

# Real-time Auditorium Modeling and Visual Effects for Live Performances

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## CCS CONCEPTS

• Computing methodologies → Mixed / augmented reality.

## KEYWORDS

live visual effects, real-time performance, mixed reality, televerse

### ACM Reference Format:

Andrew Chalmers, Faisal Zaman, Anna Stangnes, Simon Finnie, Hong Son Nguyen, JungHyun Han, and Taehyun Rhee. 2023. Real-time Auditorium Modeling and Visual Effects for Live Performances. In *SIGGRAPH Asia 2023 Real-Time Live! (SA Real-Time Live! '23)*, December 12-15, 2023. ACM, New York, NY, USA, 1 page. <https://doi.org/10.1145/3610539.3630250>

## ABSTRACT

A live visual effects platform for stage performances faces key challenges, including 1) reconstructing a 3D digital twin [Chen et al. 2022] of a large auditorium, 2) real-time rendering and composition of 3D visual assets into the 3D digital twin while ensuring coherent lighting [Rhee et al. 2017] and blending with the real stage [Young et al. 2022], and 3) enabling mutual interaction between real and virtual objects to provide a synchronized mixed reality performance [Rhee et al. 2022, 2023]. Our demo showcases a novel platform for live visual effects. Our key contributions are:

- (1) Real-time stage capturing and modeling: we demonstrate real-time capturing of the auditorium utilizing panoramic LiDAR sensors, synchronizing the stream with 360° RGB videos, and visualizing live panoramic RGBD videos. To create a 3D digital twin over a larger area, we set up multiple RGBD cameras in different parts of the auditorium.
- (2) Real-time VFX with live RGBD videos: We showcase real-time blending of 3D virtual objects into the live panoramic videos, and demonstrate real-time occlusion and collision

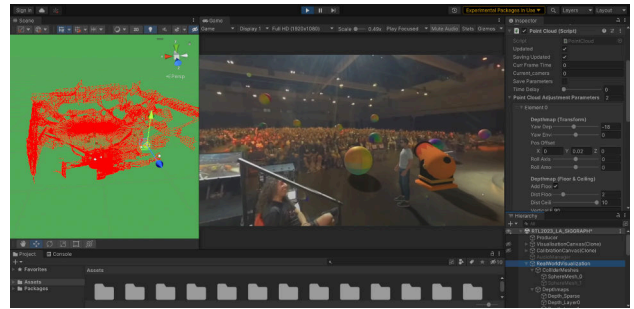


Figure 1: Our interface and mixed reality performance.

handling with the live feed (live 360 RGBD videos). We introduce creative interactive effects through our framework.

- (3) We showcase a mixed reality performance while engaging with the live in-person audience. This includes demonstrating interaction between real performers and virtual assets, and navigation using a 3D virtual actor in the real auditorium, while also allowing the audience to interact and engage with the virtual content with VFX.

We demonstrate real-time stage performances with live visual effects that enable mixed reality interactions between virtual and real elements. This, in turn, facilitates augmented live performances for in-person audiences through mixed reality experiences (Figure 1).

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SA Real-Time Live! '23, December 12-15, 2023, Sydney, NSW, Australia

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ACM ISBN 979-8-4007-0310-2/23/12.

<https://doi.org/10.1145/3610539.3630250>