



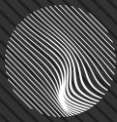
SoftKinetic™
The Interface is You

DepthSenseSDK 1.4.5

Release Notes

Project Name – Reference	DepthSenseSDK 1.4.5 - Release Notes
Ordering Part number	
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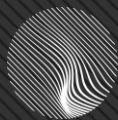
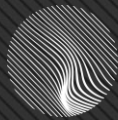


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1 Introduction

The DepthSense Software Development Kit provides camera driver components and defines an Application Programming Interface for user applications and middleware to interface with SoftKinetic DS311 and DS32x cameras, as well as with the TICDK Camera Development Kit hardware.

This section briefly describes the contents and scope of this document. It also defines the various acronyms and abbreviations used throughout the document. Finally, it provides a quick overview of the software package contents.

1.1 Purpose

The purpose of this document is to provide information about the 1.4.5 Release of the DepthSense Software Development Kit.

1.2 Scope

This document applies to the DepthSense SDK software package from SoftKinetic.

1.3 SDK version

All information in this document applies to the DepthSense SDK 1.4.5 Release.

1.4 Definitions, acronyms and abbreviations

API: Application Programming Interface

CDK: Camera Development Kit

COM: Component Object Model

FW: Firmware

GUI: Graphical User Interface

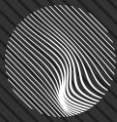
HW: Hardware

IPC: Inter-Process Communication

MW: Middleware

OS: Operating System





SDK: Software Development Kit

SW: Software

TOF: Time Of Flight

UAC: USB Audio Class

USB: Universal Serial Bus

UVC: USB Video Class

WMF: Windows Media Foundation

1.5 Overview

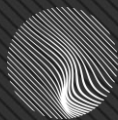
The DepthSense SDK software package provides library components and a programming interface which allows applications or middleware to control one or more DepthSense DS311 or DS325 cameras and access the data streams produced by the device sensors and microphones.

It also allows the basic operation of the TICDK Camera Development Kit platform (hardware detection and depth data streaming using the existing configurations stored in the device).

The package contains a set of applications which can be used to evaluate a DS311 or a DS325 camera on a functional level; these applications consist of a depth/color image viewer GUI with image registration capabilities and of a general-purpose command-line tool.

Finally, a simple console demo application is provided in source form.





2 Release Notes

2.1 Camera compatibility

This release is compatible with the following cameras:

Model	3D			RGB		
	VID	PID	REV	VID	PID	REV
DS311	0x2113	0x0137	0708	0x2113	0x8000	001
DS311	0x2113	0x0137	0709	0x2113	0x8000	001
DS325 v2.05 20.21	0x2113	0x0145	2021	0x2113	0x0145	2021
DS325 v2.05 20.21	0x041E	0x4096	2021	0x041E	0x4096	2021
DS325 v2.06 20.22	0x2113	0x0145	2022	0x2113	0x0145	2022
DS325 v2.06 20.22	0x041E	0x4096	2022	0x041E	0x4096	2022
DS325 v2.06 20.23	0x2113	0x0145	2023	0x2113	0x0145	2023
DS325 v2.06 20.23	0x041E	0x4096	2023	0x041E	0x4096	2023
DS325 v2.06 20.24	0x2113	0x0145	2024	0x2113	0x0145	2024
DS325 v2.06 20.24	0x041E	0x4096	2024	0x041E	0x4096	2024
DS325 v2.06 20.25	0x2113	0x0145	2025	0x2113	0x0145	2025
DS325 v2.06 20.25	0x041E	0x4096	2025	0x041E	0x4096	2025
DS325 v2.06 20.28	0x2113	0x0145	2028	0x2113	0x0145	2028
DS325 v2.06 20.28	0x041E	0x4096	2028	0x041E	0x4096	2028
DS325 v2.06 20.29	0x2113	0x0145	2029	0x2113	0x0145	2029
DS325 v2.06 20.29	0x041E	0x4096	2029	0x041E	0x4096	2029
DS325 v2.06 21.00	0x2113	0x0145	2100	0x2113	0x0145	2100
DS325 v2.06 21.00	0x041E	0x4096	2100	0x041E	0x4096	2100
DS325 v2.07 21.01	0x2113	0x0145	2101	0x2113	0x0145	2101
DS325 v2.07 21.01	0x041E	0x4096	2101	0x041E	0x4096	2101
DS325 v2.08 21.03	0x2113	0x0145	2103	0x2113	0x0145	2103
DS325 v2.08 21.03	0x041E	0x4096	2103	0x041E	0x4096	2103
DS325 v2.08 21.07	0x2113	0x0145	2107	0x2113	0x0145	2107
DS325 v2.08 21.07	0x041E	0x4096	2107	0x041E	0x4096	2107
DS327 v2.08 21.07	0x2113	0x0147	2107	0x2113	0x0147	2107
TICDK	0x0451	0x9100	0000	-	-	-

