Haptics Gaming SDK Survey (2025)

Version 2.1 - June 26, 2025

Contents

Overview

Haptic technology has become increasingly important in gaming, providing tactile feedback that enhances immersion and gameplay experience. As of 2025, the industry has seen significant advancements in haptic implementation across platforms, with technologies moving beyond simple vibration to sophisticated multi-dimensional tactile feedback. This document surveys the current landscape of haptic technologies available to game developers.

This survey primarily focuses on gaming controllers, force feedback wheels, and other haptic peripherals commonly used in gaming. The APIs and SDKs are categorized based on platform compatibility, features, and specialized use cases. With haptics playing an increasingly central role in creating immersive gaming experiences, understanding the available tools and technologies is essential for developers.

This document provides a comprehensive market survey of available SDKs and Haptic Design software for developing custom haptics implementations in video games. It combines official industry documentation with practical developer experience.

The haptics market is projected to grow significantly in the coming decade, key factors driving this growth include:

- Increased adoption in gaming and VR experiences
- Expansion into vehicle cockpits and automotive applications
- Innovation in actuator design and implementation
- Use of more actuators per device to enhance feedback capabilities
- Growing consumer demand for immersive experiences
- Replacement of physical buttons with haptic interfaces in various devices

While gaming remains a significant driver for haptic innovation, particularly in VR accessories, the automotive sector is expected to account for a major portion of market growth. The industry continues to see a shift toward more advanced haptic technologies such as LRAs replacing ERM motors, offering more configurable haptic responses with better separation of frequency and amplitude control.

Definitions

- **Cross-Platform**: Ability to play haptic content across at least two devices from different vendors
- **HOTAS**: Hands On Throttle-And-Stick

- **Mixing**: Ability to mix two haptic effects simultaneously
- **Perceptions**: Haptic modalities supported
- **Real-time update**: Ability to modify haptic effects once playback has started
- **SDK**: Software Development Kit
- **Targeting**: Ability to localize haptic effects over the human avatar
- **Testing - In App**: Haptic testing in the design tool by playing a button
- **Testing - In Engine**: Haptic testing in the game engine without compiling
- **Testing - Over the air**: Haptics synchronization over network with haptic device
- **Wideband**: Haptic effect with multiple vibrational frequencies

Emerging Haptic Trends (2025)

The haptics market continues to evolve rapidly, with several notable trends emerging in 2025:

Advanced Haptic Actuators

- Transition from LRAs (Linear Resonant Actuators) to more sophisticated options
- Growth in use of VCMs (voice coil motors) and piezoelectric actuators
- Increasing adoption of surface haptics, particularly in automotive displays
- Advanced voice coil motor (VCM) arrays for precise spatial haptic rendering
- Hybrid actuator systems combining LRAs, VCMs, and piezoelectric elements
- Smart actuator control algorithms that adapt frequency response in real-time
- Miniaturized force feedback systems integrated into mobile and handheld gaming devices

Multi-Dimensional Haptic Feedback

- Expansion beyond basic vibration to include kinesthetic (force) feedback
- Introduction of thermal haptics as an additional dimension of tactile experience
- Growth in controllers with adaptive triggers, following PlayStation 5's success
- Textural haptics: Surface simulation including roughness, stickiness, and material properties
- Impact haptics: Precise collision feedback with variable force, duration, and decay patterns
- Ambient haptics: Environmental feedback including wind, temperature simulation, and atmospheric pressure changes

- Gestural haptics: Touch-based navigation with haptic confirmation and guidance

Haptic Wearables

- New devices like haptic headsets, vests, gloves, and even rings and pendants
- Applications beyond gaming, including accessibility (e.g., DotLumen's haptic headset for the blind)
- Integration of EMS (Electrical Muscle Stimulation) and TENS (Nerve Stimulation) in advanced haptic suits

Haptic Audio Integration

- Growing trend of audio-to-haptics conversion technologies
- Specialized haptic seats for gaming and entertainment
- Integration of haptic feedback in headphones and audio devices

