KI ABSICHERUNG
Safe AI for Automated Driving

Automated AI validation using deep variational data synthesis

Korbinian Hagn, Oliver Grau

(1) VALERIE – Validation Flow Control

Flow controller sets base parameters for scene generator, e.g., pedestrian densities or street width, and instructs the variant generator with parameter variants, i.e., fixed parameters or a sampling range.

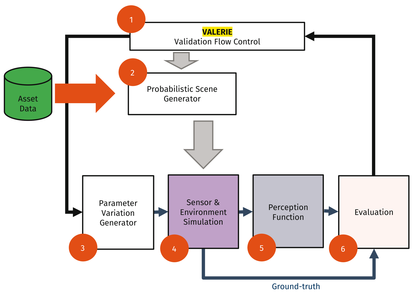

Figure 1: Variational data synthesis

(2) Probabilistic Scene Generator

Generates unbiased distributions of inner-city street scenes. The rule-based approach, high-end and low-end parametrization is done via json config-files. Placement of objects from asset database.

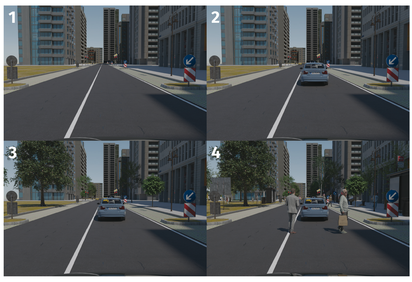

Figure 2: Incremental Scene Generation

(3) Parameter Variation Generator

Lighting, color & materials, position and orientation are varied on an object level by parameters given from the VALERIE control.

Figure 3 shows a scene with varied lighting, i.e., time of day, conditions. This module supports graph-based parameter search.

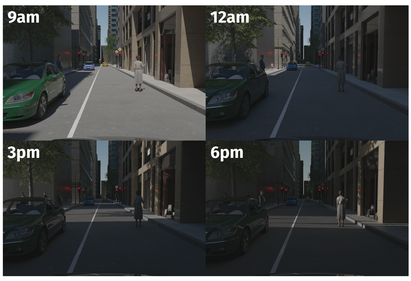

Figure 3: Change of scence lighting through time-of-day variation

(4) Sensor & Environment Simulation

Image rendering followed by simulation of optical (lens-)effects: blur, chromatic aberration, lens distortion, sensor noise and tone mapping are applied on the synthetic images to create a realistic sensor image.

Figure 4: Without (left) and with (right) sensor simulation

(5) Perception Function

The perception function, i.e., DNN/CNN, under test performs its inference on the generated variational synthetic data. Results are forwarded to the Evaluation module.

(6) Evaluation

Depending on the task (semantic-segmentation, 2d-object detection) missed pedestrian object detections are identified and fed back to the flow control to generate more variations of the scene or a detection fault is reported if multiple variations of the scene have the same missed pedestrians.

Figure 5: Missed pedestrian detection (red) in different scene variations

intel

For more information contact:
Korbinian.hagn@intel.com
Oliver.grau@intel.com

KI Absicherung is a project of the KI Familie. It was initiated and developed by the VDA Leitinitiative autonomous and connected driving and is funded by the Federal Ministry for Economic Affairs and Climate Action.

KI FAMILIE

Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

Image sources: Intel