BlazeVideo HDTV SDK User's Guide

Ⅰ. Basic Features

1. Adopt high performance MPEG video decoder with self-developed core technology.

2. Support both SD (standard definition) and HD (high definition).

3. Completely support MMX, SSE, SSE2, 3DNow direction optimization, adopt different optimized decoder examples aiming at different CPU model.

4. Supports DXVA（DirectX Video Accelerating），for those display card which supports DXVA, the chip on display card can perform part of decoding operation (IDCT, MC, DI, etc) to realize simultaneously decoding of CPU and display card, thus greatly raise decoding speed, also capable of realizing 1920 × 1088 HDTV decoding on P2-600MHz personal computer.

5. Strong error-compliance function. Good error- hiding function, auto-adjust each kind of bit error and time stamp error. Fit for DVB signal decoding.

6. Flexible quality control function, support multiple resolution mode such as half width, half height, 1/4, etc, support part of decoder (I, P, B freely selectable), especially suitable for HD stream playback.

7. Completely compliant with DirectShow, support multiple develop language, the users familiar with COM development can easily use it.

8. Supports MPEG1/2-Audio Layer-I/II, LPCM, Dolby-AC3 audio decoding.

9. Completely support DVD decoding (each kinds of audio, subtitle decoding also contained in).

10. Convert TS (Transfer Stream) into PS (Program Stream) and record.

Ⅱ. System Requirement

Operating System: Windows98/Me/2000/XP，Windows CE with X86

DirectX：8.0 or higher, 9.0 or higher is recommended.

2.1. Playback HD (High Definition) Signal

1. Display Card supporting DXVA:

a) Display Card requirement: popular medium or high config. Display Card

All ATI Radeon series VGA

nVidia MX420,440,FX series VGA

b) CPU: Pentium2－600MHz or higher，over Celeron900Mhz or higher

c) Memory: 128MB or higher

2. Display Card not supporting DXVA (only software decoder)

a) Display Card requirement: No special requirement

b) CPU: Pentium4－1.6GHz or higher，Celeron2.4Ghz or higher

c) Memory: 128MB or higher

2.2 Playback SD (Standard Definition) Signal

a) Display Card requirement: No special requirement, supporting DirectX 8.0 or later

b) CPU：400MHz or higher Intel/AMD

c) Memory：64MB or higher

Ⅲ. How to Test

Firstly, you should install DirectX SDK in your system, the test is proceeded by the utility GraphEdt.exe. (For usage of GraphEdt.exe, please see the relative documentation of DirectX SDK)

After successfully install decoder, you will see the decoder in GraphEdit. It is easily recognized in “DirectShow Filters”, the name of which all begin with Blaze.

Next you will build your needed Filter Graph with our Filter. About how to build Filter Graph, please see the relative documentation of DirectX SDK, below we just mention some points.

1. You can set filter options in option page, some need to be set before connecting, some can be modified at any time.
2. If want to launch DirectX VA function, please check-in “Use DXVA If Possible(Reconnect Required)” in Option Page before connecting Video Decoder with Filter. It is useless if check-in after connection, unless disconnect and reconnect again. The way to check if DXVA has been successfully launched is to view the connected Media Type in Pin Option Page during playback, if DXVA character is viewable, it will be successfully launched. The possible reason of failing to launch DXVA: a) Display Card does not support DXVA; b) forget to check-in above mentioned option before connecting; c) other reason which need to be deeply analyzed.
3. While testing performance, please close Filter Graph timer before running Graph, you can view fps value from Video Render.

Ⅳ. How to add it into your application

4.1 Summarize

1．You should contain all files in Bin Folder of the SDK in your application setup disc. They exist as COM components, need to be registered into system through setup program during setup procedure.

2．Connect Filter Graph in application. If there is no other similar third party component, after building Filter Graph by auto connection method, the SDK can be launched. Otherwise, in practical development, as auto connection is uncertain, generally the Filter Graph needs to be manually connected.

3. Set properties of Filter in application. You need contain header file “BlazeFiltersAPI.h” in application. Find the relative Filter in Filter Graph, get IKsPropertySet interface via QueryInterface, you will set its properties via IKsPropertySet.

