原 一个简单的基于 DirectShow 的播放器 1（封装类）

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DirectShow最主要的功能就是播放视频，在这里介绍一个简单的基于DirectShow的播放器的例子，是用MFC做的，今后有机会可以基于该播放器开发更复杂的播放器软件。

注：该例子取自于《DirectShow开发指南》

首先看一眼最终结果，如图所示，播放器包含了：打开，播放，暂停，停止等功能。该图显示正在播放周杰伦的《听妈妈的话》。

迅速进入主题，看一看工程是由哪些文件组成的，如下图所示

从上图可以看出，该工程最重要的cpp文件有两个：SimplePlayerDlg.cpp和CDXGraph.cpp。前者是视频播放器对话框对应的类，而后者是对DirectShow功能进行封装的类。尤其是后面那个类，写的很好，可以说做到了“可复用”，可以移植到其他DirectShow项目中。

本文首先分析CDXGraph这个类，SimplePlayerDlg在下篇文章中再进行分析。

首先看看它的头文件：

CDXGraph.h

```cpp
/* 雷霄骅
 * 中国传媒大学/数字电视技术
 * leixiaohua1020@126.com
 *
 */
// CDXGraph.h


#ifndef __H_CDXGraph__
#define __H_CDXGraph__

// Filter graph notification to the specified window
#define WM_GRAPHNOTIFY  (WM_USER+20)

class CDXGraph
{
private:
    //各种DirectShow接口
    IGraphBuilder *     mGraph;
    IMediaControl *     mMediaControl;
    IMediaEventEx *     mEvent;
    IBasicVideo *       mBasicVideo;
    IBasicAudio *       mBasicAudio;
    IVideoWindow  *     mVideoWindow;
    IMediaSeeking *     mSeeking;

    DWORD               mObjectTableEntry;

public:
    CDXGraph();
    virtual ~CDXGraph();

public:
    //创建IGraphBuilder，使用CoCreateInstance
    virtual bool Create(void);
    //释放
    virtual void Release(void);
    virtual bool Attach(IGraphBuilder * inGraphBuilder);

    IGraphBuilder * GetGraph(void); // Not outstanding reference count
    IMediaEventEx * GetEventHandle(void);

    bool ConnectFilters(IPin * inOutputPin, IPin * inInputPin, const AM_MEDIA_TYPE * inMediaType = 0);
    void DisconnectFilters(IPin * inOutputPin);

    bool SetDisplayWindow(HWND inWindow);
    bool SetNotifyWindow(HWND inWindow);
    bool ResizeVideoWindow(long inLeft, long inTop, long inWidth, long inHeight);
    void HandleEvent(WPARAM inWParam, LPARAM inLParam);
    //各种操作
    bool Run(void);        // Control filter graph
    bool Stop(void);
    bool Pause(void);
    bool IsRunning(void);  // Filter graph status
    bool IsStopped(void);
    bool IsPaused(void);

    bool SetFullScreen(BOOL inEnabled);
    bool GetFullScreen(void);

    // IMediaSeeking
    bool GetCurrentPosition(double * outPosition);
    bool GetStopPosition(double * outPosition);
    bool SetCurrentPosition(double inPosition);
    bool SetStartStopPosition(double inStart, double inStop);
    bool GetDuration(double * outDuration);
    bool SetPlaybackRate(double inRate);

    // Attention: range from -10000 to 0, and 0 is FULL_VOLUME.
    bool SetAudioVolume(long inVolume);
    long GetAudioVolume(void);
    // Attention: range from -10000(left) to 10000(right), and 0 is both.
    bool SetAudioBalance(long inBalance);
    long GetAudioBalance(void);

    bool RenderFile(const char * inFile);
    bool SnapshotBitmap(const char * outFile);

private:
    void AddToObjectTable(void) ;
    void RemoveFromObjectTable(void);
    //各种QueryInterface，初始各种接口
    bool QueryInterfaces(void);
};

#endif // __H_CDXGraph__
```

该头文件定义了CDXGraph类封装的各种DirectShow接口，以及提供的各种方法。在这里因为方法种类特别多，所以只能选择最关键的方法进行分析。下面打开CDXGr

aph.cpp看看如下几个方法吧：

Create() ：用于创建IGraphBuilder

```cpp
//创建IGraphBuilder，使用CoCreateInstance
bool CDXGraph::Create(void)
{
    if (!mGraph)
    {
        if (SUCCEEDED(CoCreateInstance(CLSID_FilterGraph, NULL, CLSCTX_INPROC_SERVER,
            IID_IGraphBuilder, (void **)&mGraph)))
        {
            AddToObjectTable();

            return QueryInterfaces();
        }
        mGraph = 0;
    }
    return false;
}
```

