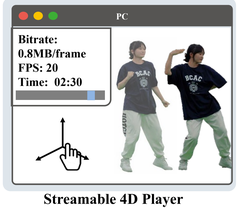
Neural Residual Radiance Fields for Streamably Free-Viewpoint Videos

Liao Wang[1,3] Qiang Hu[1] Qihan He[1,4] Ziyu Wang[1] Jingyi Yu[1]
Tinne Tuytelaars[2] Lan Xu[1] Minye Wu[2]
[1]ShanghaiTech University [2]KU Leuven [3]NeuDim [4]DGene

JUNE 18-22, 2023 CVPR VANCOUVER, CANADA

Motivation

Residual Radiance Field



Streamable 4D Player

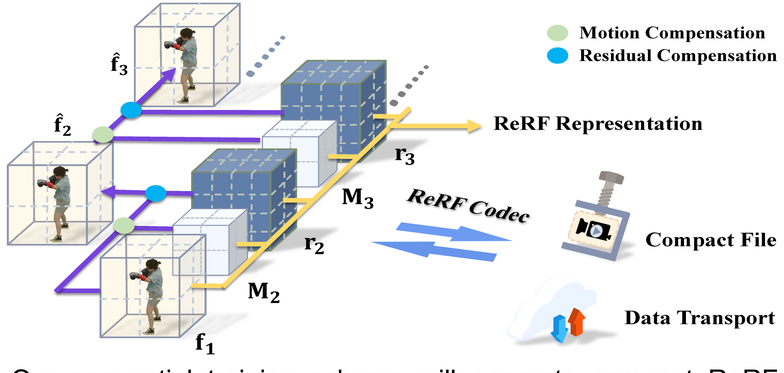
Recent dynamic radiance field rendering is restricted to :

- ❖ Offline rendering
- ❖ Short sequences without challenging motions

Contribution

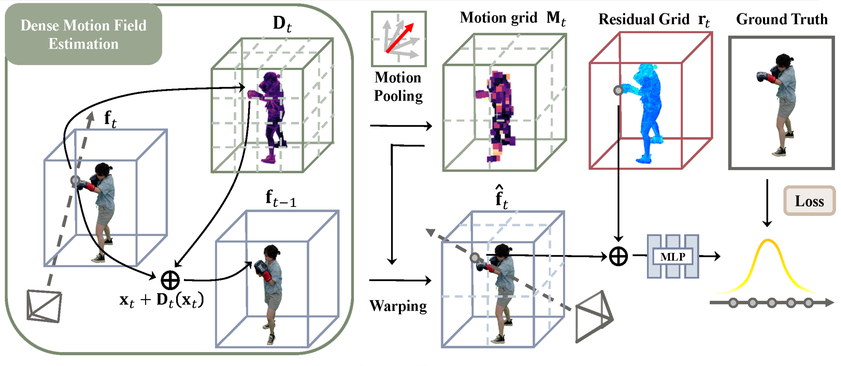
- **Streamable** free-viewpoint viewing for dynamic radiance fields
- **High compression rate** with high rendering quality
- Support **long sequences** with **large motions**
- Develop a **ReRF-based codec** and a **companion FVV player**

Overview



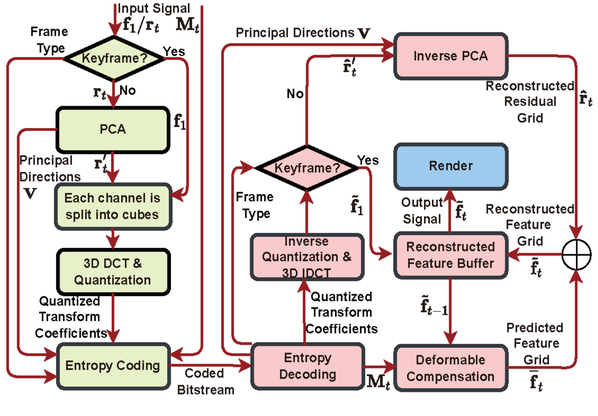
- Our sequential training scheme will generate compact ReRF representation with motion grid $\mathbf{M}_i$ and residual feature $\boldsymbol{r}_i$ for each frame i
- Our ReRF based codec scheme and player will enable fast data transport and online playing through compression

Neural Residual Radiance Field (ReRF)



1. Estimate a dense motion field $\boldsymbol{D}_t$
2. Generate a compact motion grid $\mathbf{M}_t$ through motion pooling
3. Warp $\mathbf{f}_{t-1}$ to a base grid $\hat{\mathbf{f}}_t$ and learn our residual grid $\boldsymbol{r}_t$ to increase feature sparsity and promote compression

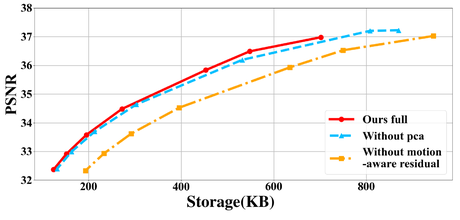
ReRF-based codec and player



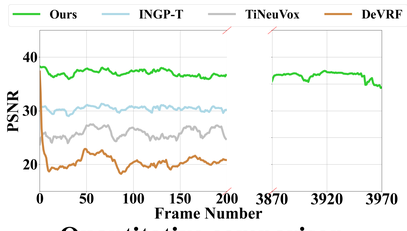
Compresses the input signal by using:

- PCA
- 3D-DCT
- Quantization
- Entropy encoding

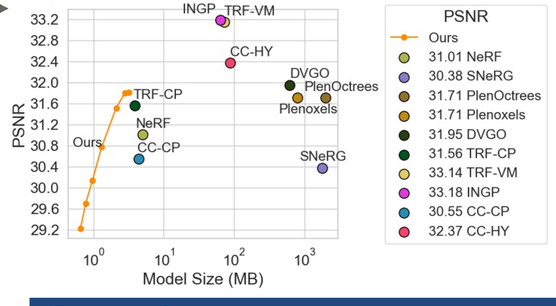
Evaluation



Rate distortion curve



Quantitative comparison on the number of frames



Quantitative results on Synthetic NeRF Dataset

Comparison