



**HAL**  
open science

## Phases: Augmenting a Live Audio-Visual Performance with AR

Dávid Maruscsák, Brett Bolton, Bent Starnes, Matt Swoboda, Christian Sandor

► **To cite this version:**

Dávid Maruscsák, Brett Bolton, Bent Starnes, Matt Swoboda, Christian Sandor. Phases: Augmenting a Live Audio-Visual Performance with AR. SIGGRAPH '24: Special Interest Group on Computer Graphics and Interactive Techniques Conference, Jul 2024, Denver CO USA, France. pp.1-2, 10.1145/3641520.3665310 . hal-04724361

**HAL Id: hal-04724361**

**<https://hal.science/hal-04724361v1>**

Submitted on 7 Oct 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Phases: Augmenting a Live Audio-Visual Performance with AR

Dávid Maruscák  
david.maruscak@lisn.upsaclay.fr  
CNRS, Université Paris-Saclay  
Orsay, France

Brett Bolton  
brettboltonav@gmail.com  
Bolton AV LLC  
Las Vegas, Nevada, USA

Bent Stannes  
bent.stannes@10bit.io  
10Bit FX Limited  
Ullensaker, Norway

Matt Swoboda  
matt@10bit.io  
10Bit FX Limited  
London, United Kingdom

Christian Sandor  
christian.sandor@lisn.upsaclay.fr  
CNRS, Université Paris-Saclay  
Orsay, France

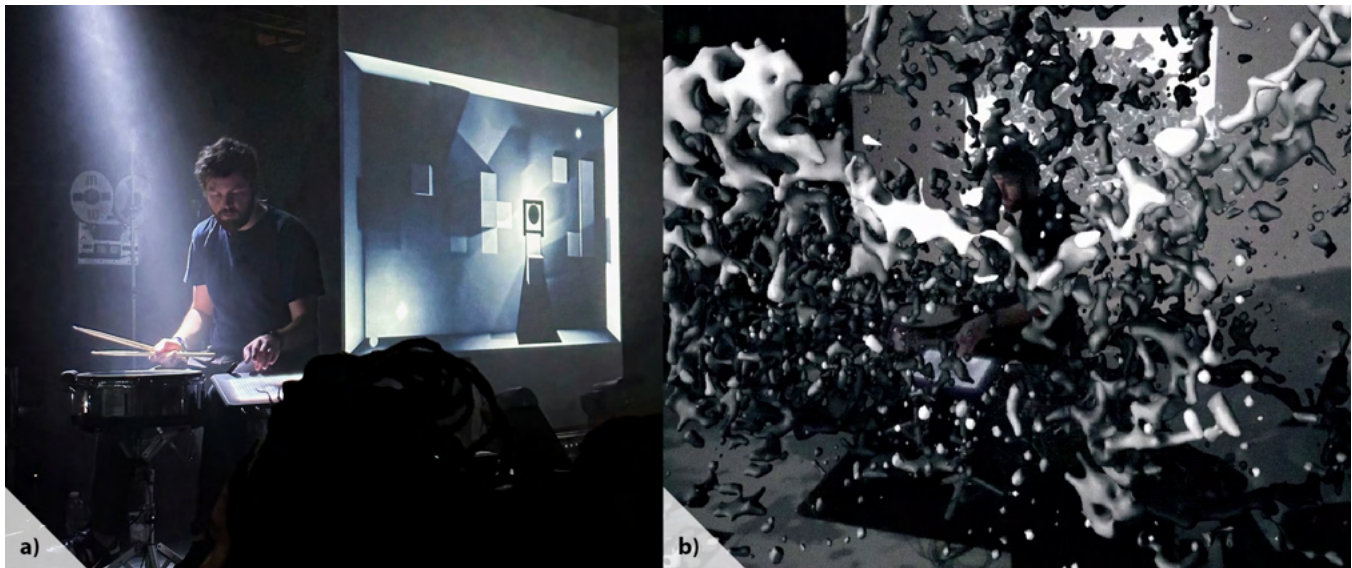


Figure 1: Image a) shows Brett Bolton while performing his audiovisual act at MUTEK Montreal, 2023. Image b) shows the same performance extended with Augmented Reality (AR) visuals around the performer, experienced through AR glasses.

## ABSTRACT

Our performance combines stage visuals with Augmented Reality (AR) to demonstrate a novel way of experiencing live events. Our goal is to enhance the sociability of such events by showcasing the potential of AR glasses over smartphone technology, which forces the audience to look at their phones and isolates them from their environment. Our project explores how the latest AR and visual technology enhance the spectator experience while retaining the social and inclusive environment of live performances.

