

IMMERSION

MPEG-I Haptics

SC29 WG2 MPEG Technical Requirements

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Haptic Use Cases



Input contribution of
updated use cases
for MPEG136



Value of Haptics in Immersive Media

THE VERGE

“The PS5’s new controller is amazing”

WIRED

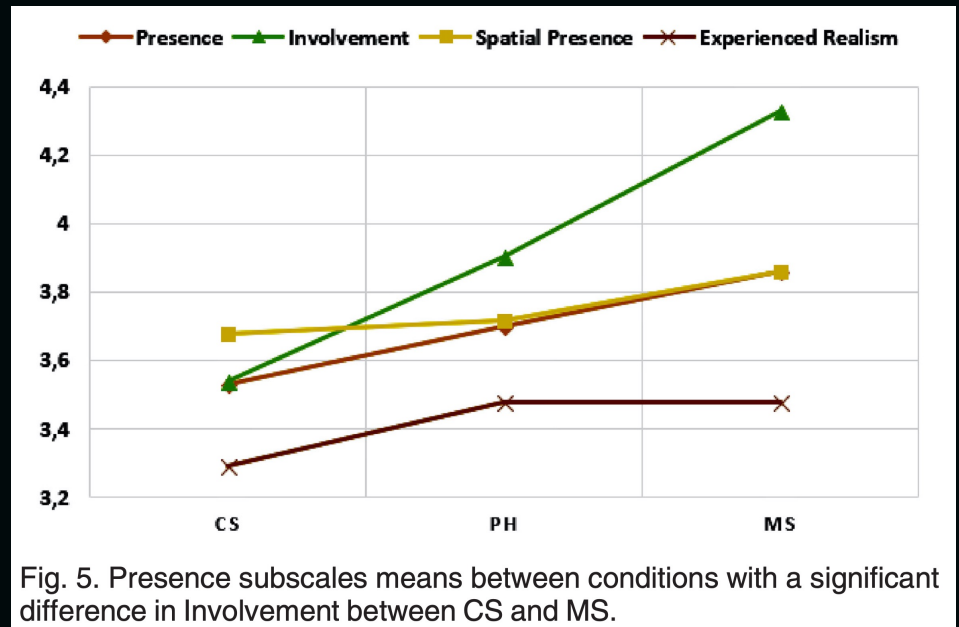
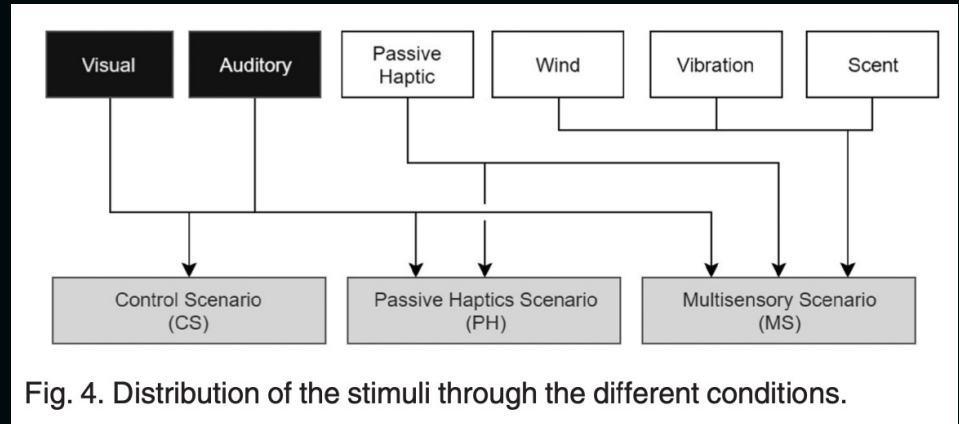
“The haptics steal the show”

gamesradar+

“Forget better loading speeds, shiny graphics, and more processing power, the DualSense PS5 controller is what makes the PS5 feel truly next-gen”







Goncalves, G, et. Al. ‘Impact of Different Sensory Stimuli on Presence in Credible Virtual Environments’, IEEE Transactions on Visualization and Computer Graphics, Vol 26, No. 11, Nov. 2020





