



TECHNICAL RECOMMENDATION

DESIGN OF VIRTUAL REALITY WORKS FOR PUBLIC USE

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English

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This recommendation is the result of the collective work of the members of the CST, gathered within the Immersion & Real-Time department

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1. INTRODUCTION

Virtual Reality works can be accessed in two ways by the public:

- either through **online platforms** using personal Virtual Reality head mounted displays (HMD);
- either through a **location based entertainment venues** that welcome the public.

On online platforms, the creator of the experience is free to choose the controls and functionalities of the experience, and then to submit them appropriately to the user. He must also respect the constraints imposed by the platforms. Exactly as it is done in the video game industry.

In the second case, to date we can distinguish three main types of venues involved:

- **Entertainment venues**, whose economic model is based on ticketing, like arcades or movie theaters;
- **Museums and cultural venues** that are diversifying and renewing their offer with digital and immersive works;
- **Art & cinema festivals**, key places where works benefit from an international showcase, an attentive public, and potential prospects.

In all these venues, the works are presented to a public largely composed of non-experts. The operators, or «mediators» operating the devices during the sessions are sometimes volunteers. They can be replaced several times a day, and are not always used to presenting such works. They may also have to present a large number of different works.

Moreover, the types of experiences and the devices used (virtual reality HMDs, controllers, tracking devices in space, etc.) are numerous and constantly evolving. This makes the control of the operation more complex.

In short, many obstacles are present to hinder a presentation and a quality viewing of these works, which can be as detrimental to the artists as to the public itself.

As the field of the Virtual Reality medium has been invested by a growing number of creators since the end of the 2010s, this recommendation is the first known initiative of its writers to unify the experiences format.



2. SCOPE OF THIS RECOMMENDATION

— 2.1. Operating

This recommendation applies to **narrative & artistic virtual reality experiences that are operated by a mediator**, whether in an entertainment venue, in a cultural venue or museum, or in an arts or cinema festival.

— 2.2. Main typologies of virtual reality

As of today the term virtual reality (VR) encompasses below three types and technologies:

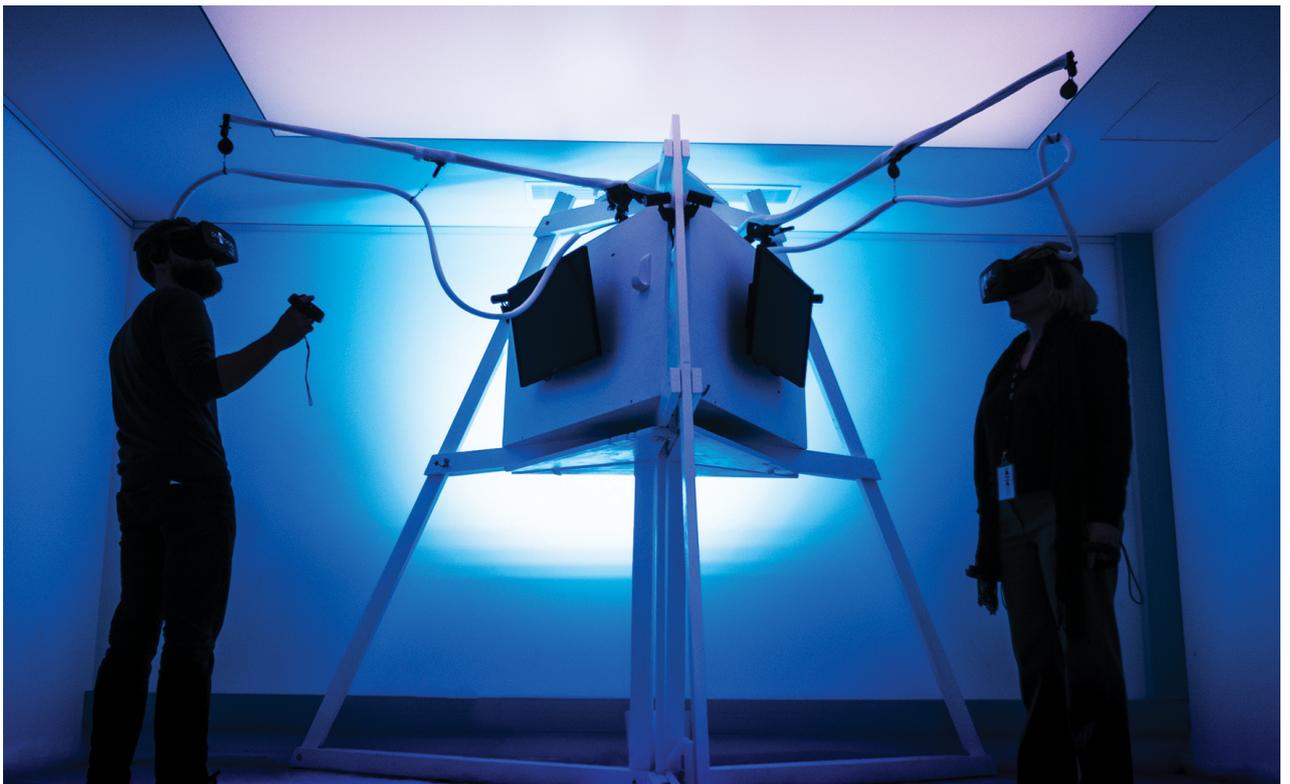
- 360 cinema or 3dof (for "3 degrees of freedom")
- 6dof (for 6 degrees of freedom) for autonomous HMDs, also known as "standalone" HMDs.
- 6dof for HMDs tethered to PCs, also called "PCVR").

