



Creating the HD Haptic Experience in Mobile Devices

Understanding that a user experience is the result of a confluence of technologies, Immersion has taken a system-level approach to developing haptic solutions: continuously developing a foundational expertise in haptic technology to provide natural and realistic touch effects while also inventing new contexts in which users experience haptics. In mobile phones today, haptics provides critical feedback for typing and touch confirmation in touch screen phones and tablets. But the true promise of haptics lies in delivering an HD Haptics Experience to the mobile interface.

Immersion defines the HD Haptic Experience as haptic interfaces that are comprised of three distinct but equally important enablement technologies:

1. Actuators combined with embedded controlling software that produces broad frequency response to create rich and nuanced haptic sensations
2. System-level software that integrates haptics easily and consistently into device user interface
3. Application-level software that allows for customized and context-appropriate haptic effects to be applied by application developers

As actuator technology improves to create increasingly high-fidelity haptic sensations, those technologies must be paired embedded control software to ensure that they are delivering optimized haptic effects. With the embedded control software in place, OEMs must deeply integrate haptics into the device UI, to ensure a consistent and customizable user experience. Once haptics are enabled in the phone OS, providing application developers access to haptics as a tool to create their user experiences not only enhances the user experience further, but provides more innovative haptic designs. This result of this combination of quality haptic effects with integration and development software is a HD Haptic Experience.

Immersion is leading the market in haptic interface design by developing the technology and tools required to create a compelling haptics interface. Immersion offers an assortment of TouchSense® solutions that provides the embedded solutions necessary for an array of underlying actuator technologies. By incorporating TouchSense technology into a mobile device design, mobile OEMs are optimizing their choice of haptic actuator to provide more nuanced and rich effects. As the fidelity of the sensations increase, haptic effects become richer and more lifelike.

Immersion's TouchSense technologies for mobile devices include:

TouchSense 3000

TS3000 consists of OEM embedded software to drive a motor and an API enable application and OS support of the haptic API. With the TouchSense 3000 product a device can control a conventional Eccentric Rotating Motor (ERM), a Linear Resonant Actuator (LRA) or coin ERM. Controlled by TouchSense 3000, the use of braking, overdrive and complex haptic waveforms, provides outstanding haptics may be achieved with these actuators.

TouchSense 4000

TS4000 is an enhanced version of TS3000 that can support up to sixteen (16) different kinds of motor actuators independently. This is sometimes used in mobile devices using an ERM and an LRA to achieve very special effects and is particularly impressive for gaming effects.

TouchSense 5000

TS5000 is an enhanced version of TS4000 that supports High Fidelity actuators such as piezo or electro-active polymer (EAP) actuators, as well as conventional motors. Immersion also provides mechanical reference designs, models of actuators and special design tools to support piezo actuators.

By combining any of our TouchSense solutions with our MOTIV Development Platform, mobile device OEMs can deliver a compelling HD Haptic Experience. The MOTIV Development Platform is comprised of two key elements, the MOTIV Integrator for OEMs and the MOTIV SDK for application developers. The MOTIV Integrator allows OEMs to quickly apply haptics to an Android OS in a matter of minutes, reducing engineering cycles while creating a superior and consistent haptic experience for the mobile UI. The MOTIV SDK then opens up a world of opportunity to application developers by providing the resources needed to create haptic interfaces for their apps.

MOTIV Integrator for OEMs

The MOTIV Integrator offers a unique set of modules that provide build-time integration options for OEMs that automatically add haptics into the Android UI and applications and provides an easy way to customize the overall tactile feel of the device. Features of MOTIV Integrator include:

- **UI Module:** Integrates haptics into the Android OS user interface within a matter of minutes, eliminating engineering cycles while creating a superior user experience. The UI Module inserts haptics into Android's user interface through its view and notification frameworks, creating a consistent user experience throughout the mobile device, both in the user interface as well as downloaded applications which use the view and notification framework. Additionally, the UI Module provides a tailored experience by allowing users to adjust and personalize haptic effects.
- **Theme Manager Module:** Allows OEMs to select from a list of haptic themes that can be applied to the Android OS and mobile user interface. Themes range in levels of intensity and personality, and can be customized by the OEM or carrier, creating a distinct and differentiated mobile experience for consumers.
- **Reverb Module:** For applications not optimized for haptics by developers using the MOTIV SDK, OEMs can install the Reverb Module, which automatically inserts haptic feedback into applications by translating audio data into effects. Examples of applications that benefit from the Reverb Module include video and music playback enhanced by the sense of the music thumping reminiscent of a subwoofer effect, or a downloaded first person shooter game where the users feel the explosions and game play in their hands.



About Immersion

MOTIV SDK for Developers

The MOTIV SDK provides an assortment of haptic design resources. These tools include the API, sample code, effect libraries with over 100 pre-designed effects, reference documentation, and a conversion layer that allows developers to easily and quickly incorporate specialized haptic effects into their Android applications. In addition, the MOTIV SDK includes a haptic effect design studio for advanced users.

By supporting the broader mobile ecosystem of device manufacturers and software developers, Immersion is enabling HD Haptic Experiences to drive the next generation of user interfaces, such as personalized touch-based themes, games with tactile response and multi-modal applications that engage the user's sense of touch.

To work with Immersion to deliver a HD Haptics Experience to your mobile device, please contact us at motiv@immersion.com.

Haptic technologies are transforming digital devices everywhere. Electronics manufacturers are providing digital controls with authentic tactile confirmation. Industrial and commercial manufacturers are increasing the accuracy, efficiency, and safety of the user experience. Content developers are creating a more engaging experience for mobile handset users. Game developers are captivating users with more intense and enjoyable entertainment. Medical schools and hospitals create a more realistic and engaging multisensory experience for surgical simulation training. Immersion technology puts the sensation of touch in the hands of visionary manufacturers worldwide.

Founded in 1993, Immersion Corporation is the recognized leader in digital touch technology and products. Immersion's technology is deployed across automotive, consumer electronics, entertainment, industrial, medical training, and mobile products. Immersion holds more than 1000 issued or pending patents in the U.S. and other countries

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