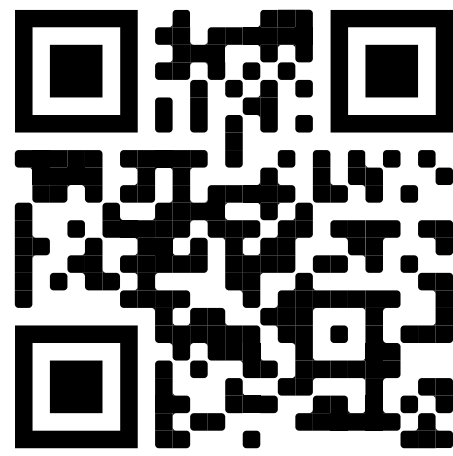


Into The Theatre: 3DGS for Theatre Design

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What is 3D Gaussian Splatting?

- Gaussians are translucent 3D blobs, and their individual colours merge to make the final image¹.
- Thousands to millions of Gaussians make up a 3D model of a scene.

Executive Summary

Problem:

- 3DGS scenes are static and only allow viewing a scene but not changing it.
- Using 3DGS for real-world design problems requires interactivity.

Goal:

- Develop an interactive 3DGS application that allows users to manipulate 3DGS scenes in Virtual Reality.

Key Contributions:

- Drag and drop 3DGS scanned objects for sets, props, and costumes in the program, and edit their features.
- Add, remove, and manipulate lights, and light characteristics.
- Navigation and pre-set key audience viewpoints to evaluate sets, props, and lighting.
- Add and view annotations.
- 3DGS capture of actors to evaluate how light hits the set.

Key Results:

- This Unreal-based prototype VR demo, Etheatre, is a promising first step to an app for stage designers to build their projects quickly and accurately.

Use Case

- Hanging theatre lights is time-consuming; the lights often have to be adjusted by hand more than once.
- Etheatre would help designers save time during lighting hangs by reducing inaccuracies found in apps like VectorWorks, which are unable to render the space photo realistically.