4.2 Add Filter into Filter Graph

1. Build Filter Graph

```
 IGraphBuilder *pIGraphBuilder    = NULL ;
    hr = CoCreateInstance(  CLSID_FilterGraph,
                            NULL,
                            CLSCTX_INPROC_SERVER,
                            IID_IGraphBuilder,
                            reinterpret_cast<void**>(&pGraphBuilder));
    if( FAILED(hr) || pGraphBuilder == NULL )
    {
          return hr ;
 }
```

2. Add Video Decoder

```
    IBaseFilter *pVideoDecoder  = NULL ;
    hr = CoCreateInstance(  CLSID_BlazeVideoDecoder,
                            NULL,
                            CLSCTX_INPROC_SERVER,
                            IID_IBaseFilter,
                            reinterpret_cast<void**>(&pVideoDecoder));
    if( FAILED(hr) )
    {
          return hr ;
    }
     hr = pGraphBuilder -> AddFilter ( pVideoDecoder ,
VIDEO_DECODER_FILTER_NAME_WCHAR ) ;
    if( FAILED(hr) )
    {
          return hr ;
    }
```

4.3 Set Filter option according requirement

Each Filter exposed with IKsPropertySet interface, via this interface you can easily change internal setting of Filter, gain same effect of Option Setting.

Property Set GUID: `AM_KSPROPSETID_BlazeFilter`

Property ID	Description
AM_PROPERTY_CPU_INFO	Get. Gain CPU properties
AM_PROPERTY_AUDIO_OUTPUT_TYPE	Set. Set output properties of audio decoder, including external speaker number, S/PDIF, left/right track switch, etc. The data type of transferring parameter is AUDIO_OUTPUT_TYPE.

AM_PROPERTY_VIDEO_COLOR_CONTROL	Get/Set. Adjust color. Adjust application color through VideoDecoder, including lightness, contrast, hue, saturation, etc. The data type of transferring parameter is VIDEO_COLOR_CONTROL. The value of each (Brightness, Contrast, Hue, Saturation) is from －128 to 127, 0 means not adjust. Note: This operation will cause mass decoder calculation, it is suggested to adjust color with Overlay Mixer first, if failed (as display card does not support color adjustment), please adjust application with this function.
AM_PROPERTY_VIDEO_GRAB_FRAME	Set. Capture still image. The data type of transferring parameter is VIDEO_GRAB_FRAME. Return a RGB24 DIB bitmap by hGlobalMemory. hGlobalMemory is allotted by standard GlobalAlloc() API function, after finish using, please release it by GlobalFree() function. The structure of DIB: BITMAPFILEHEADER＋BITMAPINFOHEADER ＋BITMAP DATA.
AM_PROPERTY_VIDEO_WEAVE_BOB	Get/Set. Select Deinterlace and Remove Scratches ways. The data type of transferring parameter is VIDEO_WEAVE_BOB. There are three ways available: Auto Select — Default ways. Intelligently and automatically select Deinterlace ways Bob/Weave according to code streaming. Select Force Bob for motion area, Select Force Weave for still area. Force Bob — Aiming at error coding stream, remove scratches of the whole video, with less decoding performance. Force Weave — Force to close deinterlace. With best performance, but some scratches may occur on video. For those movies without scratches, the video quality is best.
AM_PROPERTY_VIDEO_OUTPUT_CONFIG	Get/Set. Set the output mode of video decoder. The data type of transferring parameter is VIDEO_OUTPUT_CONFIG. The value is the combination of below parameters (logic OR): VIDEO_OUTPUT_YUV: allow YUV output, necessary VIDEO_OUTPUT_RGB: allow RGB output, optional VIDEO_OUTPUT_DXVA: allow DXVA(If usable), optional; VIDEO_OUTPUT_HW_DEINTERLACE: allow hardware deinterlace (if usable), optional.

	Note: This parameter needs to be set before connecting Filter, otherwise it will be not effective.
AM_PROPERTY_VIDEO_QUALITY_CONTROL	Get/Set. Flexibly control video decoder quality by this parameter, thus gain optimized compromise between video quality and decoder performance. The data type of transferring parameter is VIDEO_QUALITY_CONTRO. We control decoding quality by below three modes: 1. Artificially control decode frame: DECODE_I_P_B_FRAMES（decode all, default） DECODE_I_P_HALF_B_FRAMES（lose 50% B frame） DECODE_I_P_FRAMES_ONLY（lose all B frame） DECODE_I_FRAMES_ONLY（lose all P，B frame） 2. Change width of output video VIDEO_OUTPUT_RESOLUTION_MODE_FULL ， full resolution output, not any damage of video VIDEO_OUTPUT_RESOLUTION_MODE_HALF_HEIGHT，half height output, resample video, compressed into half height. VIDEO_OUTPUT_RESOLUTION_MODE_HALF_WIDTH, half width output, resample video, compressed into half width. VIDEO_OUTPUT_RESOLUTION_MODE_QUATER, QUATER output, resample video, compressed into QUARTER size. **Note**: for 1080i, 1080p code stream, this option is much more effective. As the whole video after decoding equals with several PC screen size, it is not necessary to display all video. Compress resolution will cause less change of display effect, and the performance can be raised greatly. 3. Set above two items only effective to HD code stream or not Member bForHDStreamOnly。 If set as TRUE, decoder will automatically judge current code stream is HD or not. If HD, it will launch output width and decoder frame setting to reduce CPU occupancy; if SD, it will not launch this setting, just keep the original setting. If set as FALSE, it will launch output width and decoder frame setting whether the code stream is HD or SD. This setting allows you to flexibly set HD playback performance. (Please see the Appendix 1)

AM_PROPERTY_LICENSE_CONTROL	Set. Used for License control. Remove trial version limitation, including remove watermark on video, remove time limitation, etc. Note: User only can gain this parameter's format and License code (serial number) after signing sales contract.

