

CAD2Render: A Modular Toolkit for GPU-accelerated Photorealistic Synthetic Data Generation for the Manufacturing Industry Supplementary Material

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CAD2Render

Appearance Variations

Figure 1 shows example of how the different textures affect the rendered end result.

Render resources CAD2Render includes only a limited amount of render resources such as environment maps or material models. For material models an open material databases is available at <https://github.com/Unity-Technologies/MeasuredMaterialLibraryHDRP> under the mit license. Environment maps can be created with a 360 camera like the Rico Theta Z1 or <https://polyhaven.com/> provides high quality HDRI's under the CC0 license.

Validation

Robustness against harsh light conditions

Figure 2 is an extra plot showing the estimated translation and rotation values compared to the ground truth. The intensity values represented in the legend are a measure of the number of pixels of the object that are saturated. It is found that for images where the object has a reflectivity of more than 60%, the position estimation errors increase, together with the standard error.

Dataset Samples

Dataset of Industrial Objects

Figure 3 shows a number of extra samples from the Dataset of Industrial Objects (DIMO). It shows both real images and images rendered with the CAD2Render toolkit.

Tool Keypoint Detection

Figure 4 shows a number of extra samples from the Tool Keypoint dataset generated by the CAD2Render toolkit. ¹

Assembly Control

Figure 5 shows a number of extra samples from the Assembly Validation dataset generated by the CAD2Render toolkit. It shows both correct and incorrect assemblies.

¹The full dataset can be found at https://bvanherle.github.io/synthetic_tools/.

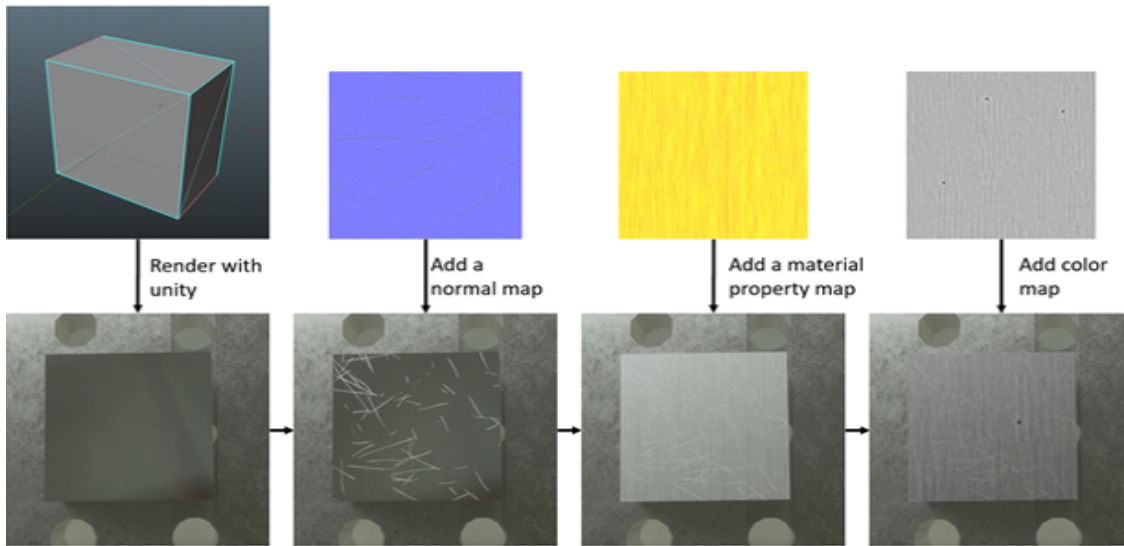


Figure 1: Illustration of the influence of different textures on end result. Typically, the appearance of the material of the object is defined by the normal map, material property map (settings for roughness and metallicnes) and color or albedo map.

