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VVV: Volumetric video in videogames

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Abstract

VVV: Volumetric Video in Videogames is a research-creation project aiming to advance experimental development using volumetric video (a computational fusion between captured depth data and video images) in expressive videogames by drawing upon successful patterns from early game design practices foregrounding captured media. Such exploration is essential given the complexity of hybrid capture images. This ongoing project presents new ways of understanding captured media within highly interactive postmedia forms.

Keywords

volumetric video, research-creation, art games

Introduction

VVV: Volumetric Video in Videogames is a research-creation project aiming to advance experimental development using volumetric video (a computational fusion between captured depth data and video images) in expressive videogames. While volumetric video is increasingly popular in non-fiction storytelling (particularly in VR/AR), the materiality of captured media makes it challenging to incorporate into highly dynamic interactive forms like videogames. *VVV*'s objective is to push deeper into interaction design paradigms for hybrid image forms like volumetric video, and ideally present a viable channel for engaging captured content in videogames.

Preliminary Project Outcomes

Here we will briefly describe our initial outcomes from this project, including an early stage art game prototype, the development of a design guide for creators, and our exploration of multiple strategies for research generation and translation.

Interaction Patterns

For *VVV*, we looked to accelerate interaction design by drawing upon successful patterns from early game design practices foregrounding captured media. Through a systematic pattern analysis of these works, we sought to make-visible common design patterns and highlight their potential role in addressing the unique affordances of captured media forms like volumetric video. To this end we conducted a design pattern analysis of over 100 FMV (full-motion video)/interactive cinema games, incorporating both historic and more recent examples in this niche genre. Using the HACS (Historical-Analytical Comparative System) system [1], common and potentially useable patterns were identified, evaluated, and later translated from formal pattern language into more accessible descriptions for use in design ideation and/or troubleshooting (see Fig 1 for examples).

Example Pattern	Description
Seen through media 	Framing volumetric video *as* diegetic media in the gameworld e.g. a projected hologram or other sort of recording, or something operating like a video (a memory, a ghost). Can be used to manage player expectations for how they might interact with the volumetric video (like a recording, or alternately that they should just view).
Activated looking 	Interacting indirectly with the volumetric video by looking, noticing, examining etc. This is typically formalized as a game mechanic (in other words, it's not just looking, but looking that is noted and acted upon by the game state). In VR/AR games, this can also take the form of gaze triggers (activations conditional on the player's gaze). Can be used to present more player agency during otherwise linear moments of video play.
Perform and response 	The player is asked to perform an action or sequence of actions to trigger a volumetric video sequence. The gameplay sequence then alternates between player actions, and activated cinematic sequences. At a basic level, this could be as simple as choosing a dialog option from a menu and watching a response play out. This structure allows for the sequencing of dynamic and static modes of interaction.

Figure 1. Example VVV design patterns (excerpts from forthcoming design guide). Illustrations by Kat Verhoeven.

While some prominent patterns can be associated with design trends from past eras, genre conventions unrelated to captured media, or in some cases issues specific to the limitations of 2D video, many reflect persistent design challenges that still exist for creators using volumetric video: notably relating to the more static nature of video recording (as opposed to the dynamic mutability of digital animation), and the often heavier data load of recorded material.

Making visible these patterns can give creators working with volumetric images in interactive contexts access to this design knowledge formerly embedded within an obscure corpus of work.

Material Affordances

To explore the material affordances of volumetric video through practice, we are also in the process of developing an interactive work. This game reconstructs an emergent storytelling performance in the form of a live-action role playing game (see Fig 2), suggesting new ways of integrating sentient actors into interactive digital contexts.

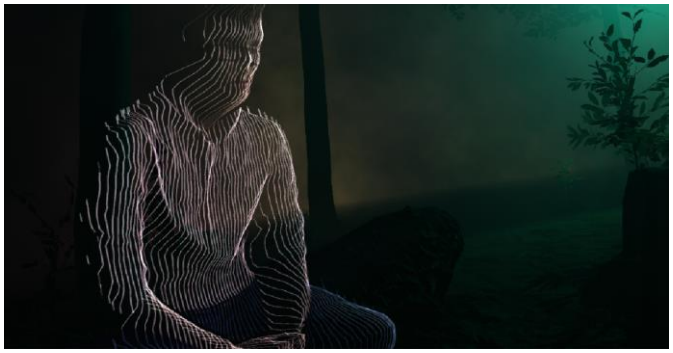

Figure 2. Still from *As the End Drew Near* (working title), a volumetric full-motion videogame (non-commercial art game), in development. Figure by author.