Developers shouldn't be required to worry about these distinct configurations

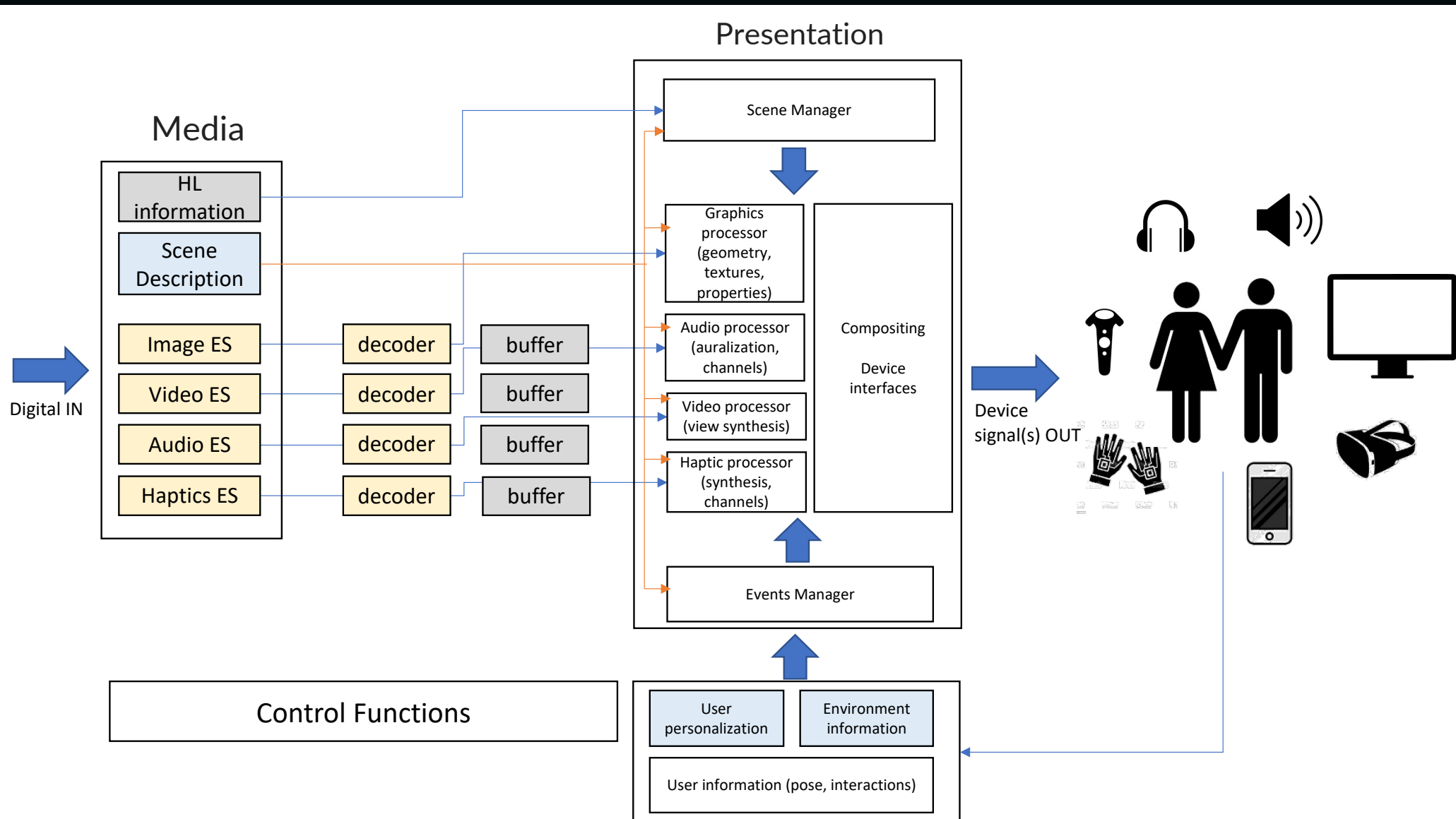
Types of Haptic Devices

Modality	SubType	Example(s)		Similar Media Type
Tactile	Vibration	Mobile phone DualShock		WAV MIDI
	Spatial Change	HaptX DK2 Gloves		Depth Image
	Friction Change	Tanvas		2D Greyscale
Kinesthetic	Impedance	GeoMagic Touch PS5 DualSense		Geometry with mechanical properties

Unique Challenges of Haptic Media

Challenge	Description
No Reference Device	There is no single device that can generate the entire range of perceivable tactile sensations.
Perceptual Variance	Tactile sensitivity varies greatly over the body surface and by tactile modality and due to cross-modal effects (e.g. priming and masking).
Avatar vs Physical Body	The 2m ² skin surface (+ proprioception) is not usually well represented in virtual environments.
Physical Device Mapping	A single user may have multiple different tactile stimulation devices with different performance capabilities, at different body locations.
Closed vs. Open Loop Feedback	Certain types of feedback (e.g. kinesthetic) require low sensor-to-actuator latency closed-loop feedback with low-jitter refresh rates.
Synchronization with other Media	Haptic perception is strongly influenced by intermodal effects from visual and audio stimulation.
Interactivity Models	Haptics in XR implies an interaction with the virtual environment. This type of interactivity can be more involved than visual/audio-based interaction feedback because feedback is often based on direct virtual contact.

Phase 2 Architecture (Under Consideration)



MPEG-I Phase 1: CfP

CfP Issued at MPEG 134, April 2021 (N00070)
Test Results at MPEG 136, Oct. 2021

Requirement	Description
High quality	The coded representation shall support coding of haptic signals that preserve frequency and amplitude independently.
Update rate	Coded representation shall provide decoded data to a presentation engine sufficient to be able to generate a drive signal between 5 and 1000Hz.
Synchronization	Coding shall enable perceptual synchronization with audio and video.
Playback transcoding	Shall enable re-rendering or synthesis of coded signals for distinct target playback hardware.
Tracks	Shall support multiple simultaneous tracks and multiple encoded versions of a single track.
Compression	Shall support lossy or lossless compression.
Actuators	Shall support arbitrary temporal hardware, multi actuators and localization relative to the user.
Mixing	Shall support mixing of multiple simultaneous tracks on a single output devices.
Modulation	Shall support application-controlled modulation of overall haptic sensation.

MPEG-I Phase 2

Requirement	Description
Surface properties	Shall support 2D (or higher) spatial haptic effect encoding.
Material properties	Shall support association of spatio-temporal haptic effects with 3D objects in a scene graph.
Latency	Shall have sufficiently low latency to ensure real-time and interactive user experience.
Avatar representation	Shall support representation of the haptic interactive elements of the user's virtual representation.
Interaction model	Shall support at least one interaction model such as: <ol style="list-style-type: none">1. Touch to feel2. Look to feel3. Ambient



Thank You!

Get Involved

MPEG Haptics AhG	https://lists.aau.at/mailman/listinfo/mpeg-haptics
Haptics Industry Forum	https://hapticsif.org/