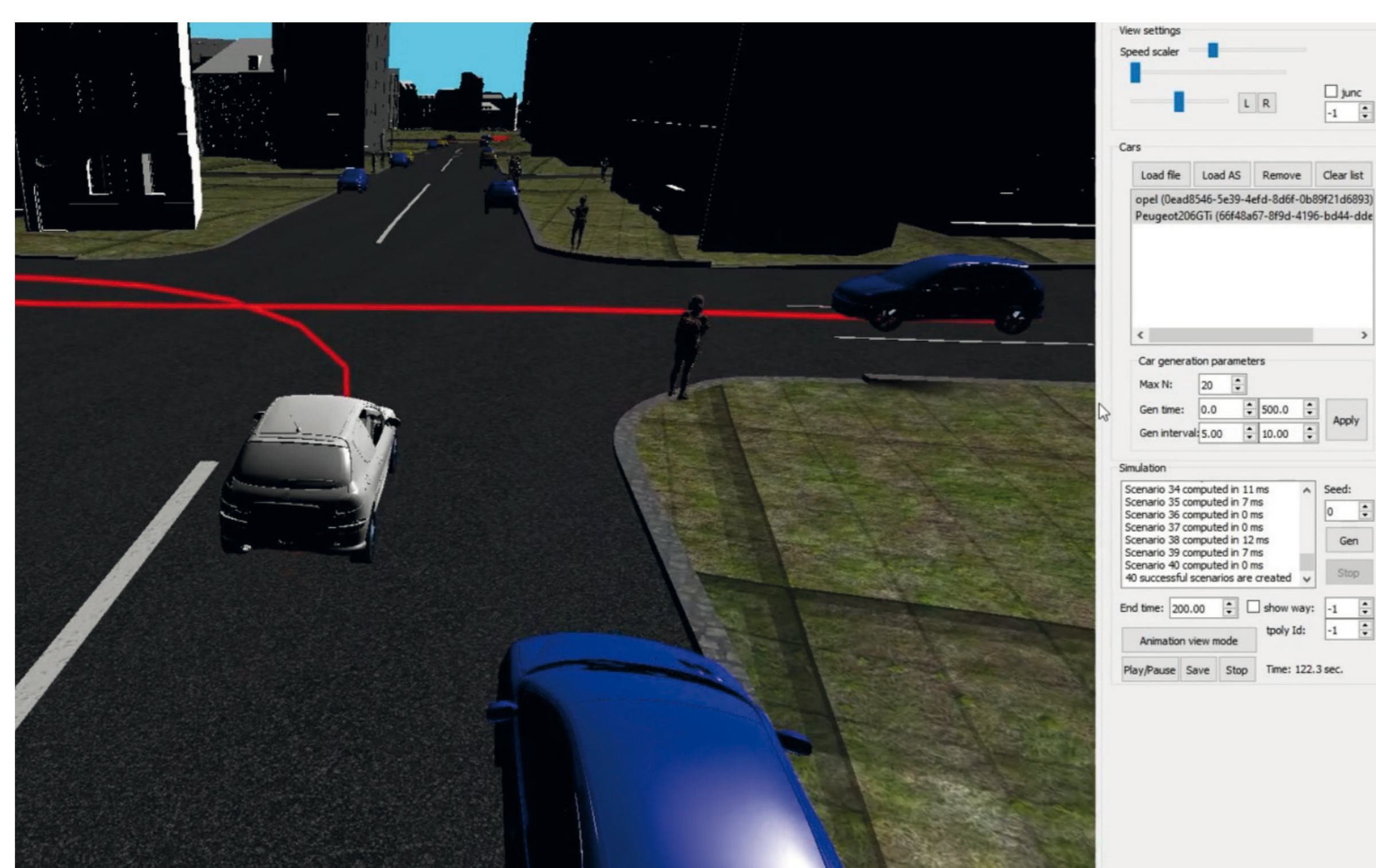
Scenario generator & animations

Figure 2: Snapshot of the scenario generator

- Creates scenes based on OpenDrive road networks
- Generation of procedural terrain
- Enrichment of scenes with buildings, street elements, vegetation
- Full traffic simulation with physical car models
- External input by OpenScenario, density maps and JSON based files
- 3D object & scene management system for full traceability

