

pgLib Reference Manual

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Chapter 1

pgLib Namespace Index

1.1 pgLib Namespace List

Here is a list of all documented namespaces with brief descriptions:

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pgIFileTool (This class provides methods for working with files)	14
pgIImageTool (This interface provides image utility methods)	15
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Chapter 2

pgLib Hierarchical Index

2.1 pgLib Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

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pgCharacter	36
pgD3DObject	40
pgAnimated	25
pgBaseMesh	31
pgBSPMesh	33
pgLensflare	62
pgLighting	68
pgParticleSystem	85
pgSegment	94
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pgTerrain	111
pgIAudio	42
pgIAudioDevice	44
pgAudioFMOD	29
pgIInput	45
pgInputDX	55
pgImage	48
pgIMathTool	51
pgInFile	54
pgInTextFile	57
pgISample	59
pgISettings	61
pgLight	65
pgList< TYPE >	71
pgLog	76
pgMaterial	78
pgMesh	81
pgMeshUtil	83
pgPath	89
pgPathLinear	91
pgPlane	93

pgSettingsFile	98
pgSteering	103
pgString	107
pgStringEx	110
pgTexture	117
pgTextureStage	119
pgTimeInstance	121
pgVec2	122
pgVec3	125
pgVec3n	126
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Chapter 3

pgLib Compound Index

3.1 pgLib Compound List

Here are the classes, structs, unions and interfaces with brief descriptions:

pgAABBox (Axis aligned bounding box)	23
pgAnimated (A pgAnimated object resembles an animated object such as a player character) . .	25
pgAudioFMOD (Internal class for audio usage. use pgAudio for basic audio functionality) . . .	29
pgBaseMesh (PgBaseMesh represents a renderable generic mesh without texturing)	31
pgBSPMesh (PgBSPMesh can load and render Q3 mesh objects)	33
pgCharacter (Animated Character Class)	36
pgD3DObject (This class is the base class of all pgLib objects which directly use the render device)	40
pgIAudio (Defines the basic audio interface)	42
pgIAudioDevice (This interface is used internally by pgIAudio)	44
pgIInput (This class defines a basic input device)	45
pgImage (PgImage objects store images)	48
pgIMathTool (PgIMathTool provides mathematical routines for 3d calculations)	51
pgInFile (Base class for file reading classes)	54
pgInputDX (This class implements the pgInput interface using <code>directinput</code>)	55
pgInTextFile (This class provides basic methods for reading text files)	57
pgISample (Basic sound sample interface)	59
pgISettings (Stores general Settings)	61
pgLensflare (Renders a lensflare)	62
pgLight (PgLight stores all information about a light)	65
pgLighting (A pgLighting is a fix set of lights which can be applied to an object up to be rendered)	68
pgList< TYPE > (PgList is a template class for storing simple objects directly in the list (no pointers))	71
pgLog (Use this class from anywhere to do logging into a file)	76
pgMaterial (PgMaterial defines the properties of a surface)	78
pgMesh (A pgMesh is a complex 3D object which can consist of several segments)	81
pgMeshUtil (Creates and updates pgBaseMesh and pgMesh objects)	83
pgParticleSystem (Creates and animates a particle system from a .ps file)	85
pgPath (This class defines the basic path interface which all path classes have to implement) . .	89
pgPathLinear (This class implements the basic pgPath interface)	91
pgPlane (This class implements a plane)	93
pgSegment (A pgSegment object can render a 3d object having exactly one material)	94
pgSettingsFile (This class loads settings (ini) files)	98
pgSkyBox (Creates and renders a skybox)	101

pgSteering (PgSteering provides basic camera movement)	103
pgString (Class for storing and formating single byte character strings)	107
pgStringEx (PgStringEx has a formating contructor)	110
pgTerrain (PgTerrain can render terrain by using geo-mipmapping)	111
pgTexture (PgTextur class)	117
pgTextureStage (PgTextureStage is part of a pgMaterial)	119
pgTimeInstance (This class represents a specific instance in time (a distinct point on the timeline))	121
pgVec2 (2D vector class)	122
pgVec3 (3D vector class)	125
pgVec3n (3D normalized vector class)	126
pgVec4 (4D vector class)	127

Chapter 4

pgLib Namespace Documentation

4.1 pgIDirectX Namespace Reference

pgIDirectX is the main connection of code outside of pgLib to directx

Enumerations

- enum { [CLEAR_Z](#) = 1, [CLEAR_COLOR](#) = 2 }
- Flags to be passed to renderBegin().*