需要注意的是，Create()调用了QueryInterfaces()

QueryInterfaces()： 用于初始化各种接口

```cpp
//各种QueryInterface，初始各种接口
bool CDXGraph::QueryInterfaces(void)
{
    if (mGraph)
    {
        HRESULT hr = NOERROR;
        hr |= mGraph->QueryInterface(IID_IMediaControl, (void **)&mMediaControl);
        hr |= mGraph->QueryInterface(IID_IMediaEventEx, (void **)&mEvent);
        hr |= mGraph->QueryInterface(IID_IBasicVideo, (void **)&mBasicVideo);
        hr |= mGraph->QueryInterface(IID_IBasicAudio, (void **)&mBasicAudio);
        hr |= mGraph->QueryInterface(IID_IVideoWindow, (void **)&mVideoWindow);
        hr |= mGraph->QueryInterface(IID_IMediaSeeking, (void **)&mSeeking);
        if (mSeeking)
        {
            mSeeking->SetTimeFormat(&TIME_FORMAT_MEDIA_TIME);
        }
        return SUCCEEDED(hr);
    }
    return false;
}
```

Release() ：释放各种接口

```cpp
//释放
void CDXGraph::Release(void)
{
    if (mSeeking)
    {
        mSeeking->Release();
        mSeeking = NULL;
    }
    if (mMediaControl)
    {
        mMediaControl->Release();
        mMediaControl = NULL;
    }
    if (mEvent)
    {
        mEvent->Release();
        mEvent = NULL;
    }
    if (mBasicVideo)
    {
        mBasicVideo->Release();
        mBasicVideo = NULL;
    }
    if (mBasicAudio)
    {
        mBasicAudio->Release();
        mBasicAudio = NULL;
    }
    if (mVideoWindow)
    {
        mVideoWindow->put_Visible(OAFALSE);
        mVideoWindow->put_MessageDrain((OAHWND)NULL);
        mVideoWindow->put_Owner(OAHWND(0));
        mVideoWindow->Release();
        mVideoWindow = NULL;
    }
    RemoveFromObjectTable();
    if (mGraph)
    {
        mGraph->Release();
        mGraph = NULL;
    }
}
```

Run()：播放

```cpp
bool CDXGraph::Run(void)
{
    if (mGraph && mMediaControl)
    {
        if (!IsRunning())
        {
            if (SUCCEEDED(mMediaControl->Run()))
            {
                return true;
            }
        }
        else
        {
            return true;
        }
    }
    return false;
}
```

Stop()：停止

```cpp
bool CDXGraph::Stop(void)
{
    if (mGraph && mMediaControl)
    {
        if (!IsStopped())
        {
            if (SUCCEEDED(mMediaControl->Stop()))
            {
                return true;
            }
        }
        else
        {
            return true;
        }
    }
    return false;
}
```

Pause() ：暂停

```cpp
bool CDXGraph::Pause(void)
{
    if (mGraph && mMediaControl)
    {
        if (!IsPaused())
        {
            if (SUCCEEDED(mMediaControl->Pause()))
            {
                return true;
            }
        }
        else
        {
            return true;
        }
    }
    return false;
}
```

SetFullScreen() ：设置全屏

```cpp
bool CDXGraph::SetFullScreen(BOOL inEnabled)
{
    if (mVideoWindow)
    {
        HRESULT hr = mVideoWindow->put_FullScreenMode(inEnabled ? OATRUE : OAFALSE);
        return SUCCEEDED(hr);
    }
    return false;
}
```

GetDuration() ：获得视频时长

```cpp
bool CDXGraph::GetDuration(double * outDuration)
{
    if (mSeeking)
    {
        __int64 length = 0;
        if (SUCCEEDED(mSeeking->GetDuration(&length)))
        {
            *outDuration = ((double)length) / 10000000.;
            return true;
        }
    }
    return false;
}
```

SetAudioVolume() ：设置音量

```cpp
bool CDXGraph::SetAudioVolume(long inVolume)
{
    if (mBasicAudio)
    {
        HRESULT hr = mBasicAudio->put_Volume(inVolume);
        return SUCCEEDED(hr);
    }
    return false;
}
```

RenderFile() ：关键！

```cpp
bool CDXGraph::RenderFile(const char * inFile)
{
    if (mGraph)
    {
        WCHAR    szFilePath[MAX_PATH];
        MultiByteToWideChar(CP_ACP, 0, inFile, -1, szFilePath, MAX_PATH);
        if (SUCCEEDED(mGraph->RenderFile(szFilePath, NULL)))
        {
            return true;
        }
    }
    return false;
}
```

播放器源代码下载： http://download.csdn.net/detail/leixiaohua1020/6453467

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