This recommendation is intended for **6dof virtual reality experiences for PCVR**.

— 2.3. How this recommendation is structured

This recommendation brings together two different elements:

- a series of recommendations intended for VR experience creators (4.).
- a technical sheet intended for the producer / distributor of the experience. It should be filled and attached to the experience build, so that the technical manager of the venue can refer to it; it should also be printed so that the mediators of the venue can also refer to it onsite (5.)



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3. QUALITY IMPROVEMENT OF THE EXPLOITATION OF THE WORKS

3.1. Presentation and viewing

Without proper guidance, the spectators may face many difficulties, such as using the controllers, moving around, or even understanding the purpose of the experience. This is in addition to motion sickness or other effects inherent to the physiological capacities of each individual.

Support by a **mediator** is therefore highly recommended to ensure that these problems do not interfere with the spectator's experience.

Presentation, or «on-boarding», is the time that precedes the experience itself. **Viewing** is the time of the virtual reality experience, which can be followed by an **exiting of the experience**, or «off-boarding». These three moments are distinct, but each requires a mediation and proper design.

3.2. Works presentation conditions

To ensure the best possible reproduction of the works, it is recommended to choose a quiet and cool place with little traffic. It is also recommended to use good quality **headphones** that allow the viewer to be isolated from his environment. The lighting environment should not be too strong, to avoid the light to pass inside the helmet and create reflections on the optics.

3.3. Hygiene

Wearing the HMD and holding controllers favors viruses and bacteria transmission from one spectator to another. In addition sweat and make-up can also stay on the HMD. To ensure good hygiene, it is necessary to clean the HMD and the controllers between each usage. It is recommended to:

- change the HMD original foam to an imitation leather cover that can be cleaned;
- use antibacterial and virucide wipes (for skin & surfaces), and clean all the parts of the HMD in contact with the face, together with controllers, between each usage;
- in addition to wipe cleaning, use a UV-C or ozone cleaning machine to refine sanitization.

You can also find on the market disposable protections to put between the HMD and the face. They are quite difficult to position and can disturb the experience, while not being as efficient as the methods described above.

It is also necessary to look for the applicable hygiene laws of the territory where the works are presented.