Functions

- PGLIB_API void [init](#) (LPDIRECT3DDEVICE8 nDevice, LPDIRECT3D8 nD3D)
Initializes the container class with the given device object.
 - PGLIB_API bool [renderBegin](#) (int nFlags=CLEAR_Z|CLEAR_COLOR)
This method has to be called before a new frame is rendered.
 - PGLIB_API void [renderEnd](#) ()
This method has to be called after rendering a complete frame.
 - PGLIB_API void [setClearColor](#) (const [pgColor](#) &nColor)
Sets the color, which is used to clear the color (frame) buffer.
 - PGLIB_API void [setClearZ](#) (float nZ)
Sets the z-value which is used to clear the z-buffer.
 - PGLIB_API [pgColor](#) [getClearColor](#) ()
Returns the color, which is used to clear the color buffer.
 - PGLIB_API float [getClearZ](#) ()
Returns the value which is used to clear the z-buffer.
-

- PGLIB_API void [setViewMatrix](#) (const pgMatrix &nMatrix)
Sets a new view matrix.
- PGLIB_API const pgMatrix & [getViewMatrix](#) ()
returns a pointer to the current view (camera) matrix
- PGLIB_API const pgMatrix & [getProjectionMatrix](#) ()
returns a pointer to the current projection matrix
- PGLIB_API void [setProjectionMatrix](#) (const pgMatrix &nMatrix)
Sets a projection matrix directly.
- PGLIB_API void [setProjectionMatrix](#) (float nAspectRatio, float nFOV, float nNear, float nFar)
Sets the projection matrices with the given aspect ratio, field of view, near plane and far plane.
- PGLIB_API void [setAspectRatio](#) (float nAspectRatio)
Sets a new aspect ratio and updates the projection matrix.
- PGLIB_API float [getAspectRatio](#) ()
Returns the currently set aspect ratio.
- PGLIB_API float [getFOVY](#) ()
Returns the currently set field of view (FOV) for the y-axis.
- PGLIB_API float [getFOVX](#) ()
Returns the currently set field of view (FOV) for the x-axis.
- PGLIB_API float [getNearPlane](#) ()
Returns the distance of the near clipping plane to the camera position.
- PGLIB_API float [getFarPlane](#) ()
Returns the distance of the far clipping plane to the camera position.
- PGLIB_API void [setSkyBoxHeightFactor](#) (float nFactor)
Sets a factor by which the skybox follows the user camera in height.
- PGLIB_API float [getSkyBoxHeightFactor](#) ()
Returns the skybox height factor.
- PGLIB_API void [switchWireframe](#) ()
Switches wireframe rendering on/off.
- PGLIB_API bool [getWireframe](#) ()
Returns true if the wireframe rendering is set to on.
- PGLIB_API void [switchUpdateVisibility](#) ()
Switches updating object visibility on/off.
- PGLIB_API bool [getUpdateVisibility](#) ()
Returns true if the visibility updating is set to on.

- PGLIB_API void [setCameraPos](#) (const [pgVec3](#) &nPos)
Sets the camera's position.
- PGLIB_API [pgVec3](#) & [getCameraPos](#) ()
Returns the camera's position as it was set with [setCameraPos\(\)](#).
- PGLIB_API void [createClippingPlanes](#) ([pgPlane](#) nPlanes[6])
Creates six clipping planes.
- PGLIB_API void [setColor](#) (D3DCOLORVALUE &nDst, const [pgVec4](#) &nSrc)
Sets a color in [pgVec4](#) ([pgColor](#)) format into a D3DCOLORVALUE color value.
- PGLIB_API void [setD3DVecFromVec3](#) (D3DVECTOR &nDst, const [pgVec3](#) &nSrc)
Sets a 3d vector in [pgVec3](#) format into a D3DVECTOR value.
- PGLIB_API void [setVec3FromVecD3D](#) ([pgVec3](#) &nDst, const D3DVECTOR &nSrc)
Sets a 3d vector in [pgVec3](#) format into a D3DVECTOR value.
- PGLIB_API void [resetStats](#) ()
Resets all triangle counters.
- PGLIB_API void [addLevelTris](#) (int nNum)
Adds triangles to the level triangle counter.
- PGLIB_API void [addTerrainTris](#) (int nNum)
Adds triangles to the terrain triangle counter.
- PGLIB_API void [addNonLevelTris](#) (int nNum)
Adds triangles to the non-level triangle counter.
- PGLIB_API void [addParticles](#) (int nNum)
Adds triangles to the particle triangle counter.
- PGLIB_API int [getNumLevelTris](#) ()
Returns how many level triangles have been counted.
- PGLIB_API int [getNumTerrainTris](#) ()
Returns how many terrain triangles have been counted.
- PGLIB_API int [getNumNonLevelTris](#) ()
Returns how many non-level triangles have been counted.
- PGLIB_API int [getNumParticles](#) ()
Returns how many particle triangles have been counted.
- PGLIB_API LPDIRECT3DDEVICE8 [getDevice](#) ()
Returns the D3D render device.
- PGLIB_API LPDIRECT3D8 [getD3D](#) ()

Returns the D3D device.