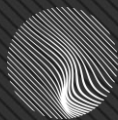
Note:

To determine the hardware IDs of a connected camera, open the Device Manager, right-click on the desired camera device entry under "Imaging Devices" and choose "Properties"; select then the "Details" tab and choose "Hardware Ids" in the "Property" drop-down list. This will show values of the form:

USB\VID_xxxx&PID_xxxx&REV_xxxx&MI_00

The actual USB Vendor ID, Product ID and Revision of the camera can then be extracted from those values.





2.2 Platform compatibility

A host with USB 2.0 or 3.0 is required.

The host CPU requires at least SSE2 support. The minimum requirement CPU is thus Intel Pentium 4 or AMD Opteron/Athlon 64. The installer performs first a sanity check and will refuse to install the software if the target platform does not comply with these requirements.

The following operating systems are supported:

	32-bit	64-bit
Windows 7		
Windows 8 / 8.1		

Note:

The DepthSense SDK is also freely available on Linux; for more information please contact our sales organization at sales@softkinetic.com.

Minimum PC requirements:

- Dual Core (Intel Core 2 Duo / AMD Athlon Duo / or equivalent)
- 2 GHz, 2 GB RAM

2.3 Tested compilers

The Windows versions are built with Visual Studio 2010 SP1 and are binary compatible with applications built with the following compilers:

- Microsoft Visual Studio 2008 SP1
- Microsoft Visual Studio 2010 SP1

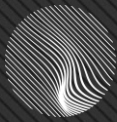
Note:

The Linux versions are built with gcc 4.6.3 on Ubuntu 12.04. At this time no cross-platform validation is done with these packages.

2.4 Who should update?

Updating is recommended for use with the latest revisions of the DS311 (7.08 and 7.09) and DS325 cameras, as well as for use with the TICDK Camera Development Kit platform.





2.5 Documentation

The DepthSense SDK documentation can be found in the "doc" subfolder of the install path:

- The DepthSense SDK 1.4.5 API Reference Manual (HTML)
- The Camera Model Documentation (PDF)
- The DepthSense Viewer User Guide (PDF)

2.6 Windows installation

On a 32-bit Windows system, run the "DepthSenseSDK-1.4.5.y-win32-VS2010-Release-installer.exe" file to start the installation.

On a 64-bit system, run the "DepthSenseSDK-1.4.5.y-win64-VS2010-Release-installer.exe" file.

The installer will propose first to uninstall any version of the same architecture already present on the system.

On a 64-bit Windows operating system (x86_64 processor architecture), both packages can be installed side by side; on such systems with both packages installed, running 32-bit and 64-bit client applications together at the same time is possible.

To uninstall, navigate to `SoftKinetic > DepthSenseSDK 1.4.5.y winXX > Uninstall DepthSenseSDK 1.4.5.y` in the Windows Start Menu or use the Control Panel.

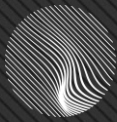
Notes:

By default, the PATH environment variable is updated by the DepthSense SDK installer (unless the installer detects that the PATH variable is too long and would be truncated). This can be disabled at install time by unchecking the "Update PATH" checkbox. For proper operation however, the user must always make sure that the PATH variable never contains any conflicting directory entry pointing to another version of the DepthSense SDK libraries.

If the uninstall is done while one of the "DepthSenseSDK" folders is open in the Windows Explorer, that folder will not be deleted (although all of its contents will). If any of the DepthSense SDK executable files is still in use at uninstall time (for instance, if the DepthSense Server and/or the DepthSense Viewer are running), then the "DepthSenseSDK" folder and its contents will be moved to a temporary location, which will be deleted subsequently on the next reboot (which the user is informed of if the uninstall is run interactively).

