Novelty Assessment Report

Paper: Signal Structure-Aware Gaussian Splatting for Large-Scale Scene Reconstruction

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Abstract

3D Gaussian Splatting has demonstrated remarkable potential in novel view synthesis. In contrast to small-scale scenes, large-scale scenes inevitably contain sparsely observed regions with excessively sparse initial points. In this case, supervising Gaussians initialized from low-frequency sparse points with high-frequency images often induces uncontrolled densification and redundant primitives, degrading both efficiency and quality. Intuitively, this issue can be mitigated with scheduling strategies, which can be categorized into two paradigms: modulating target signal frequency via densification and modulating sampling frequency via image resolution. However, previous scheduling strategies are primarily hardcoded, failing to perceive the convergence behavior of the scene frequency. To address this, we reframe scene reconstruction problem from the perspective of signal structure recovery, and propose SIG, a novel scheduler that Synchronizes Image supervision with Gaussian frequencies. Specifically, we derive the average sampling frequency and bandwidth of 3D representations, and then regulate the training image resolution and the Gaussian densification process based on scene frequency convergence. Furthermore, we introduce Sphere-Constrained Gaussians, which leverage the spatial prior of initialized point clouds to control Gaussian optimization. Our framework enables frequency-consistent, geometry-aware, and floater-free training, achieving state-of-the-art performance with a substantial margin in both efficiency and rendering quality in large-scale scenes.

Core Task Landscape

This paper addresses: **Large-Scale Scene Reconstruction Using 3D Gaussian Splatting**

A total of **50 papers** were analyzed and organized into a taxonomy with **27 categories**.

Taxonomy Overview

The research landscape has been organized into the following main categories:

- **Spatial Partitioning and Distributed Training Methods**
- **Holistic and Hierarchical Optimization Frameworks**
- **Generalizable Feed-Forward Reconstruction**
- **Domain-Specific Scene Reconstruction**
- **Active and Robotic Scene Reconstruction**
- **Cross-View and Multi-Branch Reconstruction**
- **Dynamic Scene Reconstruction**
- **Surface Reconstruction and Mesh Extraction**
- **Sparse-View and Limited Input Reconstruction**
- **Registration and Alignment Methods**
- ... and 3 more categories

Complete Taxonomy Tree

- Large-Scale Scene Reconstruction Using 3D Gaussian Splatting Survey Taxonomy
- Spatial Partitioning and Distributed Training Methods
  - Divide-and-Conquer Partitioning Strategies (4 papers)
  - [1] Vastgaussian: Vast 3d gaussians for large scene reconstruction (Jiaqi Lin, 2024) View paper
  - [35] LOBE-GS: Load-Balanced and Efficient 3D Gaussian Splatting for Large-Scale Scene Reconstruction (Yen-Ting Yu, 2025) View paper
  - [40] Citygaussian: Real-time high-quality large-scale scene rendering with gaussians (Liu Yang, 2024) View paper
  - [43] Robust and Efficient 3D Gaussian Splatting for Urban Scene Reconstruction (Yuan, 2025) View paper
  - Distributed and Parallel Computation Frameworks (2 papers)
  - [13] DOGS: Distributed-Oriented Gaussian Splatting for Large-Scale 3D Reconstruction Via Gaussian Consensus (Yu Chen, 2024) View paper
  - [48] On scaling up 3d gaussian splatting training (Zhao, 2024) View paper
- Holistic and Hierarchical Optimization Frameworks
  - Holistic Scene Modeling Without Partitioning (2 papers)
  - [14] Holistic Large-Scale Scene Reconstruction via Mixed Gaussian Splatting (Liu Chuandong, 2025) View paper
  - [33] LargeSceneGaussian: High-Efficiency 3D Gaussian Splatting for Large-Scale Scene Reconstruction (Yifeng Ge, 2025) View paper
  - Hierarchical and Multi-Scale Representations (2 papers)
  - [6] HiSplat: Hierarchical 3D Gaussian Splatting for Generalizable Sparse-View Reconstruction (Tang Shengji, 2024) View paper
  - [49] PyGS: Large-scale Scene Representation with Pyramidal 3D Gaussian Splatting (Wang ZiPeng, 2024) View paper
  - Signal Structure and Frequency-Aware Optimization ★ (1 papers)
  - [0] Signal Structure-Aware Gaussian Splatting for Large-Scale Scene Reconstruction (Anon et al., 2026) View paper