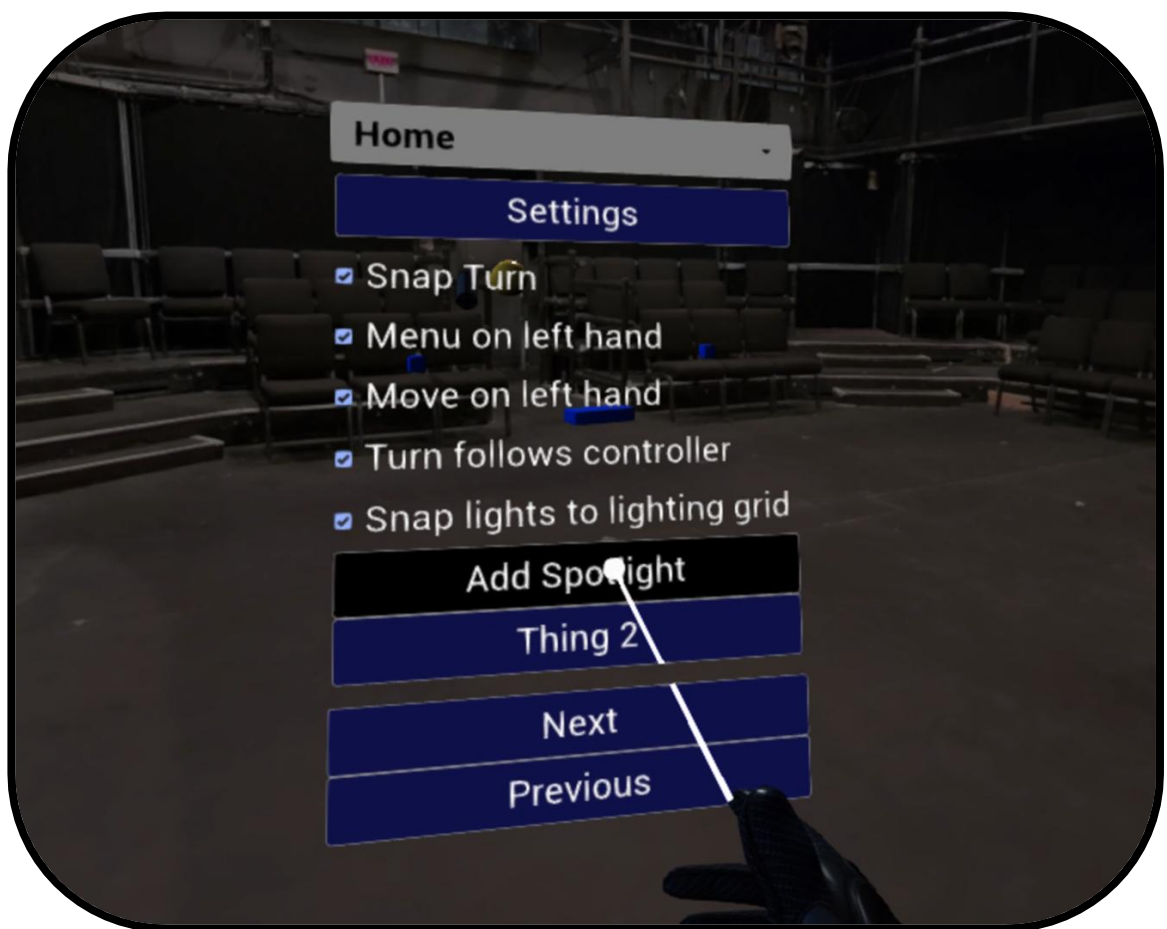


A lighting technician hangs a light while on a ladder.

