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OPENHAPTICS SOFTWARE

OpenHaptics Toolkit version 3.1 Installation Guide

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Hardware usage guidelines are provided to assist the user in protecting the effectiveness and life of the device. They are not intended as recommendations for the prevention of repetitive stress injury, carpal tunnel syndrome or any other conditions, injuries or disorders; users should consult their own physicians. By using the Phantom device, the user acknowledges and agrees that Sensable shall have no liability for any disorder, condition or injury arising from any use of the device.

> **Warning** Do NOT open the Phantom device. Attempting to open or repair the device by anyone other than a certified authorized service center voids the manufacturer warranty and hardware maintenance contract.

Questions or Comments

If you have any questions for our technical support staff, please contact us at support@Sensable.com. You can also phone 1-888-SENSABL (U.S.A. only) or 1-781-939-7444 (International).

If you have any questions or comments about the documentation, please contact us at documentation@Sensable.com.

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Contents

Preface

Congratulations on your purchase of the OpenHaptics Toolkit version 3.1!

Should you encounter any difficulties while setting up or learning the application, Sensable provides a variety of resources to help you learn the product. These are described below in "Resources for Learning the OpenHaptics Toolkit".

Resources for Learning the OpenHaptics Toolkit

Sensable provides the following documentation and other materials for learning OpenHaptics:

- **OpenHaptics Installation Guide -** This guide walks you through installing the toolkit and deploying your haptically enabled application. Detailed instructions for installing the Phantom® haptic device can be found in the *Phantom Device Guide* that came with your device. This can also be found on the OpenHaptics CD.
- **OpenHaptics Programmer's Guide** - This guide explains the OpenHaptics toolkit (which includes the QuickHaptics™ micro API), and introduces you to the architecture of the toolkit, how it works, and what you can do with it. The guide will also introduce you to the fundamental components of creating haptic environments.
- **OpenHaptics API Reference -** This manual is meant to be used as a companion to the *OpenHaptics Toolkit Programmer's Guide*. It contains reference pages to all the QuickHaptics micro API and OpenHaptics toolkit HDAPI and HLAPI functions and types as well as appendices with tables that describe all the parameters.
- **Source Code Examples & Guide -** Several examples with source code to illustrate commonly used functionality of the HDAPI and HLAPI are installed with the toolkit. These include both console examples and graphics examples. A guide to these examples is located in <*OpenHaptics Install directory*>\doc.
- **Developer Support Center** This is described in more detail below.

The Developer Support Center

A more recent version of this document may be available for download from the Sensable online Developer Support Center (DSC). To access the DSC, use the link in the upper-right corner of Sensable's home page (www.Sensable.com) or visit the Sensable Support page at www.Sensable.com/support/.

The DSC provides customers with 24 x 7 access to the most current information and forums for the OpenHaptics toolkit. Please note that you will be asked to create a registration profile and have your customer information authenticated before you will have access to the DSC.

Typographical Conventions

This guide uses the following typographical conventions:

Convention	Description	Example
Italics	First use of a new term; reference to another document or file.	See the *User Manual*.
Bold	Function name or parameter embedded in text.	Capabilities are set using **hdEnable()**
Note, **Warning**, **Important**	Calls out important additional information.	**Note:** See table...

1

Installation

This chapter contains the following sections:

System Requirements

IMPORTANT See the ReadMe in the <*OpenHaptics Install directory*> or visit www.Sensable.com for the most current system requirements information.

The OpenHaptics toolkit requires certain hardware and software components in order to function properly. These requirements are listed below.

Hardware

- Intel Pentium 4 or higher
- 512 MB disk space and 1 GB RAM
- One of the supported devices from the Phantom® family of haptic devices (note that **PCC** stands for Phantom Communication Converter):

Phantom Omni® haptic device (IEEE 1394a firewire port) or PCC	Phantom Premium 3.0/6DOF (Enhanced Parallel Port) or PCC
Phantom® Desktop™ haptic device (Enhanced Parallel Port) or PCC	Phantom Premium A 1.0/1.5/3DOF (Enhanced Parallel Port) or PCC
Phantom Premium 1.5/6DOF (Enhanced Parallel Port) or PCC	Phantom Premium L 3.0/3DOF (Enhanced Parallel Port) or PCC

Software
- Windows® XP or XP 64 (SP2) or Vista or Vista 64, Win 7 or Win 7 64.