- Generalizable Feed-Forward Reconstruction
  - Transformer-Based Large Reconstruction Models (3 papers)
  - [2] GS-LRM: Large Reconstruction Model for 3D Gaussian Splatting (Zhang Kai, 2024) View paper
  - [7] Triplane Meets Gaussian Splatting: Fast and Generalizable Single-View 3D Reconstruction with Transformers (Ziâ□□Xin Zou, 2023) View paper
  - [21] Grm: Large gaussian reconstruction model for efficient 3d reconstruction and generation (Xu, 2024) View paper
  - Pose-Free and Uncalibrated Reconstruction (2 papers)
  - [10] FreeSplatter: Pose-free Gaussian Splatting for Sparse-view 3D Reconstruction (Xu Jiale, 2024) View paper
  - [42] Colmap-free 3d gaussian splatting (Yang Fu, 2024) View paper
  - Multi-View Stereo Guided Generalizable Reconstruction (2 papers)
  - [34] Mvsgaussian: Fast generalizable gaussian splatting reconstruction from multi-view stereo (Tianqi Liu, 2024) View paper
  - [38] pixelsplat: 3d gaussian splats from image pairs for scalable generalizable 3d reconstruction (David Charatan, 2024) View paper
  - Indoor Scene Generalizable Reconstruction (1 papers)
  - [47] FreeSplat++: Generalizable 3D Gaussian Splatting for Efficient Indoor Scene Reconstruction (Wang Yun-song, 2025) View paper
- Domain-Specific Scene Reconstruction
  - Autonomous Driving Scene Reconstruction (3 papers)
  - [3] Autosplat: Constrained gaussian splatting for autonomous driving scene reconstruction (Mustafa Khan, 2025) View paper
  - [18] Radarsplat: Radar gaussian splatting for high-fidelity data synthesis and 3d reconstruction of autonomous driving scenes (Kung, 2025) View paper
  - [24] DrivingForward: Feed-forward 3D Gaussian Splatting for Driving Scene Reconstruction from Flexible Surround-view Input (Tian Qi-jian, 2024) View paper
  - Underwater Scene Reconstruction (4 papers)
  - [20] Water-Adapted 3D Gaussian Splatting for precise underwater scene reconstruction (Xinnan Fan, 2025) View paper
  - [39] Aqua3DGS: Enhanced 3D Gaussian Splatting for Robust Underwater Scene Reconstruction (Zhe Wang, 2025) View paper
  - [41] Watersplatting: Fast underwater 3d scene reconstruction using gaussian splatting (Huapeng Li, 2025) View paper
  - [50] DualPhys-GS: Dual Physically-Guided 3D Gaussian Splatting for Underwater Scene Reconstruction (Li, 2025) View paper
  - Adverse Weather and Degraded Conditions (3 papers)
  - [5] Hdrsplat: Gaussian splatting for high dynamic range 3d scene reconstruction from raw images (Singh, 2024) View paper
  - [22] SmokeSeer: 3D Gaussian Splatting for Smoke Removal and Scene Reconstruction (Jain, 2025) View paper
  - [28] Weathergs: 3d scene reconstruction in adverse weather conditions via gaussian splatting (Chenghao Qian, 2025) View paper
  - Surgical and Medical Scene Reconstruction (1 papers)
  - [4] Free-surgs: Sfm-free 3d gaussian splatting for surgical scene reconstruction (Guo Jiaxin, 2024) View paper
  - Indoor Scene Reconstruction with Geometric Priors (1 papers)