Features

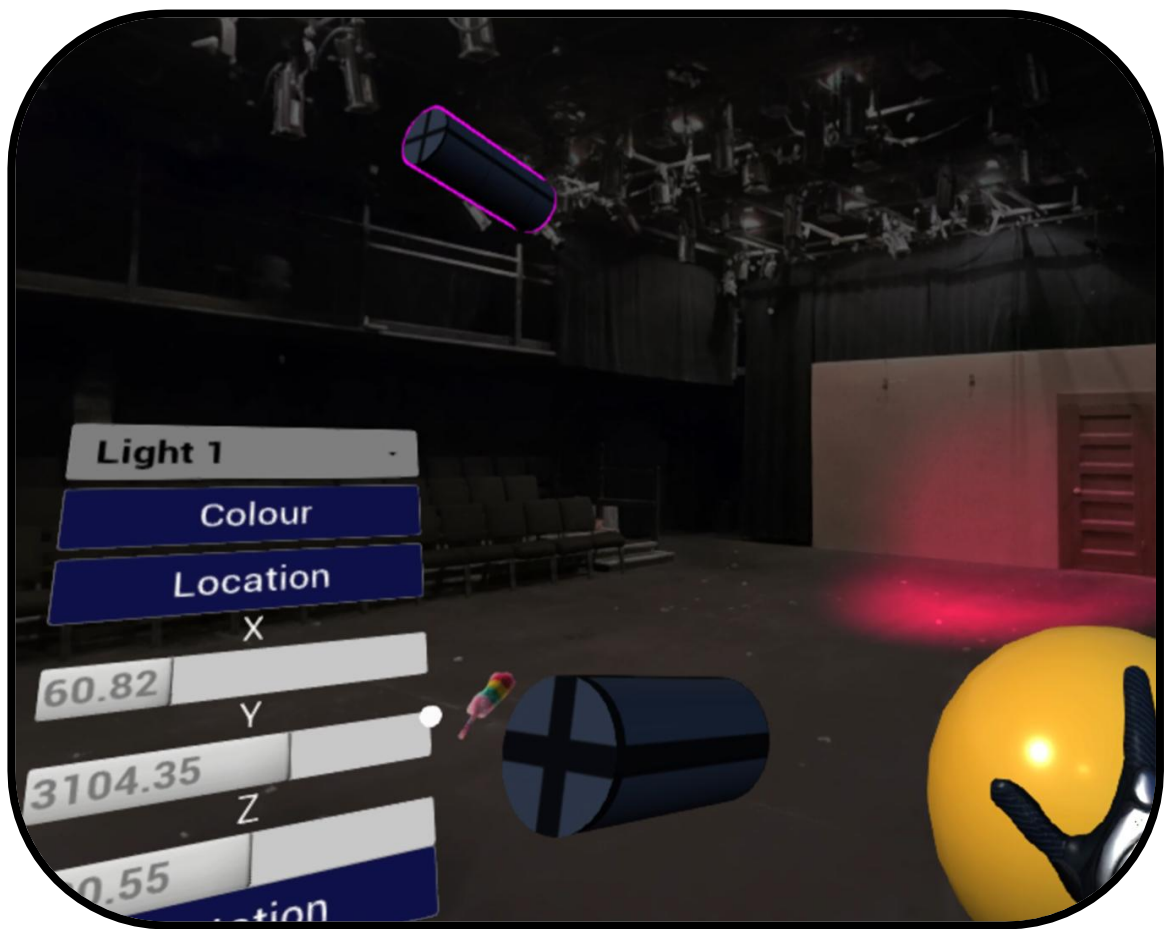


Controls teleport, walk, and point a laser to grab objects, like this feather duster.

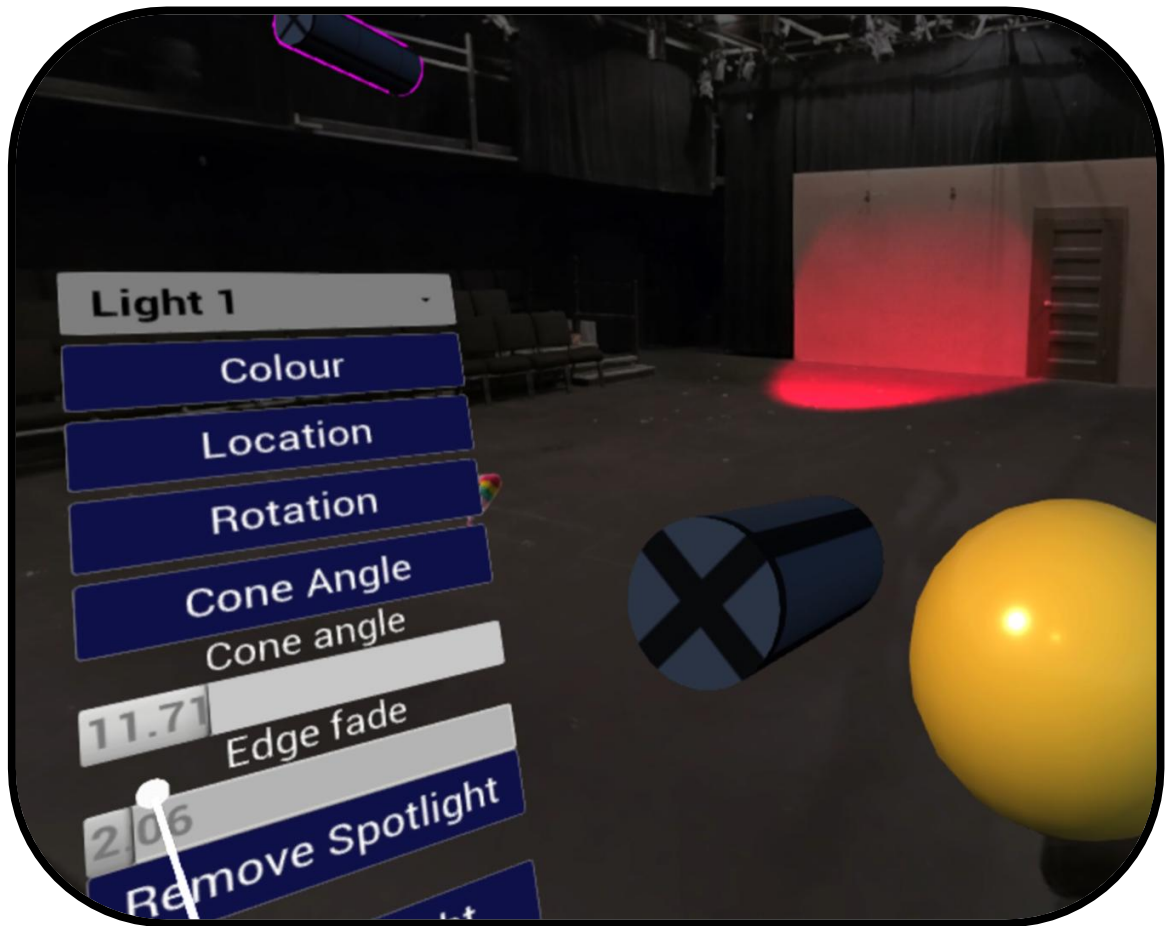


A textbox reading “Annotation” pops up from a small cube.

