CADSim: Robust and Scalable in-the-wild 3D Reconstruction for Controllable Sensor Simulation

Motivation: Realistic Sensor Simulation

- Long-tail scenarios are critical for robot learning and evaluation
- Simulation to generate experiences in a scalable and affordable way
- Realistic sensor simulation is key for running the full autonomy system

Building Assets from In-the-Wild Data

- Building digital twins from the real world:
  - scalable: data collection platform drives anywhere to collect data
  - diverse: different types of actors observed under different conditions
  - realistic: same operational area and smaller sim-real domain gap
- Existing methods:
  - poor underlying geometries under sparse and noisy observations
  - generated rigid mesh cannot be articulated
  - training is computationally expensive (>100 FPS)

Vehicle Re-Animation

Texture Transfer

Results

- Qualitative comparison with SOTA approaches:
- Quantitative comparison with SOTA approaches:
- Texture transfer in the real world:

Limitations:
- fixed topology, (b) limited inpainting capacity, (c) requires segm. masks and camera parameters, (d) limited quality when topology is complex