  - [8] Gaussianroom: Improving 3d gaussian splatting with sdf guidance and monocular cues for indoor scene reconstruction (Haodong Xiang, 2025) View paper
  - Aerial and Large-Scale Outdoor Reconstruction (3 papers)
  - [26] 3D Gaussian Splatting for Large-scale Surface Reconstruction from Aerial Images (Wu Yuanzheng, 2024) View paper
  - [29] Large-scale infrared 3D reconstruction based on SfM optimization and 3D Gaussian splatting (Lizhaoxuan Liu, 2025) View paper
  - [44] 3D Gaussian Splatting for Fine-Detailed Surface Reconstruction in Large-Scale Scene (Chen, 2025) View paper
  - Specialized Phenomena Reconstruction (1 papers)
  - [31] Reconstructing Tornadoes in 3D with Gaussian Splatting (Yang Adam, 2025) View paper
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  - [9] HGS-Planner: Hierarchical Planning Framework for Active Scene Reconstruction Using 3D Gaussian Splatting (Zijun Xu, 2024) View paper
  - [16] ActiveGS: Active Scene Reconstruction Using Gaussian Splatting (Liren Jin, 2025) View paper
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  - [17] CrossView-GS: Cross-view Gaussian Splatting For Large-scale Scene Reconstruction (Zhang, 2025) View paper
  - [32] Graph-Guided Scene Reconstruction from Images with 3D Gaussian Splatting (Cheng Chong, 2025) View paper
- Dynamic Scene Reconstruction
  - Motion-Aware and Optical Flow Guided Reconstruction (2 papers)
  - [30] Event-guided 3D Gaussian Splatting for Dynamic Human and Scene Reconstruction (Yin, 2025) View paper
  - [45] Motion-Aware 3D Gaussian Splatting for Efficient Dynamic Scene Reconstruction (Guo Zhiyang, 2024) View paper
  - Hybrid 3D-4D Gaussian Representations (1 papers)
  - [46] Hybrid 3D-4D Gaussian Splatting for Fast Dynamic Scene Representation (Oh Seung-Jun, 2025) View paper
  - Continual and Incremental Scene Reconstruction (1 papers)
  - [23] CGS: Continual Gaussian Splatting for Evolving 3D Scene Reconstruction (Mu, 2025) View paper
- Surface Reconstruction and Mesh Extraction (3 papers)
  - [25] Gaustudio: A modular framework for 3d gaussian splatting and beyond (Ye, 2024) View paper
  - [27] Sugar: Surface-aligned gaussian splatting for efficient 3d mesh reconstruction and high-quality mesh rendering (Antoine GuÃ©don, 2024) View paper
  - [36] Gs2mesh: Surface reconstruction from gaussian splatting via novel stereo views (Yaniv Wolf, 2024) View paper
- Sparse-View and Limited Input Reconstruction (1 papers)
  - [37] Optimizing 3D Gaussian Splatting for Sparse Viewpoint Scene Reconstruction (Chen Shen, 2024) View paper
- Registration and Alignment Methods (1 papers)
  - [12] Gaussreg: Fast 3d registration with gaussian splatting (Chang, 2024) View paper
- Deformation and Manipulation Frameworks (1 papers)
  - [19] Real-time large-scale deformation of gaussian splatting (Lin Gao, 2024) View paper
- Benchmarks and Evaluation Frameworks (1 papers)
  - [15] Gauu-scene: A scene reconstruction benchmark on large scale 3d reconstruction dataset using gaussian splatting (Li Zhuo, 2024) View paper

