

Fast Style Transfer on 3D Scenes using a Single Stylized Image



Background

Style transfer has become an essential tool for adding artistic effects to media, particularly for enhancing videos during post-processing. However, traditional frame-by-frame style transfer often leads to inconsistencies across views, especially in 3D scenes where multi-view coherence is critical. Applying style transfer across an entire 3D scene using a single stylized image can achieve a consistent and immersive effect, enhancing the aesthetic without compromising on temporal continuity. This approach holds potential for applications in film, animation, and augmented reality where seamless stylized visuals are desired.

Problem Specification

In 3D scene processing, maintaining multi-view consistency during style transfer poses a challenge. Applying style individually to each frame often results in visual artifacts and breaks in continuity. This project aims to implement a method to apply style transfer uniformly across a 3D scene using a Gaussian splatting-based approach, allowing for smooth transitions between viewpoints. A GUI app will enable users to select a pre-trained GSplat checkpoint or train a new GSplat model on a dataset, upload a style image, and apply the effect uniformly across the scene, ensuring real-time rendering and multi-view consistency.

Suggested Method

The project will develop a GUI application for fast 3D scene style transfer. Users will be able to load a style image, select a GSplat checkpoint, or train GSplat on a custom dataset. The style transfer will be applied using a StyleGaussian or similar Gaussian splatting-based method to ensure multi-view consistency. Rendered results will be displayed in an interactive viewer, allowing users to explore the stylized scene from different perspectives. Performance will be evaluated based on rendering speed and visual coherence across viewpoints.

Relevant Articles

- [1] Liu, K., Zhan, F., Xu, M., Theobalt, C., Shao, L. and Lu, S., 2024. StyleGaussian: Instant 3D Style Transfer with Gaussian Splatting. ([GitHub](#))
- [2] Jain, S., Kuthiala, A., Sethi, P.S. and Saxena, P., 2024. StyleSplat: 3D Object Style Transfer with Gaussian Splatting. *arXiv preprint arXiv:2407.09473*. ([GitHub](#))
- [3] Gatys, L.A., Ecker, A.S. and Bethge, M., 2016. Image style transfer using convolutional neural networks. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 2414-2423).

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