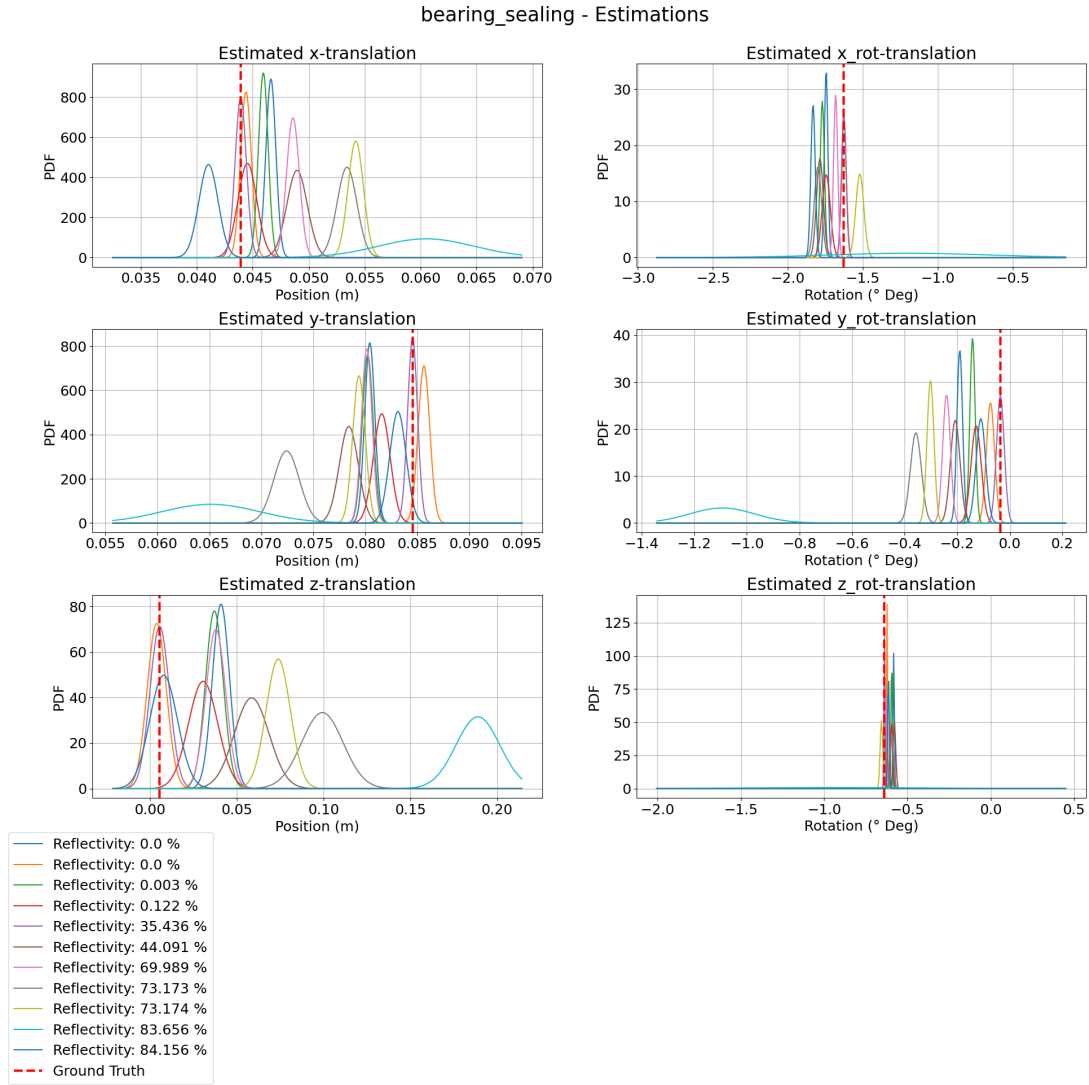


Figure 2: Comparison between translation and rotation estimations versus the Ground Truth. Note that the legend is ordered in increasing levels of intensity.