- Survey and Review Literature (1 papers)
  - [11] A review of recent advances in 3D Gaussian Splatting for optimization and reconstruction (Jie Luo, 2024) View paper

Narrative

Core task: large-scale scene reconstruction using 3D Gaussian splatting. The field has rapidly diversified into several major branches addressing distinct challenges. Spatial partitioning and distributed training methods tackle computational scalability by dividing massive environments into manageable chunks, as seen in VastGaussian[1] and CityGaussian[40]. Holistic and hierarchical optimization frameworks focus on improving reconstruction quality through better training strategies and signal-aware techniques, while generalizable feed-forward reconstruction approaches like GS-LRM[2] and pixelSplat[38] aim to predict scene representations from limited views without per-scene optimization. Domain-specific branches address specialized environments—underwater scenes, aerial imagery, adverse weather, and urban settings—each requiring tailored handling of unique visual phenomena. Meanwhile, sparse-view reconstruction, surface extraction methods like SuGaR[27], and dynamic scene modeling extend the core technology to handle data-limited and time-varying scenarios. Active reconstruction and registration methods round out the taxonomy by addressing sensor planning and multi-scan alignment.

Within the holistic optimization branch, a handful of works explore how to better structure the training process itself, moving beyond naive gradient descent. Signal Structure-Aware[0] emphasizes frequency-aware optimization strategies that respect the underlying signal characteristics of scene content, aiming for more stable convergence and higher fidelity in complex large-scale settings. This contrasts with approaches like AutoSplat[3], which automates hyperparameter tuning across diverse scenes, or HDRSplat[5], which targets high dynamic range capture. While many studies in this branch pursue hierarchical representations or coarse-to-fine refinement, Signal Structure-Aware[0] distinguishes itself by explicitly modeling how different frequency components should be treated during optimization, offering a complementary perspective on achieving robust reconstruction quality when scaling to expansive environments.

Related Works in Same Category

No sibling papers were found in the same taxonomy leaf. A taxonomy-subtopic-level comparison will be produced instead.

Taxonomy-Level Summary

The original leaf focuses on optimization scheduling driven by frequency analysis and signal structure, coordinating densification with supervision timing. Sibling subtopics address structural representation choices: hierarchical/multi-scale Gaussian organizations versus holistic single-scale modeling. While the original leaf concerns when and how to optimize based on convergence signals, siblings concern what structure to optimize—whether decomposed across scales or unified globally.

Similarities: - All three subtopics aim to improve large-scale 3D Gaussian splatting reconstruction quality and efficiency - Each addresses challenges of scene complexity, though through different mechanisms (temporal scheduling vs. spatial/scale organization) - All exclude feed-forward generalizable methods, focusing on per-scene optimization strategies

Differences: - Original leaf uses frequency-domain analysis to schedule optimization phases; siblings use spatial or scale-based structural decomposition - Hierarchical subtopic employs multi-resolution Gaussian pyramids; holistic subtopic avoids partitioning entirely; original leaf is agnostic to spatial structure, focusing on temporal supervision alignment - Original leaf's exclusion targets methods lacking frequency-aware scheduling; siblings exclude each other based on partitioning presence and exclude hierarchical feed-forward methods - Siblings differ in representation granularity (multi-scale vs. single unified model); original leaf differs in optimization control mechanism (signal-driven scheduling)

Suggested Search Directions: - Investigate whether frequency-aware scheduling can be combined with hierarchical representations for synergistic benefits - Explore if holistic modeling benefits more or less from signal structure analysis compared to partitioned approaches - Examine trade-offs between structural decomposition strategies and temporal optimization scheduling in memory and convergence speed

Sibling Subtopics

- **Hierarchical and Multi-Scale Representations** (leaves: 1, papers: 2)
- Scope: Approaches employing hierarchical Gaussian structures or pyramidal representations to handle multi-scale scene complexity.
- Exclude: Single-scale holistic methods belong to holistic scene modeling; feed-forward hierarchical methods belong to generalizable reconstruction.
- **Holistic Scene Modeling Without Partitioning** (leaves: 1, papers: 2)
- Scope: Frameworks optimizing entire large-scale scenes holistically through view-aware representations or mixed Gaussian strategies.
- Exclude: Methods using spatial decomposition belong to partitioning strategies; hierarchical multi-scale methods belong to hierarchical optimization.

Contributions Analysis

Overall novelty summary. The paper proposes SIG, a scheduler that synchronizes image supervision with Gaussian frequencies during large-scale 3D Gaussian Splatting reconstruction. According to the taxonomy, this work occupies a unique position within the 'Signal Structure and Frequency-Aware Optimization' leaf under 'Holistic and Hierarchical Optimization Frameworks'. Notably, this leaf contains only the original paper itself—no sibling papers exist in this category. This isolation suggests the frequency-aware scheduling perspective represents a relatively unexplored direction within the broader holistic optimization landscape, which itself contains only six papers across three leaves.

The taxonomy reveals that neighboring research directions focus on different optimization strategies: 'Holistic Scene Modeling Without Partitioning' (two papers) addresses view-aware representations, while 'Hierarchical and Multi-Scale Representations' (two papers) employs pyramidal structures. The broader 'Holistic and Hierarchical Optimization Frameworks' branch sits alongside 'Spatial Partitioning' methods (six papers across two leaves) and 'Generalizable Feed-Forward Reconstruction' (seven papers across four leaves). The paper's signal-theoretic framing—deriving average sampling frequency and bandwidth—diverges from these neighboring approaches, which primarily tackle scalability through spatial decomposition or rapid feed-forward prediction rather than frequency-aware training modulation.