- PGLIB_API int [getAvailableTextureMemory](#) ()
Returns the availble texture memoy in megabytes.
- PGLIB_API int [getNumTextureBlendStages](#) ()
Returns the number of texture blending stages the device has.
- PGLIB_API bool [canUseCompressedTextureFormat](#) (pgImage::FORMAT nFormat)
Returns true if the device is able to work with compressed textures.

4.1.1 Detailed Description

pgIDirectX is the main connection of code outside of pgLib to directx

pgIDirectX allows you to take advantage of working directly with directx. If you write new classes for pgLib surely have to work with directx. pgIDirectX allows you to access the view and projection matrix, although you should be careful when changing these, since a lot of classes depend on them.

4.1.2 Enumeration Type Documentation

4.1.2.1 anonymous enum

Flags to be passed to [renderBegin\(\)](#).

In order to pass more than one flag combine them with the or-operator ('|')

Enumeration values:

CLEAR_Z Tells the render device to clear the z-buffer

CLEAR_COLOR Tells the render device to clear the color-buffer

Definition at line 42 of file pgIDirectX.h.

```

42         {
43             CLEAR_Z = 1,
44             CLEAR_COLOR = 2
45         };
```

4.1.3 Function Documentation

4.1.3.1 PGLIB_API int getAvailableTextureMemory ()

Returns the availble texture memoy in megabytes.

The returned value is only a very coarse value and should not be taken for exact calculations.

4.1.3.2 PGLIB_API LPDIRECT3D8 getD3D ()

Returns the D3D device.

This method returns the d3d device which was passed to [init\(\)](#)

4.1.3.3 PGLIB_API LPDIRECT3DDEVICE8 getDevice ()

Returns the D3D render device.

This method returns the render device which was passed to [init\(\)](#)

4.1.3.4 PGLIB_API float getFOVX ()

Returns the currently set field of view (FOV) for the x-axis.

Since normally four aspect ration won't be 1.0 the FOV for x-axis and y-axis is different.

4.1.3.5 PGLIB_API float getFOVY ()

Returns the currently set field of view (FOV) for the y-axis.

Since normally four aspect ration won't be 1.0 the FOV for x-axis and y-axis is different.

4.1.3.6 PGLIB_API void init (LPDIRECT3DDEVICE8 *nDevice*, LPDIRECT3D8 *nD3D*)

Initializes the containter class with the given device object.

This method is automatically called by pgAppStub. (If the application framework is used...)

4.1.3.7 PGLIB_API bool renderBegin (int *nFlags* = CLEAR_Z|CLEAR_COLOR)

This method has to be called before a new frame is rendered.

As flags pass: CLEAR_Z if the z-buffer should be cleared CLEAR_COLOR if the color (frame) buffer should be cleared

4.1.3.8 PGLIB_API void renderEnd ()

This method has to be called after rendering a complete frame.

This method calls DirectX to finish the scene and present the rendered image.

4.1.3.9 PGLIB_API void resetStats ()

Resets all triangle counters.

The statistics count how many triangles have been drawn for level, terrain, particles and other objects (non-level).

4.1.3.10 PGLIB_API void setCameraPos (const [pgVec3](#) & *nPos*)

Sets the camera's position.

This method only saves the camera's position but does not change the view matrix accordingly It's up to the calling method to update the view matrix. The camera's position is only saved, because some objects need to know it.

4.1.3.11 PGLIB_API void setClearColor (const pgColor & nColor)

Sets the color, which is used to clear the color (frame) buffer.

pgColor takes 4 components as float values [0.0-1.0]: Red, Green, Blue and Alpha

4.1.3.12 PGLIB_API void setClearZ (float nZ)

Sets the z-value which is used to clear the z-buffer.