Figure 3: Raw raytracing output, with error generator and domain adaptation

Ground Truth

- Depth
- Semantic group & instance segmentation
- 2D & 3D bounding boxes
- Pose & skeleton joint annotations
- Body part labeling
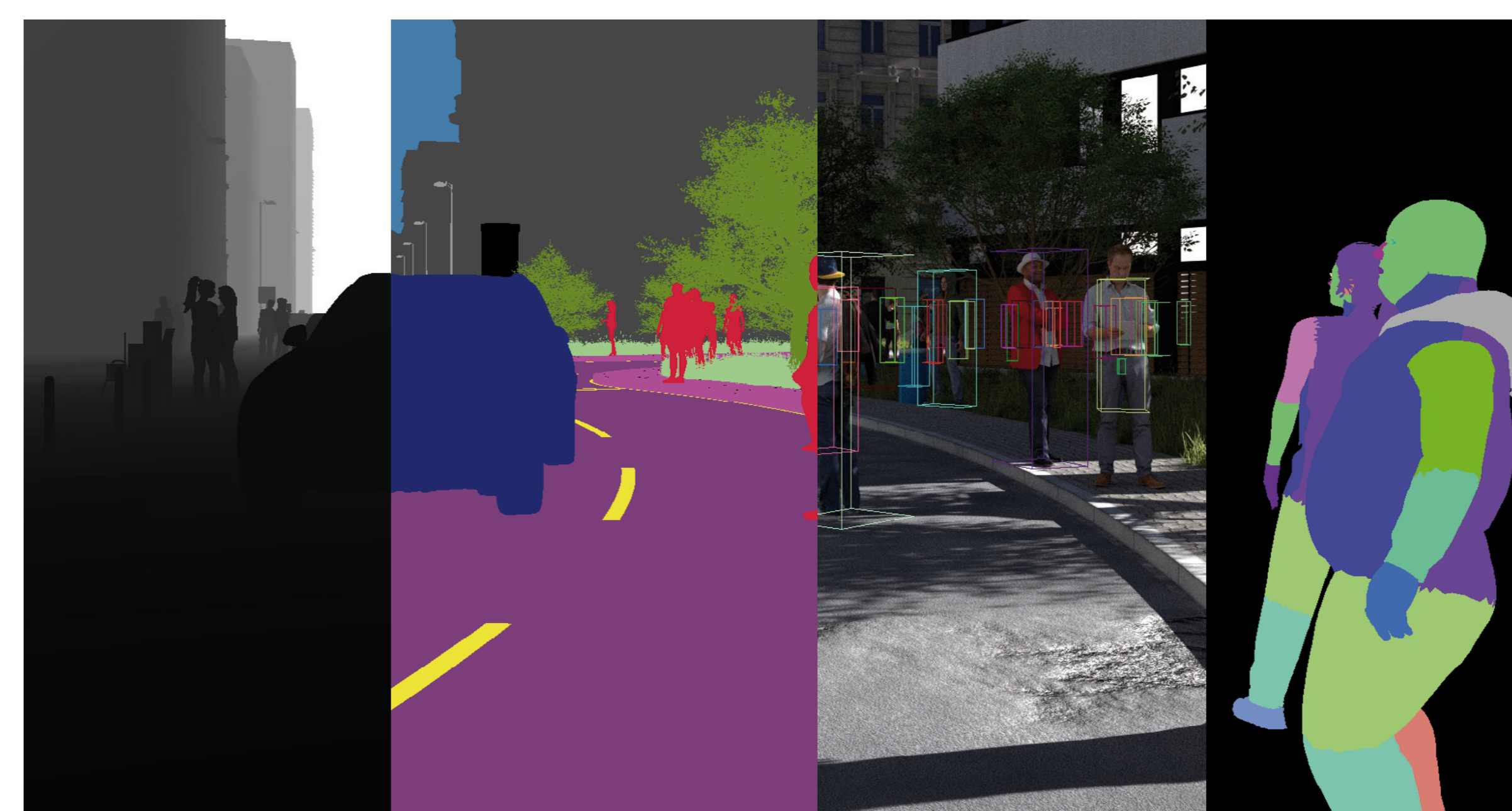- Environment & object parameters e.g. light intensity, velocity, etc.