Compilers
- MicroSoft Visual Studio 2005/2008/2010.

Drivers
- Latest Phantom® Device Drivers (PDD). Please refer to Sensable web site to download the most recent PDDs (http://www.sensable.com/support-download-pdd.htm).

Installing the OpenHaptics Toolkit

Installation Overview

Installing the OpenHaptics toolkit is a two step process.

1. Install the required Phantom Device Drivers (PDD).
2. Install the software, the OpenHaptics toolkit, according to the instructions that follow.

Step 1: Install PDD

The device driver installation can be found on the OpenHaptics product CD or from the Sensable website (http://www.sensable.com/support-download-pdd.htm). For complete installation instructions for the PDDs, see the *Phantom <model> Device Guide* that shipped with the device.

Step 2: Install Software

After you have completed the installation of the PDDs, install the toolkit as described below.

1. First locate the installation files:

   If you are installing from CD:

   a. Insert the OpenHaptics CD into your CD-ROM drive.

   b. In Windows Explorer, locate the drive letter associated with your CD-ROM Drive and double-click it.

   c. Navigate to the folder, then double-click the **OpenHaptics toolkit** directory to open it.

   If you are installing from software download:

   a. Select the appropriate OpenHaptics product from the Developer Support Center.

   b. Save the Zip file to your local system.

   c. Locate the OpenHaptics Zip file that you saved to your local system.

d Unzip the data file.

2 Double-click the installer **.exe** to begin the installation.

3 Read and then accept the license agreement. Click **Next**.

4 On the Choose Components window GLUT is selected for installation by default. If you do not already have GLUT installed on your computer, make sure GLUT is selected for install. These are recommended to incorporate visualizations with your haptics programs and are needed to build many of the sample programs. The following components must be installed:

- **Program Files**: Installs all of the necessary program files and help documentation. This should generally always remain selected.
- **External** > **GLUT**: Installs the GLUT display libraries. These are recommended to incorporate visualizations with your haptics programs. See “External Modules” on page 7 for more information.

5 Click **Next**.

6 Select the destination folder for the install directory. The installation wizard will add a new environment variable, **OH_SDK_BASE**, which will point to the install directory.

7 Click **Install**. If you need to end the installation, click **Cancel**.

Note The installation directory is labeled "OpenHaptics."

File access permissions may not be uniform across all Windows platforms. In some cases, it may be necessary to remove a previous OpenHaptics installation manually before reinstalling the software. Please make sure to back up the code for your project solutions before doing this.

Directory Structure

The toolkit is broadly partitioned into the following directories: Lib, Include, Utilities, Examples, Runtime[1], and Docs.

Upon installation, the user can specify an installation directory and optionally install GLUT (see "External Modules" on page 7.) The default value of the installation directory is C:\OpenHaptics. The installation program also adds a new environment variable, ***OH_SDK_BASE***. Upon successful installation of the toolkit, the environment variable points to the install directory. All subdirectories described in this directory are relative to the OH_SDK_BASE directory.

doc Contains documents such as the License Agreement, the API Reference, the Programmer's Guide, this Installation Guide, the QuickHaptics Doxygen docs and an HTML page that provides a guide and link to the source code examples.

examples The standard installation includes various examples including complete programs for illustrating: how to query buttons, position, velocity, the end-effector transform matrix as well as basic HLAPI rendering. Vista users may need to copy the examples to their Windows desktop or My Documents directory in order to compile the examples. Within the examples directory are three sub directories.

bin Contains the pre-built executables of the source code examples.

HD Contains console and graphics directories for the Haptic Device API examples.

