Sparse-GS2Mesh: 3D Gaussian Splatting Guided by Novel Stereo Views and 2DGS for Sparse View Surface Reconstruction

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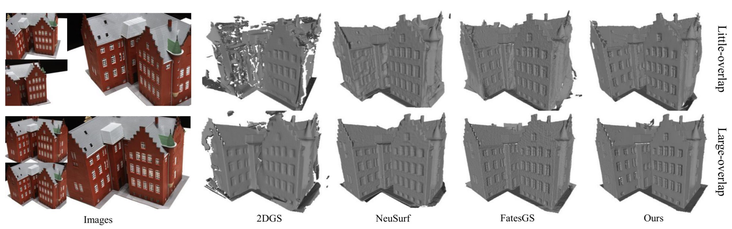
Project Page

What is this work?

Reconstruct **accurate surfaces from extremely sparse views**: a 3DGS **specialized for stereo matching** renders **novel stereo views**, a pre-trained **stereo matching network** extracts the final depth maps, and TSDF fusion turns them into a mesh.



Sparse input views → our meshes are more complete in both overlap settings.

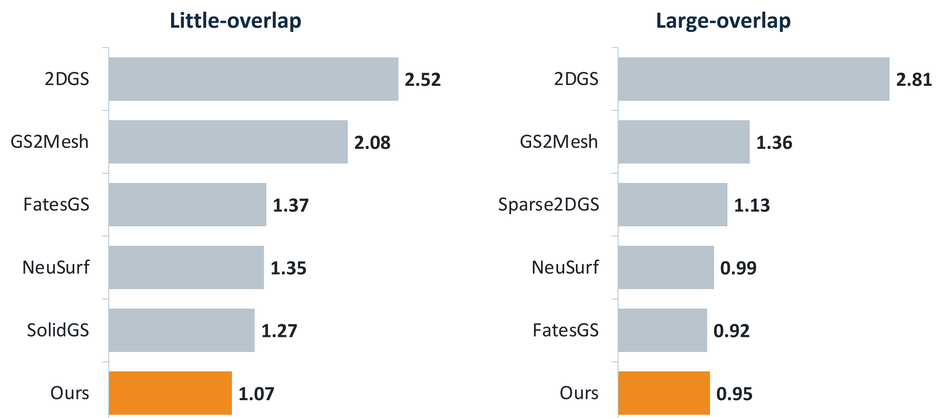
Motivation

- Real capture often gives only a few views → very few geometric cues.
- **GS2Mesh** renders novel stereo views (NVS) with 3DGS and uses them as **extra geometric cues**.
- These cues help **more under sparse views**, where cues are scarce, than under dense views.
- But **naively rendered stereo views are low-quality** — sparse-view 3DGS overfits to the inputs.

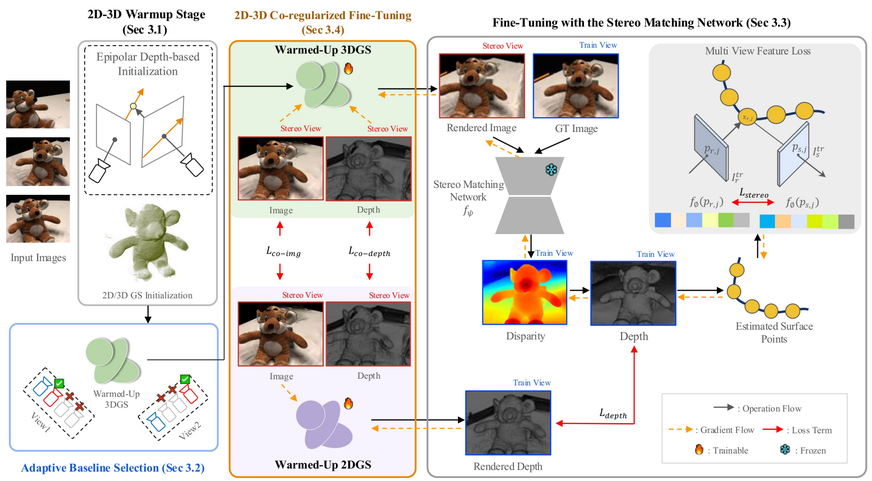
How can stereo views become **good geometric cues**?

Experiments

DTU, 3 input views · Chamfer Distance (mm) ↓



Methodology

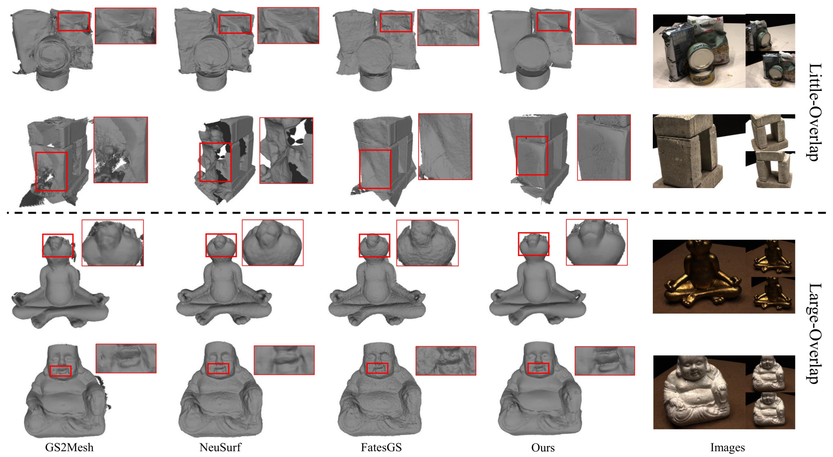


I. **Adaptive baseline selection:** per view, pick the stereo baseline B* that maximizes multi-view feature consistency.

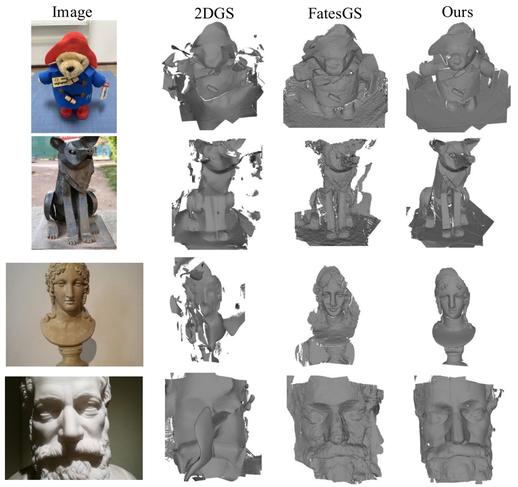
II. **Fine-tuning with the stereo network:** L_{stereo} gradients flow through a frozen stereo net into 3DGS.

III. **2D/3D Co-regularization:** $L_{co\text{-}img}$, $L_{co\text{-}depth}$, L_{depth} let 2DGS geometry and 3DGS appearance correct each other.

DTU (top: little-overlap · bottom: large-overlap)



BlendedMVS (real scenes)



Takeaways

1. **Stereo views as cues.** Synthesized high-quality stereo views add geometric cues.
2. **Specialize 3DGS.** Training through a frozen stereo net tailors 3DGS to stereo matching.
3. **2D/3D Co-regularization.** 2DGS and 3DGS complement each other's strengths.

Highlights

1.07 mm
DTU little-overlap CD

−15%
vs. previous SOTA