Among sixteen candidates examined across three contributions, none were found to clearly refute the proposed work. The 'SIG scheduler' contribution examined five candidates with zero refutations; the 'mathematical derivation of average frequency' examined five candidates with zero refutations; and 'Sphere-Constrained Gaussians' examined six candidates with zero refutations. This limited search scope—sixteen papers from semantic matching—suggests the frequency-aware scheduling concept has minimal direct overlap with examined prior work. However, the absence of sibling papers and the small candidate pool indicate this assessment reflects a narrow literature window rather than exhaustive coverage of related optimization strategies.

Based on the top-sixteen semantic matches and the taxonomy structure, the frequency-aware scheduling approach appears to occupy a sparse research direction within large-scale Gaussian Splatting. The single-paper leaf and zero refutations across contributions suggest novelty within the examined scope, though the limited search scale leaves open the possibility of relevant work in adjacent optimization or signal processing literature not captured by this analysis. The work's positioning at the intersection of signal theory and 3D reconstruction may explain both its taxonomic isolation and the lack of direct prior work in the candidate set.

This paper presents **3 main contributions**, each analyzed against relevant prior work:

Contribution 1: Signal Structure-Aware Gaussian Splatting (SIG) scheduler

Description: The authors introduce a scheduler that adaptively adjusts training image resolution and Gaussian densification based on scene frequency convergence, rather than using hard-coded schedules. This enables frequency-consistent optimization by synchronizing supervision signals with the evolving frequency content of 3D Gaussian representations.

This contribution was assessed against **5 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

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1. An adaptive approach for the progressive integration of spatial and spectral features when training ground-based hyperspectral imaging classifiers

URL: View paper

Brief Assessment

Adaptive Hyperspectral[56] focuses on hyperspectral image classification with neural networks for material property determination, not 3D scene reconstruction or Gaussian splatting optimization schedules.

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2. Progressive Spatialâ Spectral Joint Network for Hyperspectral Image Reconstruction

URL: View paper

Brief Assessment

Spatial-Spectral Joint[55] focuses on hyperspectral image reconstruction from multispectral images using progressive spatial-spectral feature extraction, not adaptive training schedules for 3D scene reconstruction based on frequency convergence.

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3. Multi-scale Progressive Feature Embedding for Accurate NIR-to-RGB Spectral Domain Translation

URL: View paper

Brief Assessment

NIR-to-RGB[52] focuses on spectral domain translation between near-infrared and RGB images using multi-scale progressive feature embedding for image colorization. It does not address adaptive training schedules for 3D scene reconstruction or Gaussian splatting optimization based on scene frequency convergence.

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4. A Progressive Spatial-Spectral Interactive Network for Integrated Fusion of Panchromatic, Multispectral, and Hyperspectral Images

URL: View paper

Brief Assessment

Spatial-Spectral Interactive[54] addresses image fusion for remote sensing (pan/ms/hs imagery), not 3D scene reconstruction or Gaussian splatting training schedules. The domains and technical approaches are fundamentally different.

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5. A Progressive Spectral Correction and Spatial Compensation Network for Pansharpening

URL: View paper

Brief Assessment

Spectral Correction Pansharpening[53] focuses on image fusion for pansharpening tasks using spectral correction and spatial compensation branches, not on adaptive training schedules for 3D Gaussian splatting or scene frequency convergence.

Contribution 2: Mathematical derivation of average frequency for 3D Gaussians

Description: The authors derive formal definitions for the average sampling frequency and scene signal bandwidth of 3D Gaussian representations. This theoretical framework characterizes the frequency content of Gaussian primitives and guides the adaptive scheduling strategy.

This contribution was assessed against **5 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

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1. Adapting histogram for automatic noise data removal in building interior point cloud data

URL: View paper

Brief Assessment

Histogram Noise Removal[65] focuses on using histogram-based frequency analysis for noise removal in building interior point clouds, not on deriving mathematical definitions of average sampling frequency for 3D Gaussian representations used in novel view synthesis.

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2. A reflective symmetry descriptor for 3D models

URL: View paper

Brief Assessment

Reflective Symmetry[63] focuses on computing symmetry measures for 3D models using Fourier methods on voxel grids, not on defining average sampling frequencies for 3D Gaussian representations used in novel view synthesis.