Except in very special cases you'll always want this value to be 1.0

4.1.3.13 PGLIB_API void setColor (D3DCOLORVALUE & nDst, const pgVec4 & nSrc)

Sets a color in pgVec4 (pgColor) format into a D3DCOLORVALUE color value.

Use this method to convert colors from pgLib format into DirectX format

4.1.3.14 PGLIB_API void setD3DVecFromVec3 (D3DVECTOR & nDst, const pgVec3 & nSrc)

Sets a 3d vector in pgVec3 format into a D3DVECTOR value.

Use this method to convert vectors from pgLib format into DirectX format

4.1.3.15 PGLIB_API void setSkyBoxHeightFactor (float nFactor)

Sets a factor by which the skybox follows the user camera in height.

Normally a skybox is fixed and the camera stays always in the center of the box. For better emmersion it can make sense to let camera move a little bit in the skybox. Be aware that if the camera moves to far away from the center, the box shape will become appearant. Default value is 0.0

4.1.3.16 PGLIB_API void setVec3FromVecD3D (pgVec3 & nDst, const D3DVECTOR & nSrc)

Sets a 3d vector in pgVec3 format into a D3DVECTOR value.

Use this method to convert vectors from pgLib format into DirectX format

4.1.3.17 PGLIB_API void setViewMatrix (const pgMatrix & nMatrix)

Sets a new view matrix.

Be aware, that strange things can (will) happen, if you change the view matrix during rendering a frame and do not restore it, before rendering an other object.

4.1.3.18 PGLIB_API void switchUpdateVisibility ()

Switches updating object visibility on/off.

It's up to every object that can be rendered to determine wether it really stops updating visibility or not by calling [getUpdateVisibility\(\)](#)

4.1.3.19 `PGLIB_API void switchWireframe ()`

Switches wireframe rendering on/off.

It's up to every object that can be rendered to determine whether it should be rendered as wireframe by calling `getWireframe()`

4.2 pgIFileTool Namespace Reference

This class provides methods for working with files.

Functions

- PGLIB_API void [getAllFiles](#) (const char *nPath, const char *nExt, [pgList](#)< [pgString](#) > &nFileList)

returns in nFileList all files which are in directory nPath and have the extension nExt

4.2.1 Detailed Description

This class provides methods for working with files.

4.2.2 Function Documentation

4.2.2.1 PGLIB_API void getAllFiles (const char * *nPath*, const char * *nExt*, [pgList](#)< [pgString](#) > &*nFileList*)

returns in nFileList all files which are in directory nPath and have the extension nExt

nExt has to be passed without dot ('.')

4.3 pgImageTool Namespace Reference

This interface provides image utility methods.

Functions

- PGLIB_API `pgImage * createLightmapFromHeightmap` (const `pgImage * nHeightmap`, const `pgVec3n &nDir`, float `nAmbient`, float `nDiffuse`)

calculates a lightmap image from a heightmap image

4.3.1 Detailed Description

This interface provides image utility methods.

4.3.2 Function Documentation

4.3.2.1 PGLIB_API `pgImage* createLightmapFromHeightmap` (const `pgImage * nHeightmap`, const `pgVec3n & nDir`, float `nAmbient`, float `nDiffuse`)

calculates a lightmap image from a heightmap image

Light is calculated as direction light. The light's direction is set using the `nDir` parameter. `nAmbient` and `nDiffuse` are used to calculate each destination pixel's luminance.

4.4 pgResourceManager Namespace Reference

pgResourceManager is the one and only instance for loading graphics stuff from HD.

Enumerations

- enum [SOURCE](#) { [SOURCE_STD](#), [SOURCE_BSP](#), [SOURCE_MD2](#), [SOURCE_OBJ](#) }
Source Paths.
- enum

