Displaying Stereoscopic 3D (S3D) with Intel® HD Graphics

Software Developers Guide

Intel® Media SDK 2012 R3

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Contents

1 *Introduction*

The purpose of this document is to give an overview and description of the Stereoscopic 3D (S3D) Application Programming Interface (API) for Intel® HD Graphics hardware.

The target audience of this document is software developers wanting to utilize S3D in their Microsoft* Windows* 7 and Microsoft Windows 8 applications.

The S3D API for Intel graphics hardware is implemented in a static C++ library, included in the Intel® Media SDK package.

This document does **not** describe how to encode, or decode video (movie) data that contains two images (left & right eyes). This document simply describes a method to get the S3D-capable monitor or TV to "display" the two images needed to present a perceived 3D image.

2 S3D Overview

2.1 Stereoscopic Display

Stereoscopic 3D (S3D) imagery (a.k.a. Stereoscopy) is, of course, two (2) 2D images (one for each eye) giving the illusion of depth.

PCs have a long history of displaying S3D images. This has generally been achieved by various proprietary methods.

The following is a few legacy solutions used in the past, and some problems/side-effects of those solutions:

- The PC can use a normal 2D display and <u>directly</u> control a pair of glasses (a.k.a. "Active Glasses"), which can block one eye from seeing an image, then alternate to block the other eye for the next image.

    Problems:

    - o Each eye only sees half of the images it would normally see. If the display is presenting 60 frames-per-second, each eye only sees 30 frames per second. *(This can increase headaches, etc.)*
    - o Users cannot connect multiple S3D sources *(game consoles, Blu-ray* players, cameras, etc.)* to their display.

- The PC can rely on a proprietary display that controls what the user sees. There are many types of these displays. One popular type is a polarized display that uses passive "polarized glasses". Others require no glasses by projecting two images, (requiring the user to place their eyes in exactly the right spot).

    Problems:

    - o Dozens of types of displays.
    - o Users must manually switch their display between normal "2D" and one of several possible "3D" modes.
    - o Users cannot connect multiple S3D sources *(game consoles, Blu-ray players, cameras, etc.)* to their display.

With newer display link technologies (like HDMI* 1.4 or Embedded Display Port* (eDP*) 1.1, etc.), devices *(PCs, Blu-ray players, game consoles, etc.)* can now **automatically** switch the display between normal "2D" and "3D".

This document describes a software interface that developers can use to utilize the newer "**automatic**" switching to/from 3D modes when displaying with Intel® HD Graphics processors.

Once the display is in 3D, an application can utilize the powerful Intel® Media SDK to prepare the left & right images or it can directly utilize Microsoft* DirectX* Video Acceleration (DXVA) APIs to generate the two images. An application could also generate its own left & right images (for example a 'game').

2.2   Scope & Assumptions

The following is a list of limitations and restrictions to consider for S3D support.

1. Microsoft* Windows* 7 and Microsoft Windows 8 only. Supports windowed or full screen usage models.

2. Direct3D9* Overlay swap chain usage is required.

3. HDMI* 1.4, special eDP*, or similar based monitor/TV (as primary display).

4. The host application should not send S3D content when the display is set to 2D mode or vice versa. Changing between 2D/S3D display mode involves an OS mode set operation.

5. The cursor will only display in left image.

6. Requires creation and use of a DXVA video processing device, even if DXVA decoding is not used.

3 Setting an S3D mode

3.1 Display

Summary

Only HDMI* 1.4 based monitors or special Embedded Display Port* (eDP*) 1.1a displays are supported.

Details

An API to allow an application to set a S3D display mode is included in the Intel® Media SDK. However, it can be used by itself as a standalone library. The library is a static library.

3.2   IGFXS3DControl Class

Summary

The IGFXS3DControl C++ class contains the methods and structures needed to control S3D display modes.

C++ Header File:

<MSDKInstallPath>\igfx_s3dcontrol\include\igfx_s3dcontrol.h

Library File <32-bit or 64-bit>:

<MSDKInstallPath>\igfx_s3dcontrol\lib\win32\igfx_s3dcontrol.lib or **<MSDKInstallPath>\igfx_s3dcontrol\lib\x64\igfx_s3dcontrol.lib**

Typical steps to use this class are as follows:

An application:

1. Creates an instance of `IGFXS3DControl::`
2. Determines what screen resolutions and refresh rates are currently possible by calling `->GetS3DCaps()`
3. Switches the TV/Monitor to 3D via `->SwitchTo3D()`
4. Creates a Direct3D9 device (with `D3DSWAPEFFECT_OVERLAY`)
5. Calls `DXVA2CreateDirect3DDeviceManager9()`
     a. Calls `->SetDevice()`
6. Calls `DXVA2CreateVideoService`
     a. Calls `->SelectLeftView()` then `CreateVideoProcessor()`
     b. Calls `->SelectRightView()` then `CreateVideoProcessor()`
7. Acquires the render target via target `GetBackBuffer()`
8. Renders left eye
     a. Using the left VideoProcessor, calls `->VideoProcessBlt()`
9. Renders right eye
     a. Using the right VideoProcessor, calls `->VideoProcessBlt()`
     b. Calls `->Present()`
10. Repeats steps 10 & 11 as appropriate
11. Calls `->SwitchTo2D()`
12. Deletes instance of `IGFXS3DControl::`

3.3   Typical modes returned by driver

Table below shows the typical modes supported by the display driver for switching to automatic S3D.

	Mode
HDMI* 1.4a S3D display	1080p24
	1080p23
	720p50
	720p59
	720p60
eDP* 120Hz	All modes**

**Note: For non-native modes default S3D behavior is to scale OS mode to native mode of panel.

4   Reference Documents / Links

- Intel Graphics Developer's Guides: http://software.intel.com/en-us/articles/intel-graphics-developers-guides/

- Intel® Media SDK: http://software.intel.com/en-us/articles/vcsource-tools/

- Intel® Media SDK Features in Microsoft* Windows 7* Multi-Monitor Configurations on 2nd Generation Intel® Core™ Processor-Based Platforms : http://www.intel.com/support/graphics/intelhdgraphics3000_2000/sb/cs032112.pdf

- Enabling High-Performance Video Encoding, Decoding, and Preprocessing: http://software.intel.com/en-us/articles/enabling-high-performance-video-encoding-decoding-and-preprocessing/