2.7 Applications





2.7.1 DEPTHSense SERVER

The DepthSense Server application is launched automatically when the first client application initializes the DepthSense library in client/server mode. It serves as a common interface between the camera hardware and multiple clients running simultaneously. Each client can see the stream data from any registered device node, but only one at a time has full control over a given node selected for streaming and thus is allowed to change its specific settings or properties.

The DepthSense Server application remains active as long as at least one client application is connected. Once the last client exits, the server exits in its turn.

2.7.2 DEPTHSense VIEWER

The DepthSense Viewer is a graphical application which can show the depth, color, confidence and/or the UV maps of all available device nodes (i.e. from any DS311 or DS325 camera connected to the host), as well as audio signals captured by the microphones.

Several instances of the DepthSense Viewer application can be launched simultaneously, but only one instance at a time can be granted full control over a given node.

The application provides a tree view of all camera devices connected to the host and for each device, shows all of its available nodes. Each node can be selected individually in the list; the application will then display GUI controls for all properties available for the selected node. If the application has been granted full control over the node, all these properties can be modified (including the ones shared between all clients); otherwise only the local, per-client properties will be editable.

Invalid depth node pixels are displayed in specific colors, depending on the map type; for instance in the phase map view, low confidence pixels are in dark gray while saturated pixels are in light gray.

2.7.3 DEPTHSense BENCHMARK

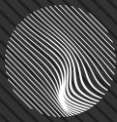
The DepthSense Benchmark application is a general-purpose command-line tool which can be used to display information about the camera devices connected to the host and provide various statistics on the depth, color and audio streaming data.

The tool accepts a number of command-line options which for instance allow the user to select specific camera nodes, choose the nodes configuration, export statistics data to the specified CSV files, record the audio input in a WAV file or display the color map in ASCII form.

Note:

A number of command-line options (such as the "--depth-export" or the "--audio-record" options) can be used to store data in external files. These options take a pathname as argument. The user must have write access to the specified files otherwise the application will exit with a non-zero status.





2.8 Sample code

The DepthSense SDK package provides a simple console demo application in source form, along with a simple Visual Studio 2008 SP1 solution which allows users to build the application directly from the source. These files are available in the "sample" subfolder of the install path.

Building the sample project from its original location, however, will generally require administrator rights. This can be avoided if the "sample" folder is first copied to some other location the user has write access to. In that case though, the Visual Studio project properties will have to be adapted accordingly as the "include" and "library" paths they refer to are relative.

2.9 Close mode operation

The DS311 camera is started in close mode by default; however it can be switched to far-range operation by the client application by setting the "mode" field in the depth node configuration of the camera to "DepthNode::LongRange". Setting the "mode" field to "DepthNode::CloseMode" will then switch it back to the default, near-range operation mode.

Switching between modes has a side effect as this automatically adapts the "range" property of the depth node accordingly. As this value may impact 3D-related computations, applications must either re-read the range value each time the mode is changed, or set up a callback on the depth node "propertyChanged" event and then take into account any notification received for the "range" property.

The DS325 has no support for far-range operation; if the client application tries to configure the camera to operate in that mode, the DepthSense library will throw an "Argument" exception.

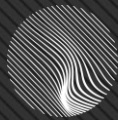
2.10 Interoperability with DepthSenseSDK-CDK

This release supports basic operation of the TICDK Camera Development Kit platform. The primary purpose of the TICDK platform is to provide a reference design for future cameras built around the TI 3D ToF sensor chipset (which employs the DepthSense® sensor technology).

A separate, dedicated DepthSenseSDK-CDK package is available for customers who need full access to the TICDK hardware. This package with extended functionality can be installed side-by-side with the regular DepthSense SDK software; both package types are fully interoperable (meaning that an application specific to the TICDK platform can run concurrently with any other regular DepthSense SDK based application).

However, full interoperability is only guaranteed if all installed packages are of the same version (not only the CDK and regular flavors, but also the 32 and 64 bits packages); if this condition is not met, applications of different kinds will still be able to run individually, but not concurrently at the same time. Therefore, it is highly recommended to upgrade all installed packages to the exact same version each time a new release is made available.