Functions

- PGLIB_API void [init](#) ()
Init has to be called before any resource can be loaded.
- PGLIB_API [pgImage](#) * [getRawImage](#) (const [pgString](#) &nFileName, int nWidth, int nHeight, [pgImage::FORMAT](#) nFormat, [SOURCE](#) nSource)
Returns the image loaded from the given filename.
- PGLIB_API [pgTexture](#) * [getTexture](#) (const [pgString](#) &nFileName, [SOURCE](#) nSource, [pgImage::FORMAT](#) nFormat=[pgImage::UNKNOWN](#))
Returns the texture with the given name.
- PGLIB_API [pgImage](#) * [getRawImage](#) (const [pgString](#) &nFileName, int nWidth, int nHeight, [pgImage::FORMAT](#) nFormat)
Returns the image loaded from the given filename.
- PGLIB_API [pgTexture](#) * [getTexture](#) (const [pgString](#) &nFileName, [pgImage::FORMAT](#) nFormat=[pgImage::UNKNOWN](#))
Returns the texture with the given name.
- PGLIB_API [pgBaseMesh](#) * [getBaseMeshMD2](#) (const [pgString](#) &nFileName, bool nLighting=false)
Returns the MD2 with the given name as a basemesh object.
- PGLIB_API [pgMesh](#) * [getMeshOBJ](#) (const [pgString](#) &nFileName, bool nLighting=false, bool nCreateNew=false)
Returns the OBJ with the given name as a basemesh object.
- PGLIB_API [pgAnimated](#) * [getAnimated](#) (const [pgString](#) &nFileName)
Returns the [pgAnimated](#) object with the given name.
- PGLIB_API [pgParticleSystem](#) * [getParticleSystem](#) (const [pgString](#) &nFileName, bool nCreateNew=false)
Returns the ParticleSystem with the given name.
- PGLIB_API [pgPathLinear](#) * [getLinearPath](#) (const [pgString](#) &nFileName)
Returns the LinearPath with the given name as a general path object.

- PGLIB_API [pgTexture](#) * [getTexNotFound](#) ()

Returns the standard texture, which is used, when another texture could not be loaded.

4.4.1 Detailed Description

pgIResourceManager is the one and only instance for loading graphics stuff from HD.

Resource Types are: Raw Images Textures in format: dds, tga, jpg, bmp

4.4.2 Enumeration Type Documentation

4.4.2.1 enum pgIResourceManager::SOURCE

Source Paths.

Enumeration values:

- SOURCE_STD** Standard Texture Path
- SOURCE_BSP** BSP Object and Texture Path
- SOURCE_MD2** MD2 Object Texture Path
- SOURCE_OBJ** Wavefront OBJ and Texture Path

Definition at line 45 of file pgIResourceManager.h.

```

45         {
46             SOURCE_STD,
47             SOURCE_BSP,
48             SOURCE_MD2,
49             SOURCE_OBJ,
50     };

```

4.4.3 Function Documentation

4.4.3.1 PGLIB_API [pgAnimated](#)* [getAnimated](#) (const [pgString](#) & *nFileName*)

Returns the [pgAnimated](#) object with the given name.

If that object is not in memory yet, it is loaded. *nFileName* must refer to a .ani script in the ani directory.

4.4.3.2 PGLIB_API [pgBaseMesh](#)* [getBaseMeshMD2](#) (const [pgString](#) & *nFileName*, bool *nLighting* = false)

Returns the MD2 with the given name as a basemesh object.

If that MD2 is not in memory yet, it is loaded.

4.4.3.3 PGLIB_API [pgPathLinear](#)* [getLinearPath](#) (const [pgString](#) & *nFileName*)

Returns the LinearPath with the given name as a general path object.

If that object is not in memory yet, it is loaded. *nFileName* must refer to a .path file in the path directory.

4.4.3.4 PGLIB_API **pgMesh*** getMeshOBJ (const **pgString** & *nFileName*, bool *nLighting* = false, bool *nCreateNew* = false)

Returns the OBJ with the given name as a basemesh object.

If that OBJ is not in memory yet, it is loaded.

4.4.3.5 PGLIB_API **pgParticleSystem*** getParticleSystem (const **pgString** & *nFileName*, bool *nCreateNew* = false)

Returns the ParticleSystem with the given name.

If that object is not in memory yet, it is loaded. *nFileName* must refer to a .ps script in the ani directory.

4.4.3.6 PGLIB_API **pgImage*** getRawImage (const **pgString** & *nFileName*, int *nWidth*, int *nHeight*, **pgImage::FORMAT** *nFormat*)

Returns the image loaded from the given filename.

Since it is a raw image, the size, height and format are needed too. CAUTION: the raw file has to have extension ".raw".

4.4.3.7 PGLIB_API **pgImage*** getRawImage (const **pgString** & *nFileName*, int *nWidth*, int *nHeight*, **pgImage::FORMAT** *nFormat*, **SOURCE** *nSource*)

Returns the image loaded from the given filename.

Since it is a raw image, the size, height and format are needed too. CAUTION: the raw file has to have extension ".raw".

4.4.3.8 PGLIB_API **pgTexture*** getTexture (const **pgString** & *nFileName*, **pgImage::FORMAT** *nFormat* = **pgImage::UNKNOWN**)

Returns the texture with the given name.