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4. EXPECTED FEATURES AND IMPLEMENTATION

Here are a number of features we recommend to ensure a smooth physical exhibition of the work, supported by a mediator. Of course these are not mandatory and could vary depending on the nature of the work.

— 4.1. Internet connection

If the work does not need the internet for the spectator's experience, the executable must be able to run normally offline. Think of an alternative for any other needs (statistical data, license validation, etc.)

— 4.2. Tutorial

It is often useful to introduce the experience with a tutorial, to introduce the movement or interaction mechanism for example. However, it is necessary to give the possibility of skipping this tutorial. In general it is better to include it implicitly in the experience.

— 4.3. Movement space

- Attach the center of the virtual set to the center of the physical area (guardian).
- If necessary, add a configuration tool to move this virtual setting and fit the physical constraints of the exhibition space. During the startup screen, we suggest **(ctrl)+(O)** as a shortcut to access this tool. Then **(ctrl)+(arrows)** to move the space, and **(shift)+(arrows)** for rotation. Then **(ctrl)+(O)** to validate the new space.

— 4.4. Operation and mediation

- Make sure that the experience runs in the background, so that clicking on the screen outside the experience window (or **(alt)+(tab)**) does not cut off the audio.
- Provide a "welcome screen" for the spectator and return to this screen at the end of the experience.
- Start of the experience, your choice:
 - Selection with the eye, or "**Gaze start**", by adding a visible cursor at the selection point, and after a few seconds of pointing to the start area. Be careful not to put this zone exactly at the level of the gaze, to avoid the spectator starting the experience while he is still kitting up;
 - Or **(Space bar)** to be activated by the mediator.
- Propose a **mirror mode** of the HMD on the computer screen, so that the mediator can assist the spectator. If the creator of the work wishes to display another image on the screen (experience title screen for example), allow switching between the HMD mirror mode and a still image, with the **(S)** key.
- Suggestion of additional shortcut keys, if applicable:
 - **(R)** to restart the experience;
 - **(P)** to pause the experience, and start it again;
 - **(1), (2), (3)**, etc. to go to the different chapters of the experience (very useful if the experience is long and it crashes), or **(N)** to go to the next chapter.

4.5. Accessibility and comfort

→ To limit cyberkineses / motion sickness:

- limit sudden acceleration or deceleration from the spectator's point of view;
- avoid dropped frames, optimize the experience to get a refresh rate between 75 and 90fps on an Nvidia GTX 1080 or equivalent with 16GB of RAM;
- allow the possibility of switching to monoscopy at the beginning of the experience with the shortcut **(ctrl)+(M)** to switch between monoscopy and stereoscopy. Indeed, some people cannot physiologically tolerate stereoscopy.

4.6. List of shortcut keys

Here is a summary of the shortcut keys presented above:

Start of the experience	(spacebar) / Gaze Start
Re-start experience	(R)
Pause the experience	(P)
Go to the different chapters of the experience	(1), (2), (3), etc. to go to each chapter or (N) to go to the next chapter.
Toggle between still image / mirror mode (in case a still image is used)	(S)
Space calibration tool	(ctrl)+(O) to open the tool (ctrl)+(arrows) to move the space, (shift)+(arrows) to rotate the space, (ctrl)+(O) to validate calibration.
Switch the experience in monoscopic mode	(ctrl)+(M)

5. TECHNICAL SHEET TO PROVIDE WITH THE EXPERIENCE

5.1. Background

All the information necessary for the exploitation of the work is often transmitted at the same time as the executable:

- the credits elements for the event communication;
- the technical elements for the installation;
- the elements of mediation.

But they are not always transmitted to the mediation staff. Summarizing them and presenting them in a standardized way greatly simplifies dissemination and presentation.