Specialized Haptic Solutions

- Automobile cockpit haptics for safety alerts and control interfaces
- Gaming chairs with integrated haptic feedback
- VR-specific haptic accessories for enhanced immersion

Notable Evolutions

Nintendo Switch 2 HD Rumble 2 (2025)

The successor to the original Nintendo Switch features an enhanced haptic system called HD Rumble 2. While retaining compatibility with previous HD Rumble implementations, the new system offers:

- More powerful and precise motors in Joy-Con 2 and Switch 2 Pro Controller
- Improved subtlety in vibration effects, creating more textural haptic experiences
- Better directional haptic feedback
- Enhanced haptic effects in first-party titles like Donkey Kong Bananza and Mario Kart World
- Reduced audible noise from rumble compared to original Switch
- Optimized power consumption for extended battery life while maintaining haptic fidelity

Interhaptics SDK

Razer acquired Interhaptics in 2022 and has since expanded the platform significantly:

- Universal HD haptic SDK for cross-platform development
- Support for PlayStation 5, PlayStation 4, Meta Quest, X-input controllers, iOS, and Android, Open XR
- Compatible with Unity, Unreal Engine, GameMaker and custom game engines
- Provides tools for creating customizable directional haptics
- Upgraded Haptic Composer software with in-app testing for DualSense controllers and Razer HyperSense devices
- Free for game studios and developers, available at interhaptics.com
- Deploys HD haptics on billions of devices across multiple ecosystems
- Features unique haptic perceptions (Vibration, Textures, and Stiffness)
- Includes a library of premade haptic effects
- Supports audio-to-haptics conversion
- Serves as the foundation for Razer's Sensa HD Haptics technology introduced in 2024
- Part of the WYVRN developer tools ecosystem starting 2025 alongside Chroma, THX and Razer AI

Razer Sensa HD Haptics

- Released in 2024, building on the Interhaptics technology
- Software-device integrated platform with sophisticated customization options
- Provides developers with control over haptics directionality, multi-actuator experiences
- Supports multiple-device integration between different platforms and peripherals
- Features real-time audio-to-haptics conversion with <20ms response time
- Allows for specially tuned haptic effects created in partnership with game developers

Rich Tap Haptics

- Next-generation haptic feedback that combines multiple actuator types for complex tactile sensations
- Integration of micro-gesture recognition with haptic response for intuitive user interfaces
- Adaptive haptic intensity based on user preferences and environmental context
- Multi-layer haptic compositions allowing simultaneous texture, impact, and ambient feedback
- Real-time haptic synthesis from audio, visual, and gameplay data streams

D-BOX Technologies

- In-house haptic coding.
- 25 years of haptic design expertise and research.
- In-house manufactured actuators 1.5, 3, and 6 inch strokes.
- Large content library 3000+ films and series, 100+ games, simulations and arcades
- Flexible software suite with different modes (cinematic, gaming, adaptive gaming, audio mode)
- Windows PC only for now
- Integration SDK free for game studios and developers, available at d-box.com

Meta Haptics SDK

Meta Haptics expanded beyond just Meta products to be able to deliver haptics towards other XR platforms as well following the Quest OS metamorphosis into an open Horizon OS for standalone headsets.

Native PC Windows APIs

DirectInput

- Joystick device enumeration
- Read button/axis values
- Control force feedback effects (constant/periodic/spring/damper/etc)
- No control over pager motor/haptic style devices
- Effectively the only way to control force feedback devices on Windows

XInput

- Only works with Microsoft Xbox licensed/compatible devices
- Joystick device enumeration
- Read button/axis values
- Control 2 pager motor style haptic motors (left/right intensity, no frequency control)
- doesn't drive force feedback motors

GameInput

- Wrapper around DirectInput/XInput
- Not yet fully implemented
- Back-ported from Xbox
- Provides no new functionality for haptics but documentation is incomplete

Raw/HID

- Low-level direct access to USB devices
- Requires understanding of device-specific communication protocols
- Useful for device makers but challenging for developers
- Poorly documented and difficult to implement