2.11 ChangeLog

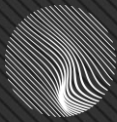
- Bugs
 - Fixed failure to start streaming with older (USB rev <2100) DS325 cameras

2.12 Known bugs

- Calling the `Context::create()` API repeatedly at a fast pace may result in a `DepthSense::TransportException` being raised.
- If the last context (client connection) is released before the first device has been completely detected, the server may not exit as it normally should. A later connection from another client instance will have the server resume its normal operation, though.
- On Linux, the audio streaming sometimes fails to start with a "Device busy" error. In addition, changing the audio node configuration while streaming is active may in some circumstances take a considerable amount of time.
- The reported frame drop count for the color node may be higher than the actual number of lost color images (false positives).
- Running the DepthSense Viewer in stand-alone mode with a DS311 may cause the application to crash.
- Minor memory leaks can be observed in the DepthSense Viewer when disconnecting and reconnecting the camera a high number of times.
- The DepthSense Server may crash if a client application exits during the processing of a Device Removed or of a Node Removed event.
- The directories in the TAR.GZ package for Linux are group-writable.

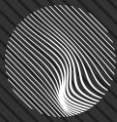
2.13 Known limitations

- Despite the fact that from the 21.00 USB revisions of the DS325 camera onwards, the hardware RGBZ synchronization is now automatically turned on for any color/depth configuration combination which supports it, proper streams matching is not available on Windows due to a lack of support of UVC timestamps by the operating system.
- The de-aliasing filter of the DS311 camera model is not supported.
- If the confidence threshold is set to the minimum value, and under certain lighting conditions, moiré artifacts can be seen in the vertices images displayed in the DepthSense Viewer.



- On DS325 camera revisions prior to 20.28, due to a known issue in the USB firmware which causes sample data corruption, enabling the MJPEG compression on the color node then starting the streaming on the depth node or changing its configuration makes the color streaming appear to stop on the client side, as the server detects the data corruption and discards all further incoming color frames.
- The Windows 7 USB 3.0 core driver imposes stricter bandwidth utilization rules on USB 2.0 devices than the USB 2.0 driver. As a result, dual depth/color streaming on USB 3.0 ports with a DS325 camera fails for all frame rates under the following configurations:
 - For camera revisions prior to 20.28, depth in QVGA resolution and color in WXGA-H (HD) resolution with color compression enabled;
 - Depth in QVGA resolution and color in VGA resolution with color compression disabled.
- For the same reason and due to known limitations in the DS311 USB firmware, dual depth/color streaming on USB 3.0 ports with a DS311 camera fails under all configurations.
- Both the Linux USB 2.0 and USB 3.0 drivers impose the same bandwidth usage restrictions as the Windows USB 3.0 driver. So in the Linux case, dual depth/color streaming fails in the same way as described above, regardless of the USB port type.
- Moving the mouse pointer in front of one of the images displayed in the DepthSense Viewer increases the CPU consumption and may cause frame drop.
- After installation, application icons or start menu shortcuts may not be set up properly until the next reboot.
- Calling the `Context::create()` DepthSense SDK API from the constructor of a global object is not supported and will most likely cause the application to crash.
- Client applications built with Visual Studio 2012 are not fully binary compatible with the VS 2010 DepthSense libraries, which may result in unpredictable behavior in some situations.
- Performance issues have been observed in some situations on Linux, such as when running the DepthSense Benchmark tool or the DepthSense Viewer with a DS311 and all maps enabled at 60 fps.
- When streaming both depth and color to multiple clients, frame drops can be observed on the depth node if one or more client has not enabled the color stream.
- The audio streaming may occasionally fail to restart on audio configuration change.
- On some systems running the FastAccess Facial Recognition software, it is not possible to share the video streams between the application and DepthSense SDK clients.
- On Linux, the nodes sometimes fail to disappear from the device tree view of the DepthSense Viewer when unplugging the camera while streaming is active.





- Depending on the USB firmware version, the color image may stay white for a couple of seconds or even longer, after starting the streaming.
- The illumination level of the DS311 must be set to a minimum value of 38, otherwise the depth image remains black.
- The serial number of a newly connected DS32x camera can only be known once the depth node is fully detected and initialized.
- Objects close to the camera may appear in double in the UV map due to a parallax effect.