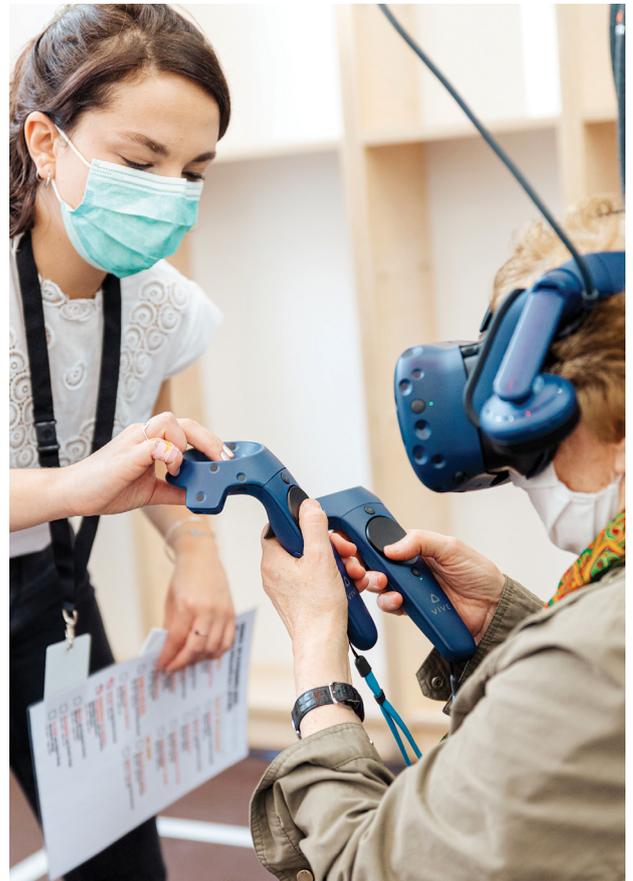
We listed these elements and recommend delivering a pdf summarizing them in the zip of the build. An example of this sheet is situated at 6. & 7., together with an editable document allowing each one to make their own technical sheet, on the website of the CST.

We also recommend that during the event, this sheet and eventual annexes are printed out and placed next to the station, at the disposal of mediators, together with a PDF version on the computer desktop.

5.2. Recommended technical sheet

5.2.1. Credits & description of the work

- Original and english title of the experience / Director / Producer / Year & Country of production / Short synopsis.
- Duration of the experience.
- Original language of the work, other languages available.
- Space needed to do the experience.
- Sitting / standing for the experience.
- Multiplayer experience or not.
- Minimum required age & trigger warnings.



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5.2.2. Technical specifications

- Recommended HMDs and all Compatible HMDs.
- Platforms (Steam, WMR, Oculus, or Oculus only, etc.).
- Name and size of the zip file of the executable, version of the executable.
- Minimum and recommended specs to run the experience: OS, CPU, GPU, RAM.
- Installation procedure (if applicable).
- Number of controllers required.
- Internet connection necessary to run the experience or not, and if yes, required bandwidth. If a specific network configuration is necessary (for a multiplayer experience for example), attach the configuration detail to the technical sheet.
- Attach any other document if specific calibration or other technical information is required (mic / camera access, network configuration for multiplayer experiences, additional software, device / tracker to be used, etc.).

5.2.3. Mediation

- How the work is presented (if applicable): attach any documentation specifying a process / speech for on-boarding and/or off-boarding the experience.
- If applicable: list of keyboard shortcuts for the experience (play, pause, re-start, calibration / center, next chapter, etc.).

5.2.4. Additional elements

Any additional items not listed above.