HL Contains console and graphics directories for the Haptic Library API examples. Within the HD and HL directories you will find the following:

1 Not included with all editions of OpenHaptics. See your license agreement.

console Examples that only employ a windows command prompt.

graphics Examples that use OpenGL®; most also use GLUT.

include Contains the header files of the OpenHaptics SDK. It is the main include directory of the 3D Touch suite. It is most conveniently referenced by adding **`$(OH_SDK_BASE)\include`** to the include path to your project settings.

lib Contains the library objects (.lib) files as well as the dynamically linked libraries (.dll) files. Note that the default runtime path is not set to include this directory, therefore the DLLs that live in this directory will not be loaded by default. We placed the DLLs in this directory to make it easier for end users to maintain multiple versions of the SDK.

runtime Contains the runtime installer that can be used for deployment of the OpenHaptics runtime components. Depending on your license agreement, this directory may not be included.The right to deploy is subject to a separate agreement, and it is not automatically granted to OpenHaptics SDK developers.

utilities Utilities include various functions such as simple vector and matrix math, haptic workspace to camera mapping, a haptic device C++ wrapper for state, event synchronization and servo loop data logging and Haptic Mouse which allows users to use the Phantom device, in addition to the standard mouse, to manipulate Windows GUI objects.

These are intended to facilitate development by providing commonly used pieces of functionality to support HDAPI and HLAPI. Source code is provided for all utilities. These classes and functions are not required to use the HLAPI and HDAPI. Their interfaces are subject to change with new releases of OpenHaptics. However, they are provided as statically linked libraries so that binary compatibility of programs using HLAPI and HDAPI may be maintained even if the utilities change.

Within utilities you will find the following:

include If you want to use the facilities exposed by the utilities, you must add **`$(OH_SDK_BASE)\utilities\include`** to the include path. Each utility is located in a separate subdirectory.

- GL (only if you selected to install GLUT files)
- HapticMouse

- HLU
- HDU
- SnapConstraints

lib This directory contains the .lib files for all the utilities. If you modify and rebuild the utilities source, this will update the .lib files in this directory as a post-build step.

src Like the include subdirectory, each utility library is located in a separate subdirectory.

- HapticMouse
- HLU
- HDU
- SnapConstraints

All utility libraries by default are compiled from MS Visual Studio 2010 developer platform. If you want to use the MS Visual Studio 2005/2008 platform, you must recompile all of the utility libraries. MS Visual Studio 2003 is no longer supported.

QuickHaptics

Contains the library objects, header files, pre-built executables, and source code examples for the QuickHaptics micro API. The included Project Solution files use the OH_SDK_BASE environment variable to locate these files.

Examples Contains the C++ source code for all the QuickHaptics examples described in the OpenHaptics Programmer's Guide. Please note that since relative pathnames are used, if application files are moved then the associated model files should be moved as well.

header Contains the C++ header files that need to be included for a QuickHaptics application

lib This directory contains the .lib files needed to link QuickHaptics applications. This directory also includes a subdirectory for FreeType.

External Modules

The toolkit installation includes, as an option, the ability to install the GLUT (Graphics Library Utility Toolkit). This library is used by most of the graphics enabled examples that are included (with source code) in the SDK distribution.

The files and installation directories are:

glut32.dll	*System directory*
glut32.lib	**$(OH_SDK_BASE)\utilities\lib**
glut.h	**$(OH_SDK_BASE)\utilities\include\GL**

Licensing

The OpenHaptics software toolkit for commercial developers requires a license file to run the HDAPI and the HLAPI programs. Once you have received your license file, it is recommended that you place it in a local directory (e.g. C:\OpenHaptics\License). You should then create an environment variable named

OH_SDK_LICENSE_PATH

and set the value as the location of the license file. Note that the OpenHaptics toolkit license file should be named either:

- **OHlicense.lic**
- or **license.lic**

As an alternative, you can place the license file in the same folder as your OpenHaptics program's executable file. However, setting the environment variable is the recommended method for managing your licensing.

Two kinds of licensing are supported, either a “temporary” license that you will receive along with the initial product CD, or a permanent “node-locked” license that is tied to a particular computer. A permanent license can be requested from the Sensable website. For host identification, the *Volume Serial Number* of the **C:** drive is used. This can be easily found using the **dir** command at the **cmd** prompt.