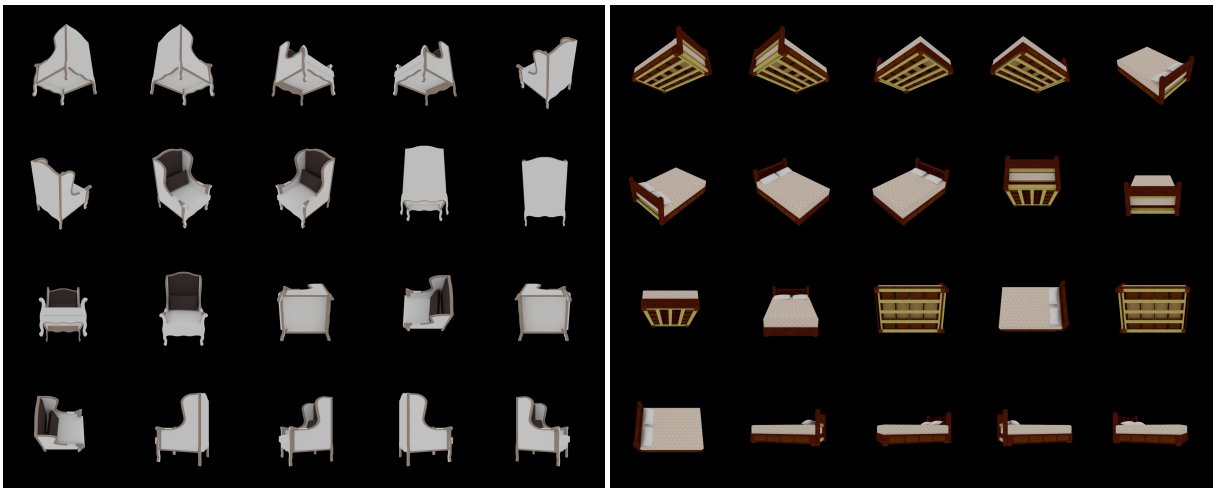
README.md

# Color & Depth Renderer for ShapeNet

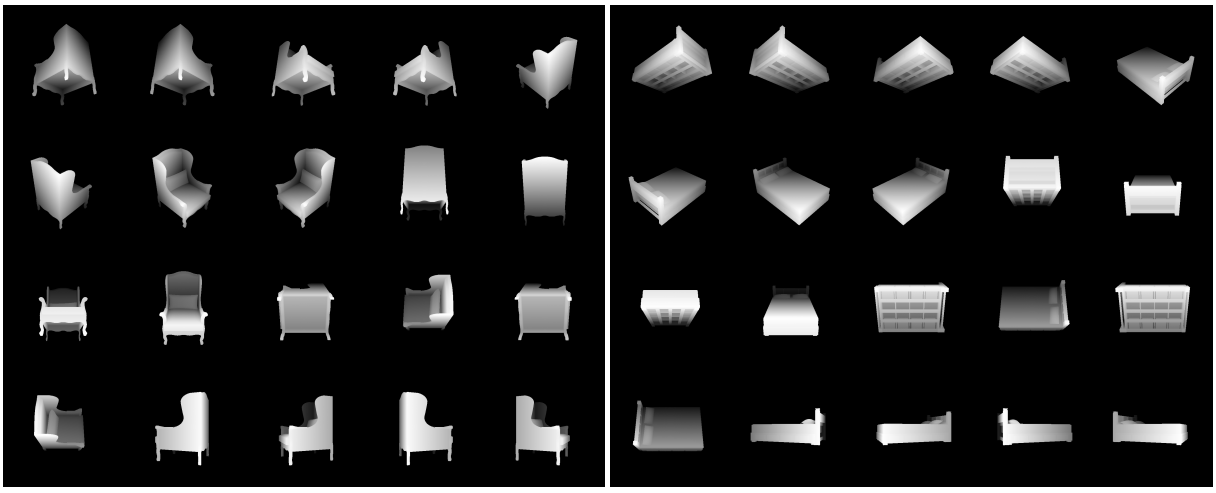
This library includes the tools for rendering multi-view color and depth images of ShapeNet models. Physically based rendering (PBR) is featured based on blender2.79.