Code for Reference:

```
    # include “BlazeFiltersAPI.h”

    IBaseFilter        *pIFilterVideoDecoder    = NULL ;
    IKsPropertySet      *pIKsPropertySet        = NULL ;
    hr = pIGraphBuilder->FindFilterByName( VIDEO_DECODER_FILTER_NAME_WCHAR,,
                                         &pIFilterVideoDecoder ) ; // Find Video Decoder from Graph
   if( SUCCEEDED(hr) )
   {
        hr = pIFilterVideoDecoder->QueryInterface( IID_IKsPropertySet,
                                    reinterpret_cast<void**> (&pIKsPropertySet)    ) ;
        if ( SUCCEEDED(hr) )
        {
            VIDEO_WEAVE_BOB weavebob ;
             memset( &weavebob, 0, sizeof(weavebob) ) ;
            weavebob.WeaveBob  = WEAVE_BOB_FORCE_BOB ;

            pIKsPropertySet->Set( AM_KSPROPSETID_BlazeFilter,
                                AM_PROPERTY_VIDEO_WEAVE_BOB,
                                NULL, 0,
                                & weavebob, sizeof(weavebob) ) ;
            pIKsPropertySet->Release() ;
            pIKsPropertySet    = NULL ;
         }
         pIFilterVideoDecoder->Release() ;
         pIFilterVideoDecoder    = NULL ;
   }
```

Appendix 1.

HD (1080i/1080p) code stream performance setting grade in only software decoder status (recommended)

Performance Grade	Internal Setting	System Requirement
Highest	Decode all, output all	Intel P4 2.4GHz / AMD2400+, FSB 800, AGP 8X
High	Decode all, output half height	Intel P4 2.4GHz / AMD2400+, FSB 533, AGP 4X

Normal	Decode all, output 1/4	Intel P4 1.6GHz / AMD1600+, AGP 4X
Low	lost 50％B frame, output 1/4	
Lowest	lost all B frame, output 1/4	

It is recommended to set an option in application for user to select, default set as Normal.

Code for Reference:

```
#include “BlazeFiltersAPI.h”
typedef enum _HD_QUALITY
{
     HD_QUALITY_HIGHEST,
     HD_QUALITY_HIGH,
     HD_QUALITY_NORMAL,
     HD_QUALITY_LOW,
     HD_QUALITY_LOWEST
} HD_QUALITY_LEVEL ;

HRESULT GetHDQuality( HD_QUALITY_LEVEL nLevel, VIDEO_QUALITY_CONTROL *pQC )
{
     HRESULT hr = S_OK ;
     If( pQC == NULL )
         Return E_POINTER ;

     ZeroMemory( pQC, sizeof(VIDEO_QUALITY_CONTROL) ) ;
     pQC->bForHDStreamOnly       = TRUE ;

     switch( nLevel )
     {
     case HD_QUALITY_HIGHEST:
         pQC->ulDecodeFrames          =  DECODE_I_P_B_FRAMES ;
          pQC->ulOutputResolutionMode =  VIDEO_OUTPUT_RESOLUTION_MODE_FULL ;
         break ;
     case HD_QUALITY_HIGH:
         pQC->ulDecodeFrames          =  DECODE_I_P_B_FRAMES ;
          pQC->ulOutputResolutionMode =  VIDEO_OUTPUT_RESOLUTION_MODE_HALF_HEIGHT ;
         break ;
     case HD_QUALITY_NORMAL:
         pQC->ulDecodeFrames          =  DECODE_I_P_B_FRAMES ;
          pQC->ulOutputResolutionMode =  VIDEO_OUTPUT_RESOLUTION_MODE_QUATER ;
         break ;
     case HD_QUALITY_LOW:
         pQC->ulDecodeFrames          =  DECODE_I_P_HALF_B_FRAMES ;
          pQC->ulOutputResolutionMode =  VIDEO_OUTPUT_RESOLUTION_MODE_QUATER ;
         break ;
     case HD_QUALITY_LOWEST:
```

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```
        pQC->ulDecodeFrames          =  DECODE_I_P_FRAMES_ONLY ;
         pQC->ulOutputResolutionMode =  VIDEO_OUTPUT_RESOLUTION_MODE_QUATER ;
        break ;
    default:
        return E_INVALIDARG ;
    }

    return S_OK ;
}
```