If that texture is not in memory yet, it is loaded from the given source. If *nFormat* is **pgImage::UNKNOWN** the format is taken from the file.

4.4.3.9 PGLIB_API **pgTexture*** getTexture (const **pgString** & *nFileName*, **SOURCE** *nSource*, **pgImage::FORMAT** *nFormat* = **pgImage::UNKNOWN**)

Returns the texture with the given name.

If that texture is not in memory yet, it is loaded from the given source. If *nFormat* is **pgImage::UNKNOWN** the format is taken from the file.

4.5 pgIStringTool Namespace Reference

This interface provides utility methods for string processing.

Functions

- PGLIB_API const char * [readLine](#) (FILE *nFp)
Reads a line and returns a temporary copy for it.
- PGLIB_API const char * [skipSpaces](#) (const char *nLine)
Skips all spaces and tabs and returns the new pointer to the same data buffer.
- PGLIB_API const char * [skipNonSpaces](#) (const char *nLine)
Skips all non spaces and non tabs and returns the new pointer to the same data buffer.
- PGLIB_API const char * [getPosAfter](#) (const char *nLine, const char *nSearch)
Searches for the given string and returns the position after it in nLine.
- PGLIB_API bool [startsWith](#) (const char *nStr, const char *nStart)
Returns true if nStr starts with nStart (ignores heading white spaces).
- PGLIB_API bool [startsWithIgnoreCase](#) (const char *nStr, const char *nStart)
Returns true if nStr starts with nStart ignoring case sensitivity (ignores heading white spaces).
- PGLIB_API bool [isEmpty](#) (const char *nStr)
Returns true if the line is empty (white space do not count).
- PGLIB_API void [removePathAndExtension](#) (const char *nFullPath, char *nFileName)
Takes a (probably) full path of a file and tries to remove the path and the extensions from it.
- PGLIB_API void [removeExtension](#) (const char *nFullPath, char *nFileName)
Takes a (probably) full path of a file and tries to remove the extensions from it.
- PGLIB_API bool [readVec2](#) (const char *nString, [pgVec2](#) &nVec2)
Reads a Vec2 from a String.
- PGLIB_API bool [readVec3](#) (const char *nString, [pgVec3](#) &nVec3)
Reads a Vec3 from a String.
- PGLIB_API bool [readVec4](#) (const char *nString, [pgVec4](#) &nVec4)
Reads a Vec4 from a String.

4.5.1 Detailed Description

This interface provides utility methods for string processing.

4.5.2 Function Documentation

4.5.2.1 PGLIB_API const char* readLine (FILE * *nFp*)

Reads a line and returns a temporary copy for it.

Be aware not to call this method from outside of the pgLib DLL, since FILE pointers may not be passed over DLL boundaries.

4.5.2.2 PGLIB_API bool readVec2 (const char * *nString*, pgVec2 & *nVec2*)

Reads a Vec2 from a String.

If reading fails, false is returned.

4.5.2.3 PGLIB_API bool readVec3 (const char * *nString*, pgVec3 & *nVec3*)

Reads a Vec3 from a String.

If reading fails, false is returned.

4.5.2.4 PGLIB_API bool readVec4 (const char * *nString*, pgVec4 & *nVec4*)

Reads a Vec4 from a String.

If reading fails, false is returned.

4.5.2.5 PGLIB_API void removeExtension (const char * *nFullPath*, char * *nFileName*)

Takes a (probably) full path of a file and tries to remove the extensions from it.

nFileName must be large enough to hold the resulting string.

4.5.2.6 PGLIB_API void removePathAndExtension (const char * *nFullPath*, char * *nFileName*)

Takes a (probably) full path of a file and tries to remove the path and the extensions from it.

nFileName must be large enough to hold the resulting string.

4.6 pgTime Namespace Reference

pgTime provides precise timing methods

Functions

- PGLIB_API void [update](#) ()
Update must only be called once per frame (before any other pgTime method is used).
- PGLIB_API float [getLastFrameTime](#) ()
Returns in seconds, how long the last frame took.
- PGLIB_API float [getFPS](#) ()
returns the current frames per second based on the last frame time
- PGLIB_API [pgTimeInstance](#) [getCurrentTime](#) ()
returns the current time in very high precision as [pgTimeInstance](#) object
- PGLIB_API float [getTimeSince](#) (const [pgTimeInstance](#) &nInst)
returns the time if seconds since which have passed since nInst

4.6.1 Detailed Description

pgTime provides precise timing methods

pgTime uses the processors VERY HIGH PRECISION timer functions, which are precise enough to bench even single assembler commands...