## Outputs

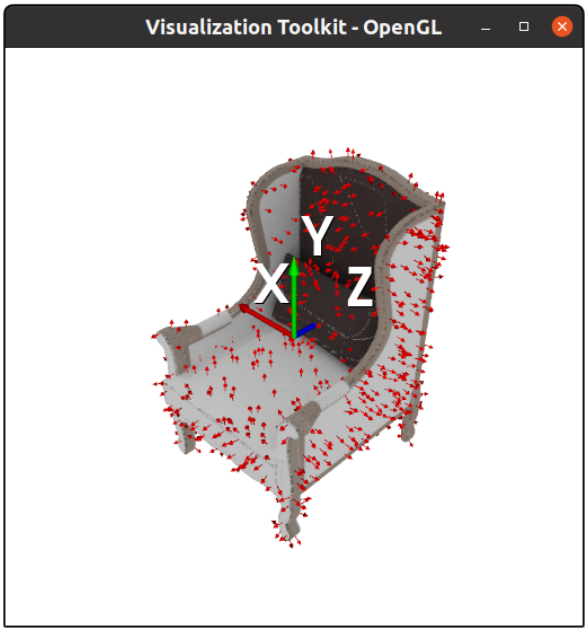
1. Color image (20 views)



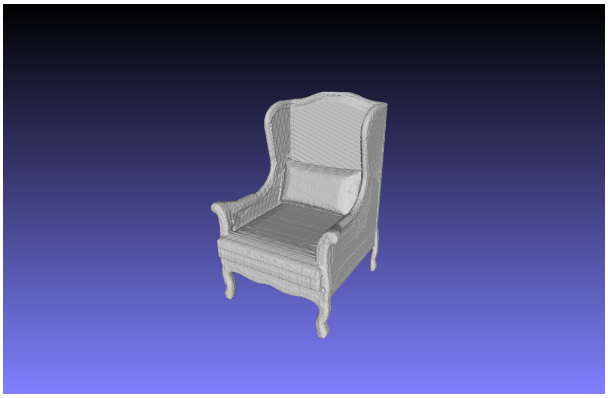
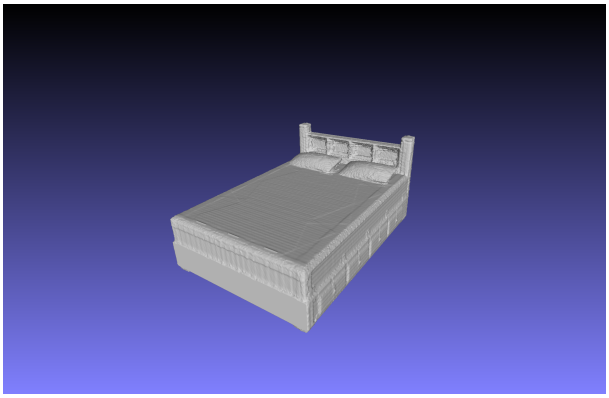
2. Depth image (20 views)



3. Point cloud and normals (Back-projected from color & depth images)




4. Watertight meshes (fused from depth maps)

## Install

1. We recommend to install this repository with conda.

```
conda env create -f environment.yml
conda activate renderer
```

2. Install Pyfusion by

```
cd ./external/pyfusion
mkdir build
cd ./build
cmake ..
make
```

Afterwards, compile the Cython code in `./external/pyfusion` by

```
cd ./external/pyfusion
python setup.py build_ext --inplace
```

3. Download & Extract blender2.79b, and specify the path of your blender executable file at `./setting.py` by

```
g_blender_excutable_path = '../../blender-2.79b-linux-glibc219-x86_64/blender'
```

## Usage

1. Normalize ShapeNet models to a unit cube by

   ```
   python normalize_shape.py
   ```

   The ShapeNetCore.v2 dataset is put in `./datasets/ShapeNetCore.v2`. Here we only present some samples in this repository.

2. Generate multiple camera viewpoints for rendering by

   ```
   python create_viewpoints.py
   ```

   The camera extrinsic parameters will be saved at `./view_points.txt`, or you can customize it in this script.

3. Run renderer to render color and depth images by

   ```
   python run_render.py
   ```

   The rendered images are saved in `./datasets/ShapeNetRenderings`. The camera intrinsic and extrinsic parameters are saved in `./datasets/camera_settings`. You can change the rendering configurations at `./settings.py`, e.g. image sizes and resolution.

4. The back-projected point cloud and corresponding normals can be visualized by

   ```
   python visualization/draw_pc_from_depth.py
   ```

5. Watertight meshes can be obtained by

   ```
   python depth_fusion.py
   ```

   The reconstructed meshes are saved in `./datasets/ShapeNetCore.v2_watertight`

## Citation

This library is used for data preprocessing in our work SK-PCN. If you find it helpful, please consider citing

```
@inproceedings{NEURIPS2020_ba036d22,
 author = {Nie, Yinyu and Lin, Yiqun and Han, Xiaoguang and Guo, Shihui and Chang, Jian and Cui, Shuguang a
 booktitle = {Advances in Neural Information Processing Systems},
 editor = {H. Larochelle and M. Ranzato and R. Hadsell and M. F. Balcan and H. Lin},
 pages = {16119--16130},
 publisher = {Curran Associates, Inc.},
 title = {Skeleton-bridged Point Completion: From Global Inference to Local Adjustment},
 url = {https://proceedings.neurips.cc/paper/2020/file/ba036d228858d76fb89189853a5503bd-Paper.pdf},
 volume = {33},
 year = {2020}
}
```

## License

This repository is relased under the MIT License.