6. BLANK TECHNICAL SHEET FOR 6DOF PCVR EXPERIENCE

CREDITS & DESCRIPTION			
Original title		Director	
International title		Producer(s)	
Production year		Production country	
Short synopsis (150 characters), experience description			
Duration of the experience		Original language	
Recommended position: Standing up / seated		Other available languages	
Space necessary for the experience		Multi-user experience? If yes precise how many	
Required minimum age		Trigger warnings	
TECHNICAL			
Recommended HMD & all compatible HMDs		Name and size of the zipped exe file	
Platforms (Steam, WMR, Oculus only, etc.)		Version of the executable	
Minimum specs of the PC (CPU, GPU, RAM)		Number of controllers necessary	
Installation process (if applicable)		Is the Internet compulsory? If yes minimum bandwidth	
<p>Attach any other document if specific physical installation, calibration or device is required (scenography, props, mic / camera access, network configuration for multiplayer experiences, additional software, device / tracker to be used, etc.). Specify the file name and the number of pages in "Additional Element" section.</p>			
MEDIATION PROCESS			
<p>Mediation process to present the work: attach any documentation specifying a process / speech for on-boarding / off-boarding the experience.</p>			
List of keyboard shortcuts (play, pause, re-start, calibration / center, next chapter, etc.)			
ADDITIONAL ELEMENT / PHYSICAL INSTALLATION			

7. EXAMPLE OF A FILLED TECHNICAL SHEET FOR 6DOF PCVR EXPERIENCE

CREDITS & DESCRIPTION			
Original title	Ayahuasca Kosmik Journey	Director	Jan Kounen
International title	Ayahuasca Kosmik Journey	Producer(s)	Atlas V, a_BAHN & Small
Production year	2019	Production country	France
Short synopsis (150 characters), experience description	A visionary experience through the realms of the medicinal plants, led by indigenous Shipibo traditional healer in the amazon rainforest. Experience the visual and sound effects of taking Ayahuasca.		
Duration of the experience	18 minutes	Original language	English
Recommended position: Standing up / seated	Seated	Other available languages	French, spanish, portuguese, chinese, korean
Space necessary for the experience	1,20 m	Multi-user experience? If yes precise how many	No
Required minimum age	12 years	Trigger warnings	Snakes and close-up insects
TECHNICAL			
Recommended HMD & all compatible HMDs	Any PCVR HMD	Name and size of the zipped exe file	ayahuasca-kosmikjourney-noDRM-191106-v1.0b.zip. 3.96GO
Platforms (Steam, WMR, Oculus only, etc.)	Steam, WMR & Oculus	Version of the executable	1.0
Minimum specs of the PC (CPU, GPU, RAM)	i7, Nvidia GTX 1080, 16GB	Number of controllers necessary	0
Installation process (if applicable)	N/A	Is the Internet compulsory? If yes minimum bandwidth	No
Attach any other document if specific physical installation, calibration or device is required (scenography, props, mic / camera access, network configuration for multiplayer experiences, additional software, device / tracker to be used, etc.). Specify the file name and the number of pages in "Additional Element" section.			
MEDIATION PROCESS			
Mediation process to present the work: attach any documentation specifying a process / speech for on-boarding / off-boarding the experience.			
List of keyboard shortcuts (play, pause, re-start, calibration / center, next chapter, etc.)	N/A		
ADDITIONAL ELEMENT / PHYSICAL INSTALLATION			
N/A			

8. GLOSSARY

Mediator

Operator who takes charge of the operational launch of the viewing session, offers technical assistance to the viewer and animates a presentation time. Depending on the requirements of the work, an artistic, scientific or narrative mediation, during or after the viewing, can also be proposed.

PCVR

Device according to which the virtual reality experience runs on a computer, which is connected to the headset by a cable.

Virtual reality headset - Head-Mounted Display HMD

360° display device worn on the head by the user.

Stand-alone headset

Virtual reality headset which is not connected to a computer, and embeds a computing capacity that runs applications.

Presentation

Mediation time that precedes the viewing time.

Viewing

Effective time to visit the work.

Gaze

Interaction method in which the virtual reality headset is used as a pointer: placing the pointer for several seconds on a button in the experiment launches the corresponding action.

Gaze Start

Use of a Gaze to launch a work.

Mirror mode

Refers to a type of PCVR operation in which the computer screen displays a copy of what is being viewed in the headset on the flat screen.

Cyberkinetosis

Disorder that appears in a situation of discordance between visual perception and the sensation of movement, similar to motion sickness, when using a virtual reality HMD.



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