

Project plan

Participants

Students

- Sudiksha Sharma

Supervisors

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Goal

Construct a rasterization-based image generator for industrial surfaces and explore benefits and shortcomings of such an approach.

Tasks:

- Load 3D models in a PBR rasterization engine (e.g. Blender, Godot, **UE4/5**)
- Compose rasterization materials from existing procedural path tracing materials
- Compare and incrementally improve the result quality through comparison to the ground-truth results from path tracing
- Explore usage of anisotropic material shaders for more consistent results
- Explore usage of pre-computable light simulation techniques for more realistic results (reflection captures, GI probes)
- Encapsulate the pipeline into a configurable image generator

Timeline

21.11.2022. - 31.3.2023. ~ 19 weeks

1. Get acquainted with basics of UE (2 weeks)
 - a. Scene hierarchy and management
 - b. Object loading
 - c. Light setup and building lightmaps
 - d. Material definition and usage
 - e. Blueprint for object and scene programming
 - f. Finding resources to help with solving specific problems
2. Prepare the inspection scene (3 weeks)
 - a. Load the mesh and place it into the scene
 - b. Write a simple target material using existing OSL shader as a reference
 - c. Load and set material for inspection light source
 - d. Remove environment sphere
 - e. Program a player blueprint with light source positioned around the camera
3. Program the image acquisition blueprint (3 weeks)
 - a. Define several camera poses as array for testing purposes
 - b. Program a method for traversing camera poses
 - c. Export each image into a structured directory ([ExportRenderTarget](#))
4. Parse viewpoints from a file (3 weeks)
 - a. Setup C++ environment for UE
 - b. Define viewpoint struct and proper trans. matrix calculation
 - c. Write file loader and parser
 - d. Expose modules to blueprints
 - e. Update image acq. to use the new modules
 - f. Generate images
5. Translate more materials into UE (1 week)
6. Compare images to path traced targets (1.5 weeks)
 - a. Write a small script in Python to load pairs of images and compares them
 - b. Describe where are the differences most prominent
7. Increase image quality (4.5 weeks)
 - a. Reflection capsules
 - b. GI nodes
 - c. Material anisotropy
 - d. ...
8. Collect results and write the final project report (1 week)