## CCS CONCEPTS

• Applied computing → Performing arts.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).  
SIGGRAPH Real-Time Live! '24, July 27 - August 01, 2024, Denver, CO, USA  
© 2024 Copyright held by the owner/author(s).  
ACM ISBN 979-8-4007-0526-7/24/07  
<https://doi.org/10.1145/3641520.3665310>

## KEYWORDS

Augmented Reality, Real-Time Rendering, Audio-Visual

### ACM Reference Format:

Dávid Maruscák, Brett Bolton, Bent Stannes, Matt Swoboda, and Christian Sandor. 2024. Phases: Augmenting a Live Audio-Visual Performance with AR. In *Special Interest Group on Computer Graphics and Interactive Techniques Conference Real-Time Live! (SIGGRAPH Real-Time Live! '24)*, July 27 - August 01, 2024. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3641520.3665310>

## 1 INTRODUCTION

Recently, it has become nearly impossible to enjoy a concert without struggling to see the stage through a sea of smartphones. Technology such as smartphones and social media has arguably diminished the live experience, reducing sociability and immersion for those watching through their phones and disrupting the experience for others. This behaviour sacrifices the shared experience of the moment in exchange for a poor video recording or photo, usually intended for posting on social media. The question arises: why be "here" at all? AR glasses have the potential to change this: liberating



Figure 2: The image sequence shows the evolution of the visuals starting from left to right from different points of view.

the viewer from observing through the smartphone and enhancing the immersion of the experience in the moment, in a completely live way that must be experienced in person, in the moment, and retaining - even enhancing - the sociability and shared experience. These are important aspects to explore for the future of live entertainment, and this unique collaboration across industry, academia and creativity offers a unique opportunity to do so.

## 2 TECHNICAL OVERVIEW

Our work is a live, real-time audio-visual performance to be experienced simultaneously via a large screen and through AR glasses. To realise this, we focus on a number of key elements:

Real-time generation and rendering of live visuals, triggered by a performer and created in the latest version of Notch.[3] Notch provides a graphical user-interface (UI) allowing artists to create compelling visuals that are responsive to a range of live inputs, controllers and sensors, and is already used throughout the live entertainment industry by many of the world's biggest artists, bands and live TV productions. Notch's new rendering engine is technically innovative in the real-time space, providing a hybrid rasterisation and ray-tracing renderer (based on RESTIR[4]), particle fluids based on MPM and a sparse volumetric 3D fluid solver. In our performance, multi-disciplinary artist Brett Bolton[1] showcases these capabilities with visuals that react to his live playing of an electronic drum and MIDI controller.

On-stage two Canon MREAL X1[2] AR glasses deliver the experience. AR can superimpose elements onto the environment and alter the perception of the real world itself. Where Virtual Reality (VR) is an isolated experience, AR has the potential to be social - enhancing the experience for viewers sharing the physical environment. Our focus in this area is both technical: aligning scene reconstruction with the coordinate system of the AR glasses and real-time rendering of the visual; and creatively exploratory: what kind of AR experience works within a shared space with non-AR viewers, adds tangible value and retains sociability?

## 3 EXPERIENCE

We showcase the live audio-visual performance by multi-disciplinary artist Brett Bolton, who drives real-time visuals via his musical performance using custom instruments. While the Siggraph Real-Time Live audience experiences the visuals via the main screen, two

audience members will stand on the stage, wearing AR glasses - and experience an enhanced, augmented, immersive view of the performance in real-time.

We aim to demonstrate that the performance can be compelling both with and without AR, simultaneously and together in the same physical space, with the AR experience offering tangible enhancement and increased engagement but with inclusion, not isolation.

The show starts with subtle AR elements that are becoming more and more prominent by the end. The AR elements consist of gas and liquid simulations occupying the space around the performer. The other part of the AR element is taking the video feed of the AR glass as input to create alterations to the real world, altering the viewers' perception. The third type of AR visuals is facilitating the interaction between the spectators. These visuals are interactive, and the gaze of the spectators triggers them. For example, when the two spectators' gaze meet, it triggers an action which visually shows a connection between them.

## ACKNOWLEDGMENTS

This work was supported by a French government grant managed by the Agence Nationale de la Recherche as part of the France 2030 programme, reference ANR-22-EXEN-0002 (eSEMBLE/CATS) and by Canon Inc.

## REFERENCES

- [1] Brett Bolton. 2023. *PHASES - AV PERFORMANCE - 2023*. Retrieved May 23, 2024 from <https://www.brettbolton.net/phases>
- [2] Marie-Anne Leonard. 2022. *MREAL: The distinctly human magic of Mixed Reality*. Retrieved May 23, 2024 from <https://www.canon-europe.com/view/mreal-the-human-magic-of-mixed-reality/>
- [3] 10 Bit FX Limited. 2024. *Notch*. Retrieved May 23, 2024 from <https://www.notch.one>
- [4] Y. Ouyang, S. Liu, M. Kettunen, M. Pharr, and Jacopo Pantaleoni. 2021. ReSTIR GI: Path Resampling for Real-Time Path Tracing. *Computer Graphics Forum* 40 (11 2021), 17–29. <https://doi.org/10.1111/cgf.14378>