Virtual Prototyping Capabilities by ADAS Tools Connected with a Gaming Engine

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Motivation

Virtual prototyping is more time and cost efficient than physical prototyping to design, test, validate & develop complex systems.

- Virtual prototyping enables faster fielding of technology, and reduces risks by allowing failure at low cost.
- Digitization enhances the verification & validation of real & virtual sensors.
- Creating accurate scenes in virtual worlds from scanned real world data ensures accurate analysis and virtual experimentation.

Fundamental Research Questions

- What metrics can be used to evaluate the performance and hence determine accuracy of real and virtual sensors?
- What level of scene fidelity is required for a virtual representation of reality?
- How accurately can a scene be created in the virtual world considering the resolution and fidelity of real and virtual sensor data?

Research Objectives

Build needed tools to enable virtual prototyping of algorithms, and methods:

- Use the sensor validation tool to analyze & compare the performance of real & virtual sensors, and use a scoring metric to determine their accuracy.
- Use the scene recreation tool to automatically create scenes in the virtual world from real live sensor data, and accurately represent reality.
- Develop the ability to modify the recreated scenes in the virtual world.

Approach

1) Sensor Validation Tool

Develop a tool that allows comparing, replaying and visualizing sensor data logs and determine the accuracy of real and virtual sensors based on a score.

Real lidar point cloud [1] Virtual lidar point cloud [1]

Combine with sensor validation to obtain accurate representation of reality. Develop highest fidelity scenes and apply modifications when needed.

2) Scene Recreation Tool

Develop a tool to read logged real-world sensor data and recreate the scene.

- Import vehicle (real) sensor data, de-noise the raw point cloud data.
- Segment point cloud data into clusters.
- Extract common shapes and build meshes.
- Export meshes to Unreal Engine.

Future Work

- Project just stated in Feb. 2020.
- Deploy virtual prototyping tools to study sensors and scenes.
- Create blends of real and virtual environment of the world.

References