DimSplat: A Real-Time Diminished Reality System for Revisiting Environments Using Gaussian Splats in Mobile WebXR

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Motivation

Diminished Reality (DR) removes or alters objects from the user's view [Mann, 1999]

DR can help for...

- Heritage preservation
- Renovation planning & construction
- Privacy-sensitive spaces [Tabet et al., 2023]

Problem:

Challenges arise from **complex backgrounds**, dynamic lighting, occlusions, and high processing requirements

S. Mann. Mediated reality. Linux Journal, 1999(59es):5–es, 1999

S. Tabet, A. Kayssi, and I. H. Elhajj. Mobile diminished reality for preserving 3d visual privacy. In *2023 International Conference on Intelligent Metaverse Technologies & Applications (iMETA)*, pages 01–07. IEEE, 2023.
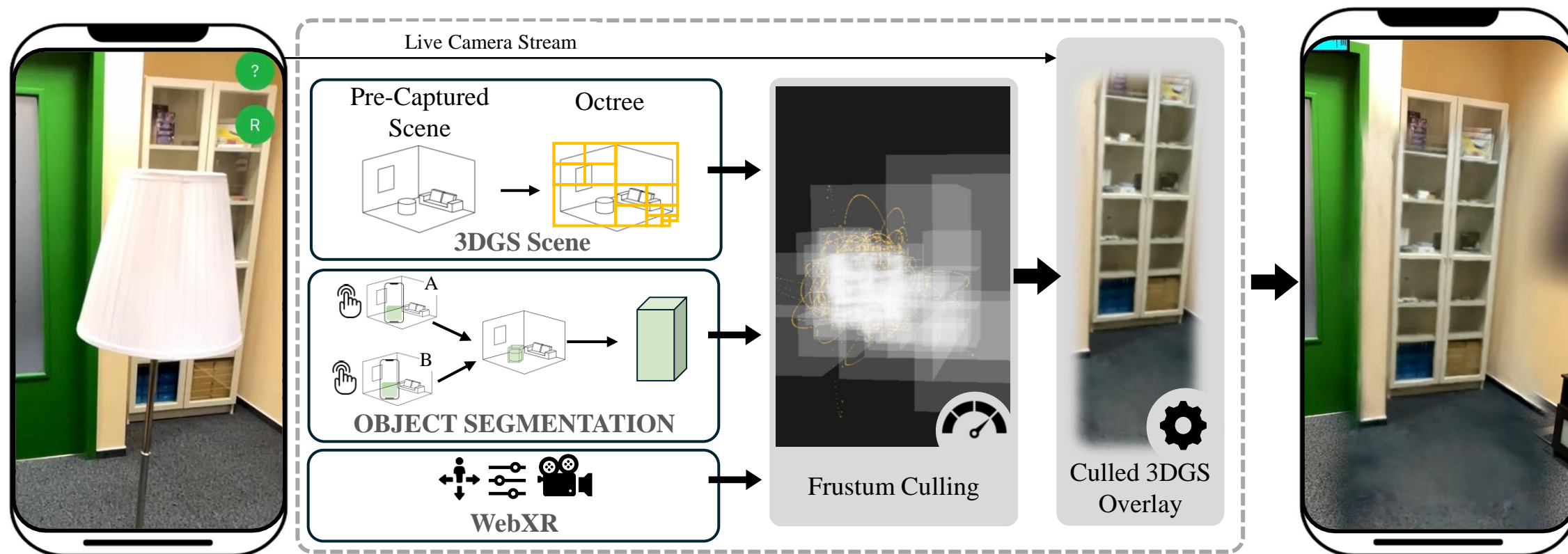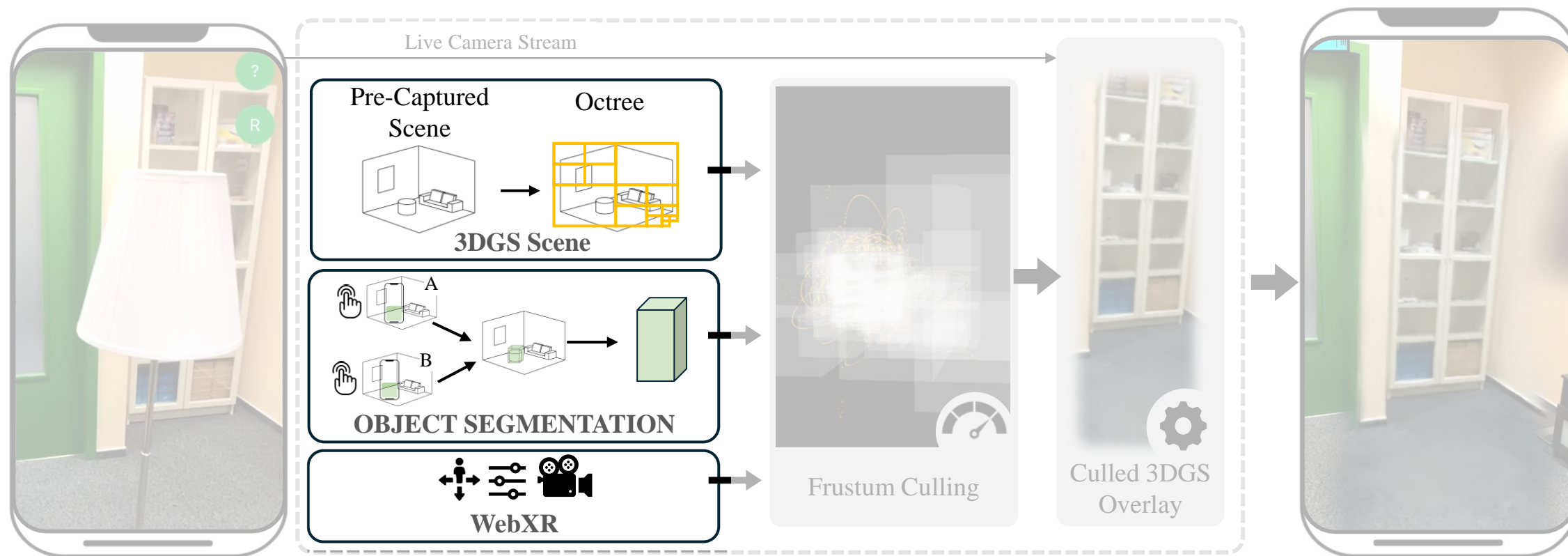
Contribution