Figure 4: Meta data output: depth, segmentation, 3D & 2D bounding boxes, body parts

Sensor effects

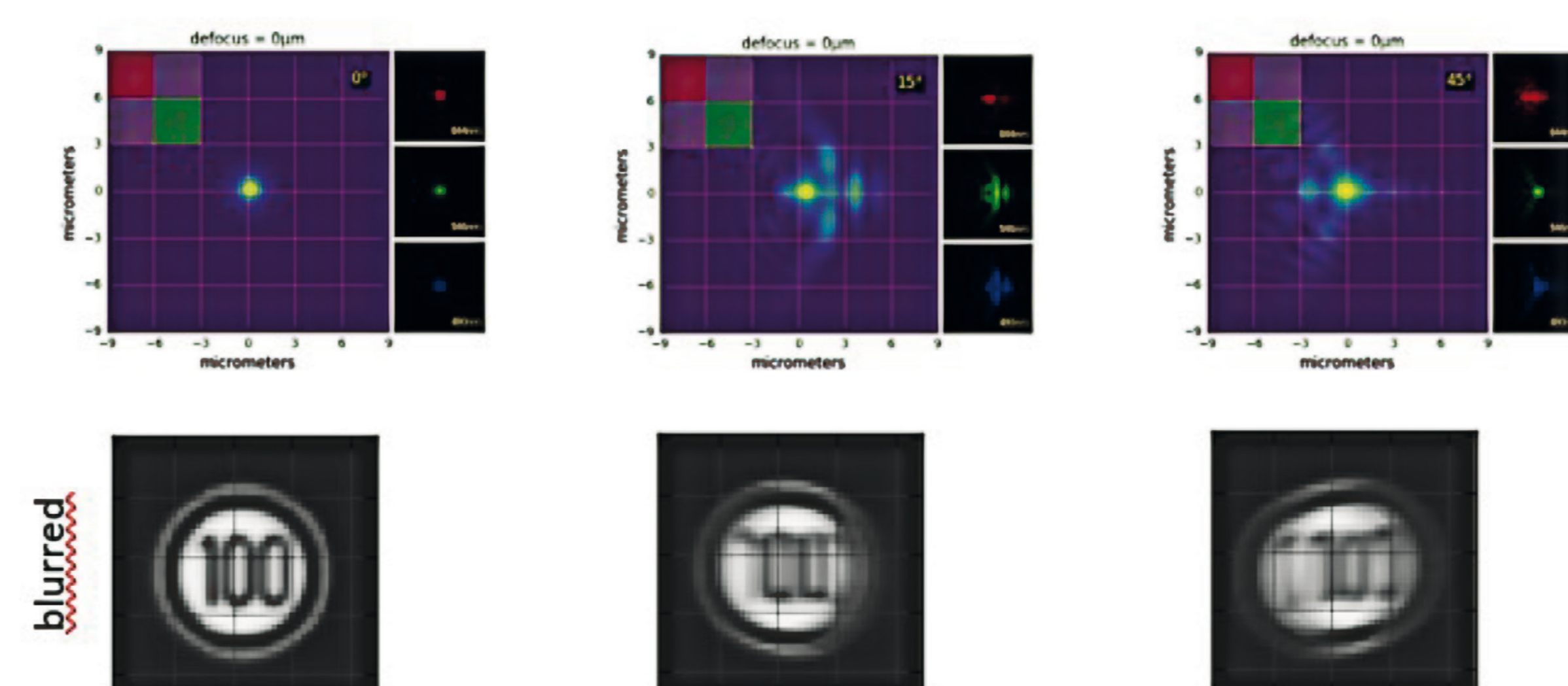*Figure 5: Rendering from OSPRay with motion blur and procedural sun-sky*

Figure 6: PSF (x, y, lambda, depth) – simulated point spread kernels representing the field, wavelength and depth dependent lens aberrations

LiDAR Module

Figure 7: Point cloud from simulated LiDAR – rotating mirror scan pattern with "rolling shutter" effect, multiple echoes, instance UUIDs, variants

Interfaces

- Khronos glTF 2.0
- OpenMaterial Extension

Synthetic Data