算法挑战赛报告

计01 容逸朗 2020010869

简介

队伍

战队名称:boxworld

• 战队成员(仅有一人)

队长:容逸朗 2020010869选择赛题:可微渲染新视角生成

算法

本次比赛中主要使用了 Instant-NGP 模型:

Instant Neural Graphics Primitives with a Multiresolution Hash Encoding Thomas Müller, Alex Evans, Christoph Schied, Alexander Keller ACM Transactions on Graphics (SIGGRAPH), July 2022. [Paper]

以及普通的 NeRF 模型:

NeRF: Representing Scenes as Neural Radiance Fields for View Synthesis
Ben Mildenhall, Pratul P. Srinivasan, Matthew Tancik, Jonathan T. Barron, Ravi
Ramamoorthi, Ren Ng
ECCV, 2020. [Paper]

本次比赛中,我队通过对不同场景的镜头角度、射线起始点、迭代次数等参数做不同的调整来优化算法效果,一些观察如下:

- 对于 Car 和 Easyship,传统的 NeRF 性能比 Instant-NGP 更优;
- Car 的场景较为简单,选择更多的采样射线会导致模型的渲染效果降低;
- Coffee 的场景较为简单,选择更多的采样点和射线会导致模型的渲染效果降低;
- Scar 数据集在镜头步长更小的相机下的渲染效果越好;
- Scarf 数据集较复杂,选择更多的采样点可以带来极大的性能提升;
- 进行越多次迭代的 NeRF 模型效果会越好,但 Instant-NGP 则不然;
- 优化纹理并不能提升结果的 PSNR 值,但调整镜头参数可以。

更详尽的内容请参考代码中的 README.md 。

比赛成绩

效果

本模型在比赛提供的数据集上的渲染成绩如下:

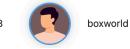
数据集	模型	实现方式	PSNR
Car	NeRF	jrender	24.5174
Coffee	Instant-NGP	JNeRF	34.3579
Easyship	NeRF	jrender	25.2233
Scar	Instant-NGP	JNeRF	40.5888
Scarf	Instant-NGP	JNeRF	32.1524
总计	-	-	156.8397

部分数据集对应的预训练模型在此处下载,使用方法请参考代码中的 README.md 。

对应的提交纪录编号为: 2022063011343344449405

最终排名

截至 2022.6.30 中午 12 时,本战队排名如下图示:



清华大学

156.84

队伍分工

全部工作皆由容逸朗完成。

参考

本项目基于下述论文实现,部分代码参考了 jrender 和 JNerf。

```
1 @article{liu2019softras,
       title={Soft Rasterizer: A Differentiable Renderer for Image-based 3D
   Reasoning},
       author={Liu, Shichen and Li, Tianye and Chen, Weikai and Li, Hao},
3
       journal={The IEEE International Conference on Computer Vision (ICCV)},
4
       month = {Oct},
5
       year={2019}
6
7
   }
8
   @article{hu2020jittor,
```

```
title={Jittor: a novel deep learning framework with meta-operators and
10
    unified graph execution},
11
        author={Hu, Shi-Min and Liang, Dun and Yang, Guo-Ye and Yang, Guo-Wei and
    Zhou, Wen-Yang},
12
        journal={Science China Information Sciences},
13
        volume={63},
14
        number={222103},
        pages={1--21},
15
        year={2020}
16
17
    }
18
    @article{mueller2022instant,
19
        author = {Thomas M\"uller and Alex Evans and Christoph Schied and Alexander
20
    Keller},
21
        title = {Instant Neural Graphics Primitives with a Multiresolution Hash
    Encoding},
22
        journal = {ACM Trans. Graph.},
23
        issue_date = {July 2022},
24
        volume = \{41\},
25
        number = \{4\},
        month = jul,
26
27
        year = {2022},
28
        pages = \{102:1--102:15\},
29
        articleno = {102},
        numpages = \{15\},
30
31
        url = {https://doi.org/10.1145/3528223.3530127},
32
        doi = {10.1145/3528223.3530127},
        publisher = {ACM},
33
        address = {New York, NY, USA},
34
35
    }
36
37
    @inProceedings{kato2018renderer
38
        title={Neural 3D Mesh Renderer},
39
        author={Kato, Hiroharu and Ushiku, Yoshitaka and Harada, Tatsuya},
        booktitle={The IEEE Conference on Computer Vision and Pattern Recognition
40
    (CVPR)},
        year={2018}
41
    }
42
43
    @inproceedings{mildenhall2020nerf,
44
45
        title={NeRF: Representing Scenes as Neural Radiance Fields for View
46
        author={Ben Mildenhall and Pratul P. Srinivasan and Matthew Tancik and
    Jonathan T. Barron and Ravi Ramamoorthi and Ren Ng},
47
        year={2020},
        booktitle={ECCV},
48
49 }
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