

In Situ Editing (EiS) For Fulldomes

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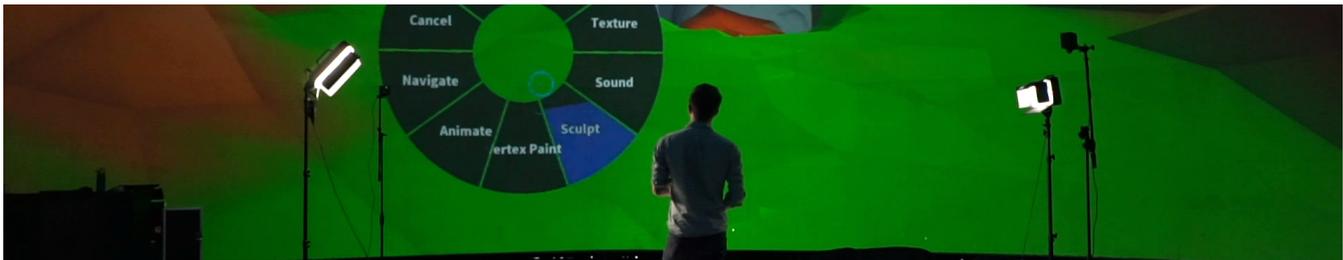


Figure 1: 3D scene editing while in a 18m wide fulldome

ABSTRACT

The creation workflow for fulldome consists today of many back and forth between the immersive space for visualization and desktop computers for editing. The EiS platform is an interactive creation tool that enables editing while being inside the immersive environment, allowing for coarse-grained 3D content editing. In this paper we present EiS, a platform geared toward editing inside fulldomes, but also possibly other immersive spaces. The core of EiS is a set of Blender (the popular 3D modeling tool) plugins adding support for VR controllers, fulldome rendering and interfacing with an external audio spatialization engine.

CCS CONCEPTS

• **Human-centered computing** → **Virtual reality**; *Interaction techniques*; *Visualization toolkits*; • **Applied computing** → *Media arts*;

KEYWORDS

VR, VR editing, fulldome

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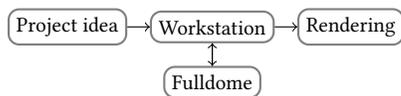
1 INTRODUCTION

Creating content for immersive media is affected by the specific geometry of the associated display. In a way similar to that of traditional rectangular display devices, for which composition rules and clear definitions of its limitations have emerged, fulldomes and CAVEs among other immersion devices have specific capabilities that offers specific opportunities. For instance, wide fulldomes offer the capability to host many simultaneous viewers but cannot display very close virtual objects, while VR headsets which are single user devices, are capable of displaying very close objects. Accordingly, resulting creation choices may differ significantly.

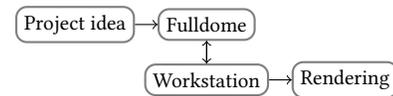
This is of particular interest to content creators. The usual fulldome creation workflow is focused on a back and forth between the creator's workstation and the fulldome (figure 2a). The content is designed and rendered on the workstation, tested inside the fulldome where flaws and errors are noted, and fixed once back at the workstation. This time consuming process leaves little room to improvisation and experimentation.

A sensible step to improve this workflow is to allow for creators to design while inside the fulldome, at least partially. Previous work has been done to give access to *in situ* creation. Tran Luciani et al. [Luciani and Lundberg 2016] propose to add sketching capabilities to draft fulldome presentations. Mendes et al. [Mendes et al. 2017] and Courchesne et al. [Courchesne et al. 2014] describe specific modeling tools adapted to immersive creation. Similar approaches are emerging for virtual reality headsets, a good example being Google Tilt Brush [Google 2016] which can be seen as a tool for sketching quickly in an immersive environment.

The EiS platform is geared toward fast prototyping of an immersive 3D environment, regardless of the targeted experience: a fixed piece, a film, or an interactive environment. The specific case of



(a) Traditional fulldome workflow: the fulldome is only used to validate the work done on the workstation, which implies exporting the content and prevents modifications while inside the fulldome



(b) EiS workflow: the fulldome is a place of experimentation where the content can be drafted and modified, then cleaned up once at the workstation

Figure 2: Fulldome creation workflows: traditional and our proposition

fulldomes is addressed, given the context of this work: a 210 degrees 18 meters wide fulldome with 31 channels spatialized sound and a couple of smaller domes, mainly used for showing artistic content. To our knowledge, EiS is the only fulldome in situ editing platform offering a complete creation workflow.

2 PLATFORM DESCRIPTION

Our major concern while designing the platform was to allow for smooth transition between working *in situ* and back on a traditional workstation. We chose to build the platform on top of Blender [Foundation 1995], an open source 3D modeler with scripting capabilities. This allowed us to add immersive rendering to its 3D viewport, a VRPN client to receive inputs from compatible servers, and support for the SATIE sound spatialization engine [Bouillot et al. 2017].

Regarding controls, we wanted interaction metaphors to be as natural as possible. We use the HTC Vive controllers, which are tracked with six degrees of freedom inside the fulldome. This allows for natural transformation metaphors (translation, rotation, scaling, sculpting, painting), and for pointing objects and directions while inside the fulldome. The tools are accessed through an on-screen pie menu to make the most of muscular memory (figure 1).

3 WORKFLOW

Overall, the first difference between the traditional and the proposed workflows is that the first steps of a new project are taken in the fulldome for the latter, and at the workstation for the former (figure 2b). Users start with a clean slate and begins drafting their 3D environment and staging directly in the full dome. They have access to their assets (3D models, images, sounds) that they can use to populate the scene. The creation tools available through the platform allow the users to:

- import 3D models, images, sound
- navigate through the scene
- create additional scenes
- transform objects: translation, rotation, scale
- sculpt and paint objects
- animate objects and the camera

The result of this creation process in the immersive space is a draft of the 3D stage, which can then be used as a reference for more precise work on the workstation. As the platform is built on top of Blender, the draft is a Blender file which does not need any conversion to be read from a compatible computer. The user can work from the draft, then go back to the fulldome with the updated 3D set.

This illustrates the second difference between the two workflows. The traditional way forces the user to export the scenography to

a format displayable inside the fulldome (a film, an interactive export, etc). The proposed workflow allows for loading the exact same project in the workstation and in the fulldome, thus giving the possibility to switch quickly between the workstation and the immersive device.

4 CONCLUSION AND FUTURE WORK

The platform has been tested internally as a proof of usability of the workflow [F.Brien et al. 2017]: we created a 30 seconds video from a few assets and an empty scene in a few hours inside our fulldome, then cleaned it up ‘offline’ to prepare it for rendering in multiple formats (non-immersive, spherical projection, and stereoscopic equirectangular projection).

Our approach to implementing the platform led to some limitations. First, as a 3D modeling software, Blender is not designed to support real-time interactions with the 3D scene: this prevents us to use it for interactive pieces. Second, the internal architecture of Blender does not allow for multiple users to modify the scene at the same time: this restricts our platform to a single local user at a time, and prevents any multi-user mode through the network. Lastly, we are limited to the graphics capabilities of the Blender 3D real time rendering engine, which (at the time of this writing) prevents any serious work on lights and texturing (although this is meant to improve).

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