Native Windows Managed (C#) APIs

UWP (deprecated)

- Windows.Gaming.Input.Force
- Windows.Devices.Haptics

Other

- Various wrappers for XInput/DirectInput for C# and other managed languages

Windows Gaming Middleware

Steam

- ISteamInput
- Support for some console controllers that normally lack PC drivers
- Compatible with PS5 controller haptics and Nintendo Switch controllers

Unity

- UnityEngine.XR.Interaction.Toolkit
- XR.InputDevice.SendHapticImpulse()

Unreal

- Play Haptic Effect

Virtual Reality Controllers

OpenXR (open standard)

- xrApplyHapticFeedback
- extensions for different vendors (Meta, Vive, Pico)

PSVR2

- only for PS partners, localized haptics for controllers, headband; sensations – texture and stiffness

Valve OpenVR

- IVRSystem::TriggerHapticPulse

Meta OpenXR Implementation

- Fully embraced OpenXR standard for VR applications by 2025
- Legacy LibOVR APIs fully deprecated in favor of OpenXR
- Meta's VR haptics now accessible through standardized OpenXR haptic interfaces
- Enhanced cross-compatibility between Meta Quest devices and other OpenXR platforms
- Meta Haptics Studio adapted to support the OpenXR haptic feedback pipeline
- Simplified development process for haptics across multiple VR platforms

Cross-Platform Gaming SDKs

Cross-platform gaming SDKs allow developers to implement haptic functionality across multiple devices and platforms. These SDKs vary in their features, compatibility, and implementation methods. As of 2025, several major players have expanded their offerings to become nearly universal solutions.

Feature Comparison

SDK/APIs API Name	**Unity Native** InputSystem.Haptics	**Unreal Native** Force Feedback	**Core Haptics** Core Haptics SDK	**Android** Android SDK	**Meta Haptics** Nice Vibrations	**Interhaptics** Interhaptics SDK	**Wwise** Wwise Motion
Asset	No	.wav	.AHAP	.ogg	.haptics	.haps	.wav
Scripting	Yes	Yes	Yes	Yes	Yes	Yes	No
Game Engine	Unity	Unreal	Unity	Any	Unity	Unity/Unreal/Game Maker/Any	Any
Haptic Engine	No	No	Core Haptics	No	No	Interhaptics Engine	Audio Engine Plugin
Wideband	No	No	Yes - 1 sharpness	No	Yes – advanced patterns	Yes	Yes
Real Time Update	No	No	Yes	No	Yes	Yes	-
Targeting	Left/Right	Left/Right	Left/Right	Left/Right	Left/Right	Full Body Mapping	Device Actuators
Mixing	No	No	No	No	No	Yes	Yes
Perceptions	Vibration	Vibration	Vibration/Force	Vibration	Vibration	Vibration/Stiffness/Texture	Vibration/Stiffness
License	Unity	Unreal	Apple License	Android	MIT	WYVRN License	Audiokinetic License
Design Tool	-	-	Haptic Sampler/Haptrix	-	Meta Haptic Studio 2.0	Haptic Composer	Wwise Motion

Device Compatibility

Supported devices/Protocols	**Unity Native**	**Unreal Native**	**Core Haptics SDK**	**Android SDK**	**Meta Haptics**	**Interhaptics**	**Wwise**
DualSense	No	No	Yes - Amplitude	No	No	Yes - Wideband	Yes - Wideband
DUALSHOCK	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PSVR2	No	No	Yes - Amplitude	No	No	Yes - Wideband	Yes - Wideband
DirectInput							
XInput/HID	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GDK	No	No	No	No	No	No	Yes
Android	No	Yes	No	Yes	No	Yes	Yes
Core Haptics	No	Yes - Amplitude	Yes	No	Yes - Wideband	Yes - Wideband	No
Meta Quest (OpenXR)	Yes	Yes	No	No	No	Yes	No
OpenXR	Yes	Yes	No	No	No	Yes	No
Nintendo Switch 1/2	Yes	No	No	No	No	Yes	Yes
Steering Wheel	No	No	Yes - Limited	No	No	No	No

Platform Native Gaming SDKs

These SDKs are specific to certain gaming platforms and provide direct access to haptic capabilities of their respective controllers. As of 2025, most major platforms have significantly enhanced their haptic offerings, with Nintendo Switch 2's HD Rumble 2 being a notable recent addition.