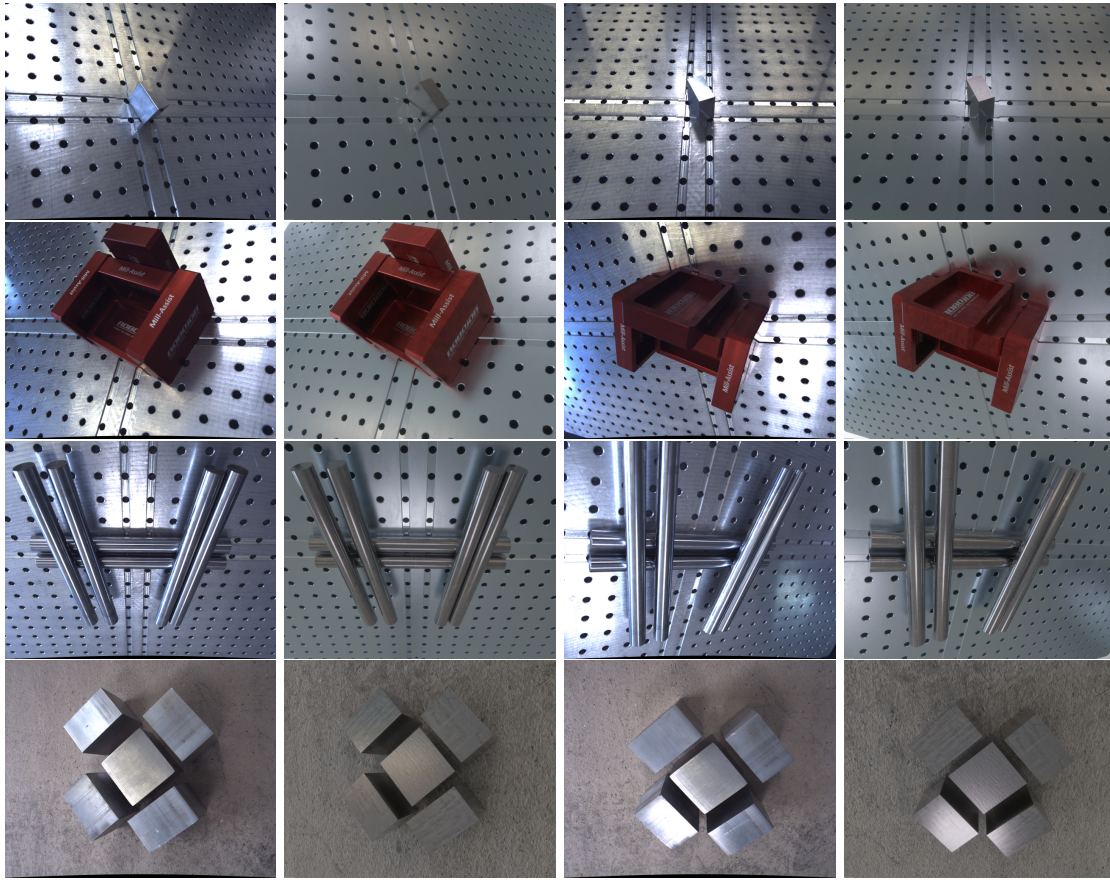


Figure 3: Extra examples of the Dataset of Industrial Metal Objects. The left images are real images taken with a JAI GO-5000-PGE, the right images are digital twin images rendered by the CAD2Render toolkit.



Figure 4: Extra examples of the Tool Keypoint Detection dataset rendered by the CAD2Render toolkit.

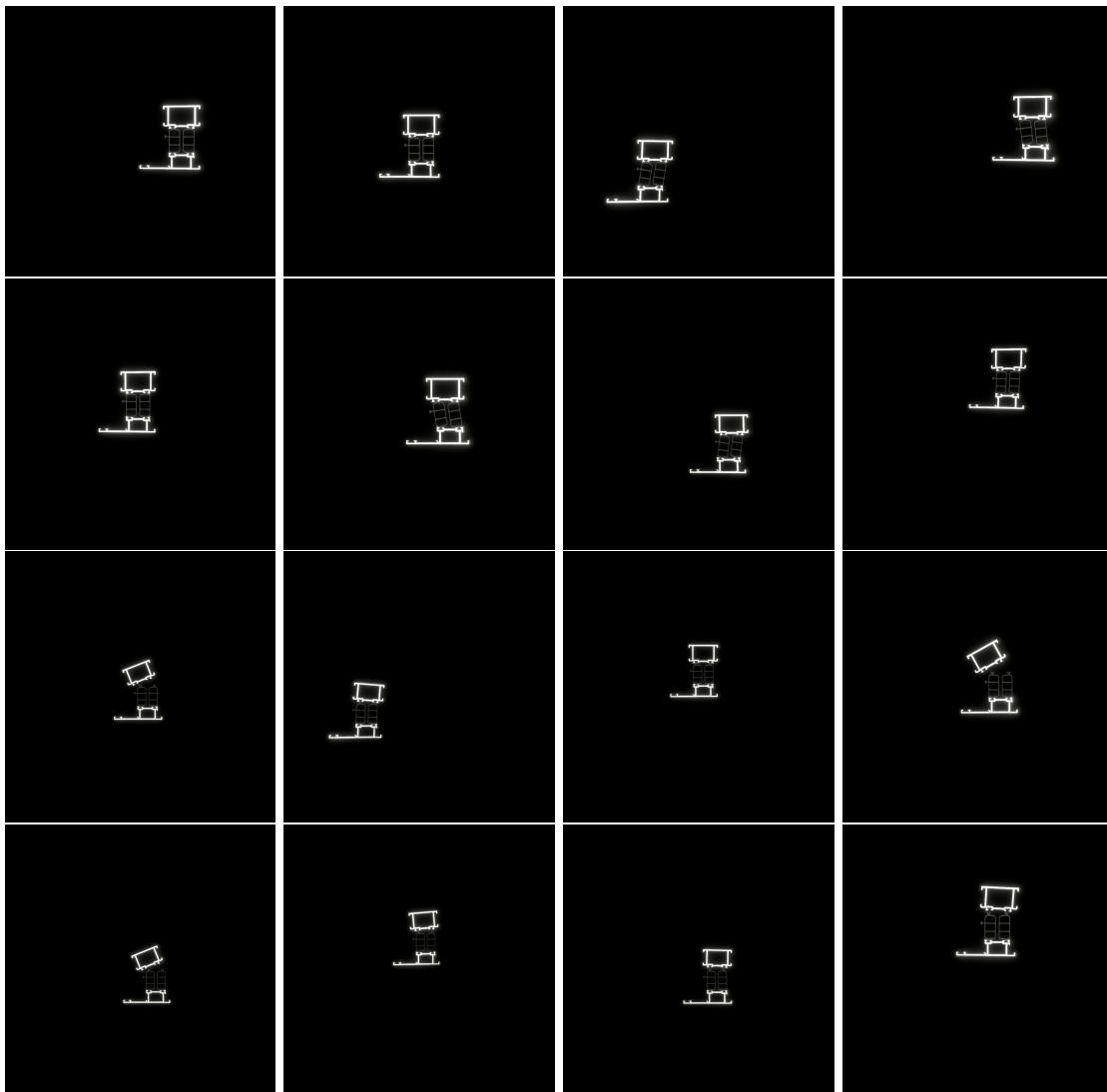


Figure 5: Extra examples of correct (top 2 rows) and defect (bottom 2 rows) assemblies for the Assembly validation dataset, rendered by the CAD2Render toolkit.