A colour wheel and sliders change light colours.



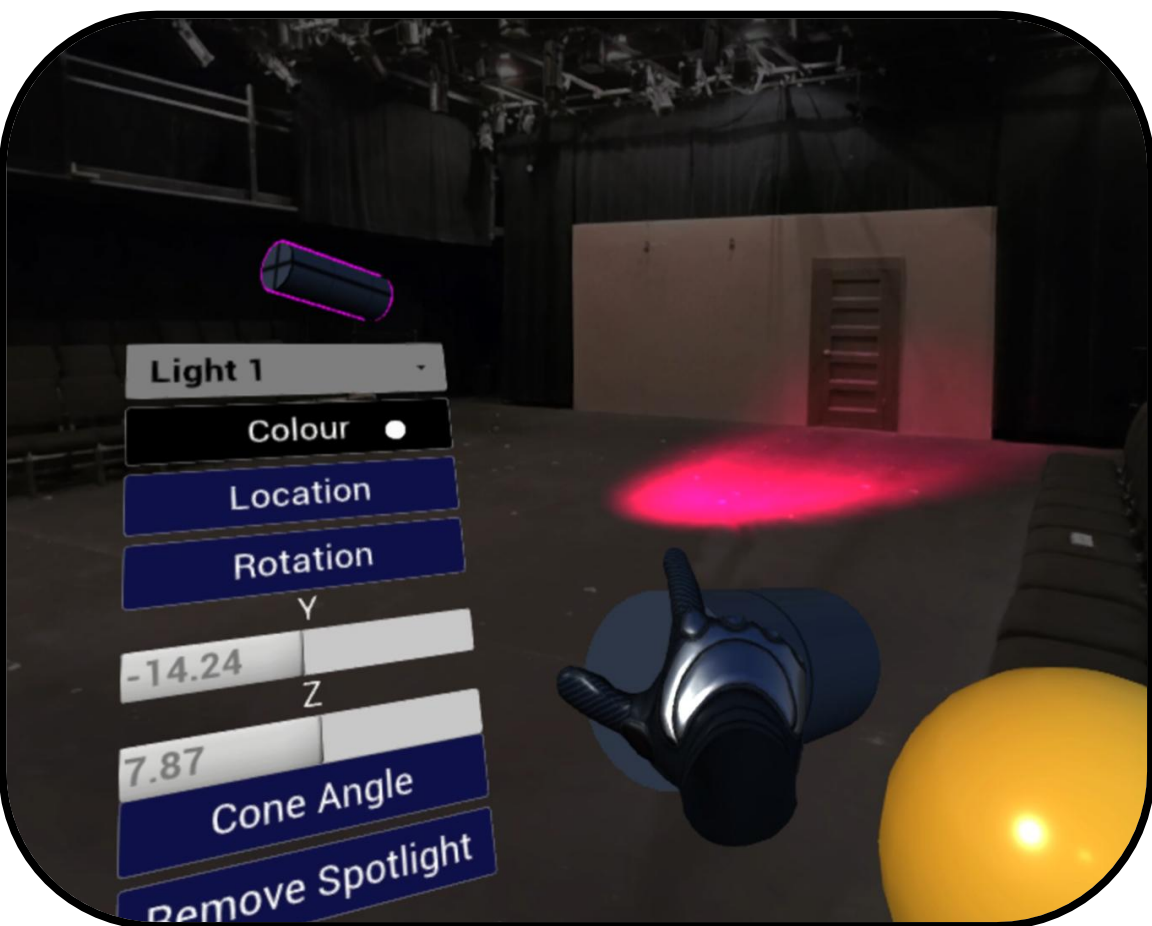
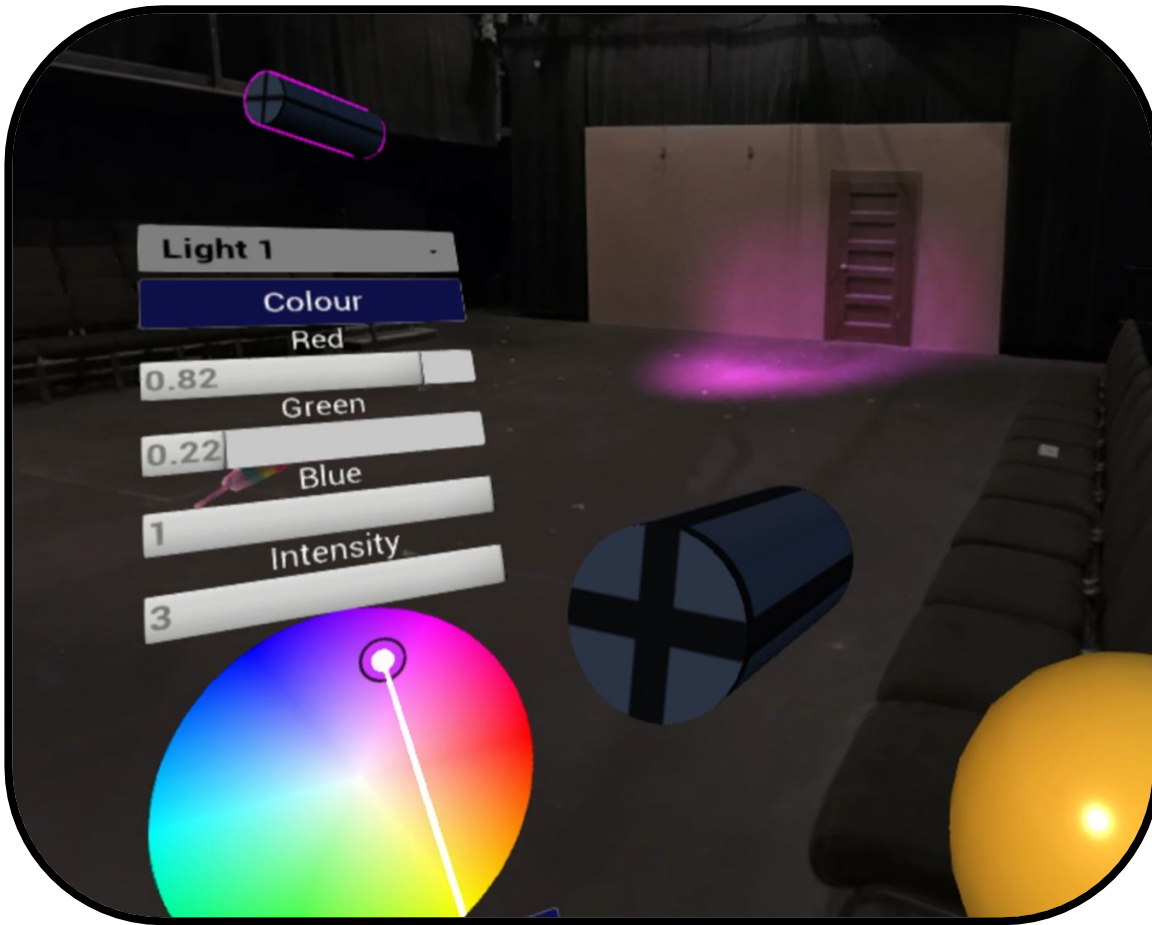
A rotating cylinder and sliders change the light angle.



A rotating cylinder and sliders change the light angle.



A dropdown menu navigates home.



What is Unreal?

- Unreal is a game engine that supports virtual reality game design.
- The LCC plugin allows Unreal to render 3DGS scenes.

Future Work

- Export where the lights are and where they're looking.
- Add 3DGS scanned actors to realistically adjust lighting angles.
- Make spotlight assets to physically manipulate the lights by hand.
- Add presets that mimic real spotlights.
- Add realistic shadows.

Related Works

- Vectorworks is an app for theatre designers to draft and visualize their ideas.
- Vectorworks can't truly visualize a scene in 3D, unlike Etheatre, which uses virtual reality to fully render the scene immersively.
- Etheatre can move objects in real-world directions rather than relying on intangible numbered coordinates.
- Etheatre renders a scene photo realistically, instead of using pre-made computer graphics.

References

- Kerbl, B., [...] & Drettakis, G. (2023, August 8). 3D Gaussian Splatting for Real-Time Radiance Field Rendering.
- Chen, D., [...] & Zhang, G. (2025). PGSR: Planar-Based Gaussian Splatting [...] IEEE Transactions on [...] Computer Graphics, 31(9), 6100–6111.

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Scenes captured by XGRIDS PortalCam

Props and actors captured by PGSR