SDK/APIs API Name	PlayStation SDK DualShock, DualSense, Sense, Head Haptics	Microsoft GDK All Xbox controllers/XInput	Nintendo SDK Switch (non Switch Lite), Switch 2 HD Rumble 2	Meta Haptic SDK Quest Pro and Quest controllers	Steam Deck Steam Deck, Steam Controller
Asset	.wav	no	no	.haptics	MIDI
Scripting	Yes	Yes	Yes	Yes	Yes
Game Engine	Unity/Unreal/Other	Any	Any	Unity	Any
Haptic Engine	No	No	No	?	No
Wideband	Yes	No	Yes (HD Rumble 2)	Yes	No
Real Time Update	Yes	Yes	Yes	Yes	Yes
Targeting	Left/Right/Triggers/Head	Left/Right/Triggers	Left/Right/Center	Left/Right	Left/Right
Mixing	No	No	No	N/A	Yes
Perceptions	Vibration/Force	Vibration	Vibration	Vibration	Vibration
Documentation	After NDA	After NDA	After NDA		
License	PlayStation Partners	Xbox Game Developer Program	Nintendo developer	Oculus Developer	Steamworks
Design Tool	Yes (available in the PS SDK)	-	-	Meta Haptics Studio	-

Gaming Peripherals Haptics SDKs

These SDKs are designed for specialized haptic peripherals that enhance gaming experiences beyond standard controllers.

SDK/APIs Supported Devices	bHaptics bHaptics	D-Box D-Box Actuators	Teslasuit SDK Teslasuit/Teslaglove	Unitouch Actronika Vest
Script	yes	yes	N/A	yes
Asset	.tact	-	N/A	.wav
Game Engine	Unity	Any	Unity	Unity
Haptic Engine	No	No	N/A	Yes
Wideband	No	Yes	Yes - Teslaglove	Yes
Real Time Update	yes	Yes	N/A	Yes
Targeting	Body Mapping	Pitch/Roll/Heave/4 Corner/Yaw/Sway/Surge	Body/Hands	Chest
Mixing	Yes	Yes	Yes	Yes
Perceptions	Vibration	Vibration/Position/Texture	Vibrations and weight through TENS (Nerve Stimulation) and EMS (Electrical Muscle Stimulation)	Vibrations
Documentation	Link	Link	N/A	Link
License	Not shared	N/A	Requires hardware	
Design Tool	bHaptics Designer	N/A	Teslasuit Haptic Editor	Unitouch Studio

Force Feedback in Specialized Peripherals

Steering wheels, pedals, HOTAS (Hands On Throttle-And-Stick), and motion platforms are specialized peripherals that provide haptic feedback for specific types of games. These devices can produce effects like loss of grip, vibrations, resistance, and more.

Manufacturers typically provide their own SDKs to implement these effects using vehicle telemetry or other game state information. Technology is constantly evolving to provide increasingly realistic tactile sensations.

Proprietary Hardware APIs

The following companies produce force feedback wheels and provide APIs for direct control over the FFB signal. Many also offer control over haptic motors on pedals and rims, as well as multi-tonal haptic side channels.

There are no universal APIs (maybe a need for standardization through USB-HID).

- Logitech
- Fanatec
- Asetek
- Conspit (pedals with haptic motors)
- Moza
- Simagic
- Simucube
- Thrustmaster
- VNM Simulation
- VRS Racing

Telemetry Middleware

- **Simracers**
- **Flight Sims**
- D-Box Suite
- SimHub
- SimDash

DirectInput

- Joystick device enumeration
- Read button/axis values
- Control force feedback effects (constant/periodic/spring/damper/etc)
- No control over pager motor/haptic style devices
- Effectively the only way to control force feedback devices on Windows

Mac/Linux Support

Mac and Linux have their own ports of DirectInput with minimal support for force feedback hardware. Historically, only older Logitech wheels worked reliably on these platforms. Steam has improved compatibility somewhat in recent years, but support remains limited compared to Windows. (G25 - only wheel that worked)

Cross-Platform Haptic Design Tools

These tools allow developers to design haptic effects that can be deployed across multiple platforms and devices.