4.6.2 Function Documentation

4.6.2.1 PGLIB_API float getLastFrameTime ()

Returns in seconds, how long the last frame took.

The time difference between the last two calls to [update\(\)](#) is returned.

Chapter 5

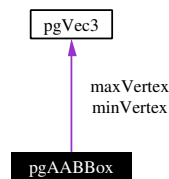
pgLib Class Documentation

5.1 pgAABBox Class Reference

Axis aligned bounding box.

```
#include <pgAABBox.h>
```

Collaboration diagram for pgAABBox:



Public Methods

- void `setMin` (const `pgVec3` &nVertex)
Sets one corner of the bounding box.
 - void `setMax` (const `pgVec3` &nVertex)
Sets another corner of the bounding box.
 - void `addVertex` (const `pgVec3` &nVertex)
Extends the box to contain the given vertex.
 - void `addBox` (const `pgAABBox` &nOther)
Extends the box to contain an other box.
 - `pgVec3` `getCenter` () const
Calculates and returns the center of the box.
 - void `move` (const `pgVec3` &nMove)
Moves the box by nMove.
-

- void `reset ()`
Resets the box to contain everything.
- void `setMid (const pgVec3 &nMid, float d)`
Resets the box to be centered at nMid and to have each side of length d.
- void `setMid (const pgVec3 &nMid, float dx, float dy, float dz)`
Resets the box to be centered at nMid and to have size dx,dy,dz.
- const `pgVec3 &getMin ()` const
returns one point of the box
- const `pgVec3 &getMax ()` const
returns the other point of the box
- `pgVec3 getMid ()` const
returns the center of the box

5.1.1 Detailed Description

Axis aligned bounding box.

An axis aligned bounding box can be calculated very effectively. A AABBox is defined by only two vertices (corners).

Definition at line 30 of file pgAABBox.h.

The documentation for this class was generated from the following file:

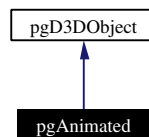
- pgAABBox.h

5.2 pgAnimated Class Reference

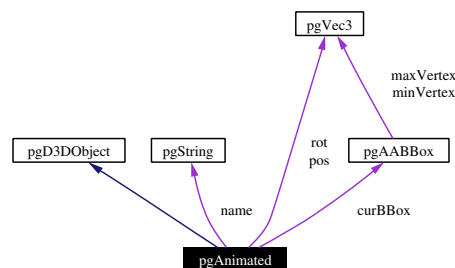
A pgAnimated object resembles an animated object such as a player character.

```
#include <pgAnimated.h>
```

Inheritance diagram for pgAnimated:



Collaboration diagram for pgAnimated:



Public Types

- enum **FRAMEOP** { **BLEND**, **SWITCH** }
Type of operation done when changing between animation frames.

Public Methods

- bool **load** (const char *nFileName)
Loads the given .char file.
- void **startAnimation** (int nAnim)
Starts the animation with the given index.
- void **startAnimation** (const char *nName)
starts the animation with the given name
- int **getAnimationIndex** (const char *nName)
Returns the index of the given animaion name.
- pgMesh** * **getActiveMesh** ()
Returns the mesh that is currently in use.

- const [pgAABBox](#) & [getCurrentBBox](#) () const
Returns the bounding box which is formed by the current mesh.
- const [pgString](#) & [getName](#) ()
Returns the name of the object.
- bool [getDidMeshLoop](#) () const
Returns true if the mesh animation did loop during the last update.
- void [resetDidMeshLoop](#) ()
Resets the didloop flag.
- void [setFreeze](#) (bool nFreeze)
If nFreeze is true, the animation is stopped (frozen).
- void [setHidden](#) (bool nHidden)
If nHidden is true, the object is not drawn until it is unhidden.
- virtual void [render](#) ()
Renders the current underlying mesh.
- virtual void [deleteDeviceObjects](#) ()
The implementing object has to destroy all device dependent objects.
- virtual bool [restoreDeviceObjects](#) ()
The implementing object has to recreate all device dependent objects.

5.2.1 Detailed Description

A pgAnimated object resembles an animated object such as a player character.

A pgAnimated object is constructed by loading an .ani file. Several animations can be stored in one object, which can each be started by calling [startAnimation\(\)](#)

Definition at line 38 of file pgAnimated.h.

5.2.2 Member Enumeration Documentation

5.2.2.1 enum pgAnimated::FRAMEOP

Type of operation done when changing between animation frames.

