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

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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 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.

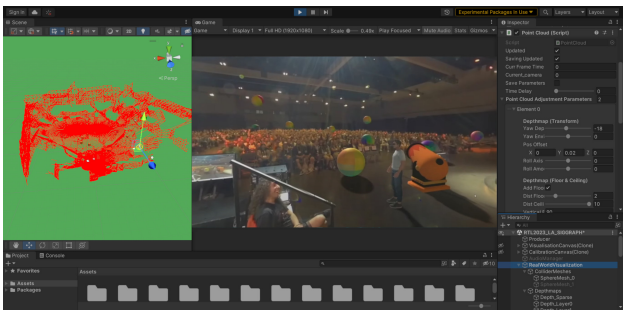

Figure 1: Our interface and mixed reality performance.

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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