Feature Comparison

Asset	Haptrix .ahap	Apple Sampler .ahap	Meta Studio .haptic	Haptic Composer .haps	Wwise Motion Soundbank file, .bnk
Perceptions Design	Vibrotactile, Force	Vibrotactile	Vibrotactile	Vibrotactile, Texture, Force	Vibrotactile, force
Audio to Haptics	No	No	Yes	Yes	No
Wideband	No	1 sharpness	1 frequency	Multi frequency	Multifrequency
Testing - Over the air	iOS	iPhone through http request	Quest Controller, Quest Pro Controller	iOS, Android	Android, PS4, PS5, Switch, Windows, Xbox
Testing - In app	No	No	No	DualSense, Razer Kraken Hypersense	Yes
Testing - In Engine	No	No	Quest Controllers (2,3, Pro)	Quest Controller, Game-Input, Razer Sensa HD Haptics	Yes
Multichannel Design	Mono	Mono	Mono	Mono	1, 2 or 4 channel depending on device
Documentation	Link	Yes	Yes	Yes	Yes
License			Oculus Developer	WYVRN EULA	Audiokinetic EULA (and request)

Device Compatibility

Supported devices/Protocols	Haptrix/Haptics Sampler	Meta Studio	Haptic Composer	Wwise Motion
DualSense	Yes - Amplitude	No	Yes - Wideband	Yes - Wideband
DualShock	Yes	No	Yes	Yes
PSVR2	Yes - Amplitude	No	Yes - Wideband	Yes - Wideband
GameInput/X-input/HID	Yes	No	Yes	Yes
DirectInput	No - TODO: check	No	No	No
Android	No	No	Yes	Yes
Core Haptics	Yes	No	Yes - Wideband	No
Meta Quest	No	Yes	Yes	No
OpenXR	No	Yes	Yes	No
Nintendo Switch 1/2	No	No	Yes	Yes
Steering wheel	Yes - Limited	No	No	No

Tool Descriptions

Meta Haptics Studio

- Haptic Designer for .haptics files
- Import audio and extract haptics
- Edit Transient and advanced haptic patterns
- Test over the air on Meta devices via OpenXR
- Expanded compatibility with industry-standard OpenXR protocols
- Enhanced integration with Unity and Unreal game engines
- Meta Haptics Studio

Interhaptics Haptic Composer

- Haptic Designer for .haps files
- Import audio and extract haptics
- Edit Transient and up to 16 mixed patterns
- Design adaptive triggers haptics
- Test over the air iOS and Android
- Test in app: PlayStation DualSense, Razer Sensa HD Haptics, GameInput controllers
- Test in engine: GameInput/XInput controllers, Meta Quest, Open XR controllers, PlayStation DualSense, Xbox, Switch
- Haptic Composer

WWISE Motion

- Design haptics parametrically or audio to haptics
- Plugin of the Wwise Audio Engine
- Draw and design haptic effects
- Generate haptics from audio source
- Motor-assignable
- Test in app (license needed)
- Test in audio engine
- Wwise Motion

Apple Sampler

- AHAP Editing in JSON format
- Transient and Continuous editing
- Testing based on Apple platform
- No GUI, edit JSON manually
- AHAP example files available

Haptrix

- Haptic Designer for AHAP files
- Marketplace of paid and free effects
- Download
- Testing App for iOS

Contacts

Gaming WG Co-Chairs

- Felix Gervais O'Neill - fgervais@d-box.com
- Eric Vezzoli - eric@hapticsif.com
- Adrian Tamas - adrian.tamas@razer.com