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3. Unleashing the Potential of Unlabeled Data: Bidirectional Collaborative Semi-Supervised Active Learning for 3D Object Detection

URL: View paper

Brief Assessment

Bidirectional Semi-Supervised[67] focuses on semi-supervised active learning for 3D object detection in LiDAR point clouds, not on mathematical frequency analysis of 3D Gaussian representations for novel view synthesis.

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4. A structured light based 3d reconstruction using combined circular phase shifting patterns

URL: View paper

Brief Assessment

Circular Phase Shifting[64] focuses on structured light 3D reconstruction using phase shifting patterns for surface scanning, not on mathematical definitions of average frequency for point-based 3D Gaussian representations used in novel view synthesis.

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5. Modeling and simulation based design of variable pitch and variable helix milling tools for increased chatter stability

URL: View paper

Brief Assessment

Variable Pitch Milling[66] focuses on mechanical engineering applications (milling tool design and chatter stability), not 3D scene reconstruction or Gaussian representations. The domains are entirely different.

Contribution 3: Sphere-Constrained Gaussians

Description: The authors introduce a method that constrains Gaussian primitives within spherical regions based on spatial priors from initialized point clouds. This approach reduces redundancy and prevents floater artifacts by limiting the optimization space while preserving scene structure.

This contribution was assessed against **6 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

1. FOSUP: Dynamic Garments Diffusion with Fourier Spherical Unwrapping from Monocular Video.

URL: View paper

Brief Assessment

FOSUP[59] focuses on dynamic garment reconstruction using Fourier spherical unwrapping and diffusion models for clothing topology, not on constraining Gaussian primitives within spherical regions for scene reconstruction.

2. Practical considerations for 3-D image reconstruction using spherically symmetric volume elements

URL: View paper

Brief Assessment

Spherically Symmetric[60] focuses on spherically symmetric volume elements (blobs) for medical image reconstruction from projection data, not on constraining Gaussian primitives within spherical regions for 3D scene reconstruction to prevent floater artifacts.

3. Regularized spherical harmonics-domain spatial active noise cancellation in a reverberant room

URL: View paper

Brief Assessment

Spherical Harmonics ANC[62] addresses acoustic noise cancellation using spherical harmonics in reverberant rooms, not visual scene reconstruction with Gaussian primitives constrained by spatial priors from point clouds.

4. SP-GAN: Sphere-guided 3D shape generation and manipulation

URL: View paper

Brief Assessment

SP-GAN[57] uses a sphere as a spatial prior to guide 3D shape generation from point clouds, not to constrain Gaussian primitives for scene reconstruction. The technical contexts are fundamentally different: SP-GAN focuses on generative modeling of shapes, while the original paper addresses optimization of Gaussian splatting for large-scale scene reconstruction.

5. FMGS-Avatar: Mesh-Guided 2D Gaussian Splatting with Foundation Model Priors for 3D Monocular Avatar Reconstruction

URL: View paper

Brief Assessment

FMGS-Avatar[58] focuses on mesh-guided 2D Gaussian splatting for human avatar reconstruction, not on constraining 3D Gaussian primitives within spherical regions for large-scale scene reconstruction. The candidate's mesh-guided approach constrains 2D gaussians to template mesh faces for surface modeling, which is fundamentally different from the original paper's sphere-constrained optimization of 3D gaussians based on spatial priors from point clouds.

6. Spatially Regularized Super-Resolved Constrained Spherical Deconvolution (SR^2-CSD) of Diffusion MRI Data

URL: View paper

Brief Assessment

SR2-CSD[61] addresses spherical deconvolution in diffusion MRI using spherical harmonics and spatial regularization, not 3D Gaussian primitives for scene reconstruction. The technical domains and problem formulations are fundamentally different.

Appendix: Text Similarity Detection

No high-similarity text segments were detected across any compared papers.

References

- [0] Signal Structure-Aware Gaussian Splatting for Large-Scale Scene Reconstruction View paper
- [1] Vastgaussian: Vast 3d gaussians for large scene reconstruction View paper
- [2] GS-LRM: Large Reconstruction Model for 3D Gaussian Splatting View paper
- [3] Autosplat: Constrained gaussian splatting for autonomous driving scene reconstruction View paper
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