We present a new DR system using **3D Gaussian splatting** for efficient scene rendering with a dynamic **frustum culling** method that achieves up to 60 FPS on mobile devices.
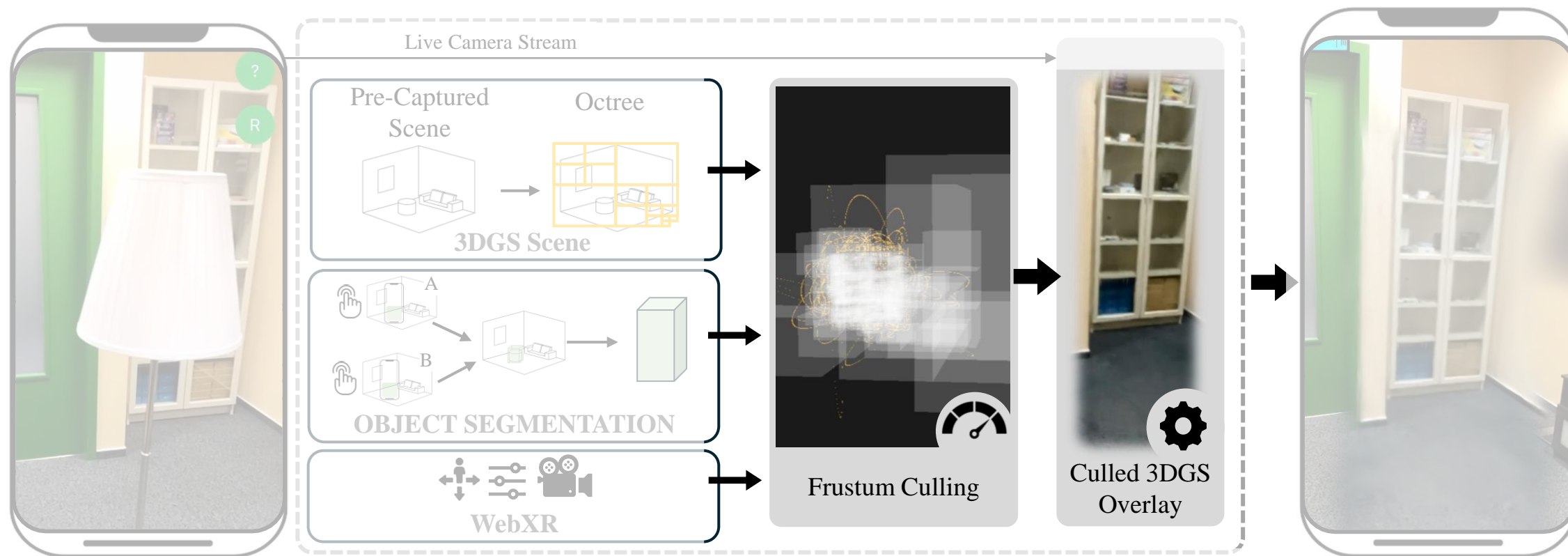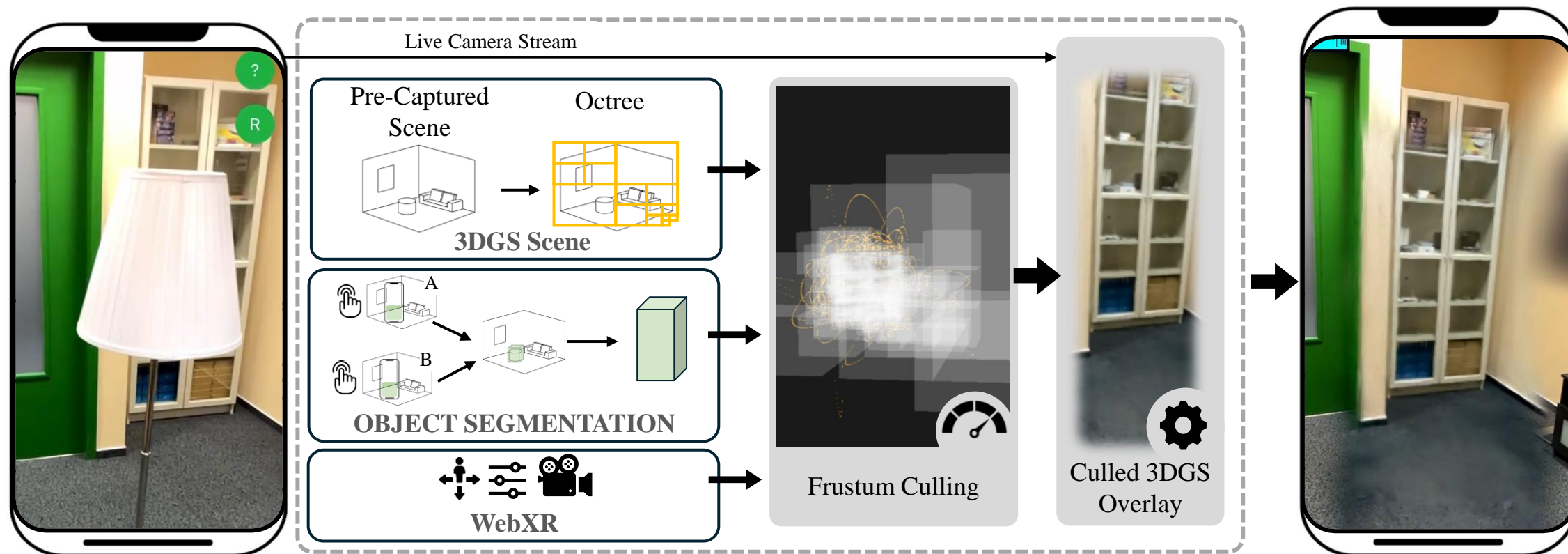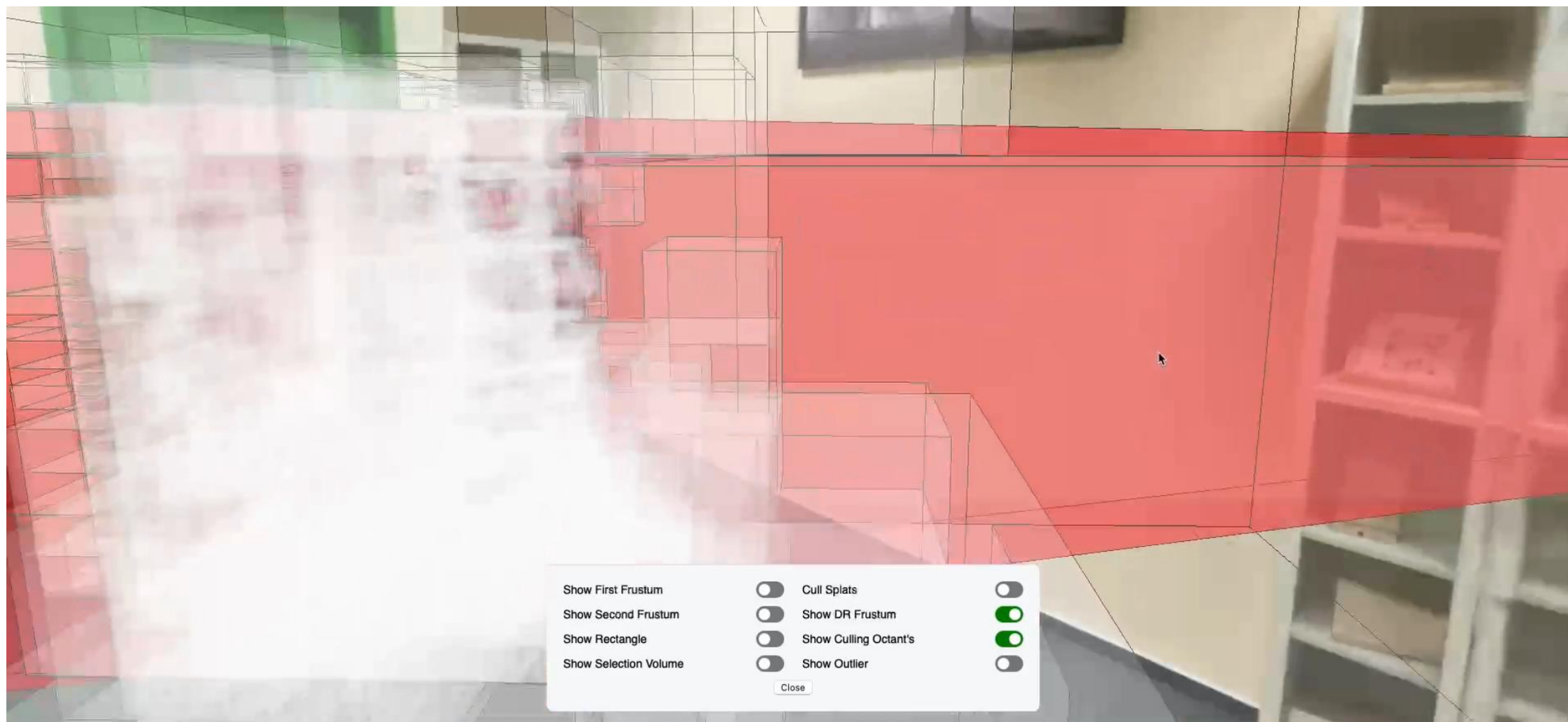
Method

Method

Method

Method

Show First Frustum   Cull Splats

Show Second Frustum   Show DR Frustum

Show Rectangle   Show Culling Octant's

Show Selection Volume   Show Outlier

Close

This frustum is then culled against the previously created octree, where the splats are organized. This allows us to efficiently determine which splats are necessary for occlusion and which are not.

Evaluation

- **Different objects**, complex backgrounds
- Visual and perceptual metrics (SSIM & LPIPS)

Performance:
- Frustum culling ensures **real-time performance (**30-60 Fps)
- reducing splats by up to a factor of 20

Lamp: *SSIM* = 0.69, *LPIPS* = 0.14

Shelf: *SSIM* = 0.55, *LPIPS* = 0.11

TV: *SSIM* = 0.78, *LPIPS* = 0.22

Thank you for your attention!

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