As the End Drew Near (working title) is a VR experience optimized for the Oculus Rift S. It is a fully interactive narrative game that incorporates the volumetric video recording of a stand-alone LARP (live-action role playing game), written and designed by author Natalie Z. Walschots (Hench). The narrative is constructed through three iterations of the LARP enactment, importantly including the framing construct for the narrative (worldbuilding and exiting). It is influenced by fiction-blurring works like Hirokazu Kore-eda's *After Life* (1999), and is informed by design patterns identified in the first phase of our project.

In the game, players are charged with materializing key details and timelines in the narrative, as they scrub through different instances of the performance that evoke different details, highlight particular emotions, or are simply performed in a distinct way. Having repaired glitches and multiplicities in the timeline, the players' last task is to anchor the memory in one otherwise non-extraordinary moment which stands out as sublime. The result, we hope, is a work that speaks to the blur between fictive and non-fiction performance, narrative networks and instances, and transparency and immersion in VR. To create the entangled narrative storylines of the game, the LARP was performed three times: each time as an unscripted improvisation, structured by pre-determined story beats. The player experience is of a singular narrative that at glitch points slips out of joint between three alternate realities.

It is particularly challenging to capture the game-performance hybrid known as LARP. This (often misunderstood) genre has none-the-less shown extraordinary critical potential as an immersive form, in part because of the necessary entanglement between immersive role-play and embodied enactment [2]. *As the End Drew Near* features a narrative construct, but otherwise is emergently performed by non-actors. Volumetric recording allows for the capture of the gestural excess of this live collaborative storytelling, as the performers negotiate in-game and out-of-game roles.

Through this creation process, we have been able to expand our understanding of the material affordances of volumetric video for interactive experiences. These included activating qualities of indexical images (including situating the subject within the actual world, abducting qualities of the subject, and offering evidence or warranting), expanding VR/AR workflows to encompass a filmmakers (as opposed to an animators') skillset, and using volumetric video's depth affordance to evoke spatial presence, particularly for human subjects.

Expanded Practice

In two key ways this research-creation project aims to expand and accelerate current practice in interactive volumetric video beyond the creation of a singular art game: via formal (applied pattern analysis) and rhizomic approaches (jams/workshops).

A concern from the project onset was how we might translate the results of our design pattern analysis back into design tools that can be more fluidly integrated into the design process, at either stages of ideation or the point of design frictions. Inspired by other work translating game design patterns for creators [3][4], we aim to develop a guide that can more readily be referenced to inform future design work using emerging captured media forms such as

Figure 3. Dames Making Games VVV Game Jam (2018, Toronto Media Arts Centre). Photo credit: Henry Faber.

volumetric video. As is demonstrated in an early form by Fig 1, useful design patterns from our initial analysis of early FMV and interactive cinema games are in the process of being translated into a short illustrated format. This approach attempts to bridge formal models and design practices.

The second approach is rhizomic: by conducting game jams and workshops introducing this media format to new audiences, we have aimed to generate insight through opening up more creator experimentation into interactive volumetric video. Our initial game jam (Fig 3) was held at the Toronto Media Arts Centre in 2018, in partnership with our technology partner Scatter, and community organization Dames Making Games. The experimental wayfinding of formats like game jams and workshops can reinforce knowledge pulled from a formal pattern analysis, by allowing for new solutions, and indeed new problems, as creators explore interactions, themes, and techniques not directly drawn from past practice.

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More information about the development of this work: https://www2.ocadu.ca/research/gameplay/project/vvv-volumetric-video-in-videogames

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Author Biography

Cindy Poremba is a digital media researcher, gamemaker and curator. They are an Associate Professor in Digital Futures at OCAD University (Toronto, CA) and Co-Director of the game:play Lab. Cindy has presented internationally at conferences, festivals and invited lectures, on topics relating to game art and curation, capture in postmedia practices, and interactive documentary. Their research and critical writing has been published in journals such as Eludamos, Loading and Games & Culture, as well as edited collections, art catalogs and magazines. Cindy also organizes non-traditional exhibitions as an independent curator, including Joue le jeu/Play Along (FR), and XYZ: Alternative Voices in Game Design (US). Their award-winning game and “New Arcade” work as a member of the kokoromi experimental videogame collective has been featured in both international game and digital art exhibitions.