Enumeration values:

BLEND Do vertex blending for smooth animation

SWITCH Just switch between frames (faster but looks awfull

Definition at line 42 of file pgAnimated.h.

```

42         {
43             BLEND,
44             SWITCH
45     };

```

5.2.3 Member Function Documentation

5.2.3.1 virtual void pgAnimated::deleteDeviceObjects () [virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' [deleteDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

5.2.3.2 int pgAnimated::getAnimationIndex (const char * *nName*)

Returns the index of the given animaion name.

If the name is invalid -1 is returned

5.2.3.3 bool pgAnimated::getDidMeshLoop () const [inline]

Returns true if the mesh animation did loop during the last update.

For several reasons it can be useful for the owner of a pgAnimated object to know when the animation was finished and restarted because looping is active.

Definition at line 93 of file pgAnimated.h.

```
93 { return didMeshLoop; }
```

5.2.3.4 bool pgAnimated::load (const char * *nFileName*)

Loads the given .char file.

See the specification in the manual

5.2.3.5 virtual bool pgAnimated::restoreDeviceObjects () [virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' [restoreDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

5.2.3.6 void pgAnimated::setHidden (bool *nHidden*) [inline]

If nHidden is true, the object is not drawn until it is unhidden.

The animation goes on (is updated), but the object is not drawn. Call setFreeze(true) if the animation should stop too.

Definition at line 108 of file pgAnimated.h.

```
108 { hidden = nHidden; }
```

5.2.3.7 void pgAnimated::startAnimation (int *nAnim*)

Starts the animation with the given index.

If the index is invalid the animation nr 0 is started

The documentation for this class was generated from the following file:

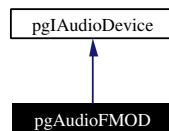
- pgAnimated.h

5.3 pgAudioFMOD Class Reference

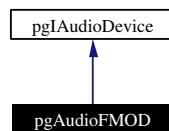
internal class for audio usage. use pgAudio for basic audio functionality

```
#include <pgAudioFMOD.h>
```

Inheritance diagram for pgAudioFMOD:



Collaboration diagram for pgAudioFMOD:



Protected Methods

- virtual void [init](#) ()
must be called before any sound can be loaded or played
- virtual void [cleanup](#) ()
should be called before quitting the program
- virtual void [update](#) ()
must be called every frame to update the audio engine
- virtual int [getNumChannels](#) ()
returns the total number of channels available for playing sounds
- virtual [pgISample](#) * [loadSample](#) (const char *nName)
loads a sound sample (.wav, .mp3, etc...)

Friends

- class [pgIAudio](#)

5.3.1 Detailed Description

internal class for audio usage. use pgAudio for basic audio functionality

Definition at line 26 of file pgAudioFMOD.h.

The documentation for this class was generated from the following file:

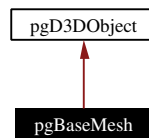
- pgAudioFMOD.h

5.4 pgBaseMesh Class Reference

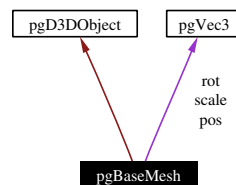
pgBaseMesh represents a renderable generic mesh without texturing.

```
#include <pgBaseMesh.h>
```

Inheritance diagram for pgBaseMesh:



Collaboration diagram for pgBaseMesh:



Public Types

- enum **TYPE** { **TYPE_UNDEFINED**, **TYPE_INDEXED** }
Indexed or nonindexec type of mesh.

Public Methods

- void **render** (int nFrame)
Renders frame number nFrame.
- void **renderTweened** (int nFrame0, int nFrame1, float nBlendWeight)
Renders the mesh by tweening between the frames nFrame0 and nFrame1 by the weight nBlendWeight.
- int **getNumFrames** () const
This method returns the number of keyframes in the basemesh.
- virtual void **deleteDeviceObjects** ()
The implementing object has to destroy all device dependent objects.
- virtual bool **restoreDeviceObjects** ()
The implementing object has to recreate all device dependent objects.

Friends

- class [pgMeshUtil](#)

5.4.1 Detailed Description

pgBaseMesh represents a renderable generic mesh without texturing.

Therefore the basemesh can be shared by many meshes each using different textures. A pgBaseMesh can consist of several frames in order to animate an object. pgBaseMesh does NOT setup any render or blending stages.

Definition at line 69 of file pgBaseMesh.h.

5.4.2 Member Enumeration Documentation

5.4.2.1 enum pgBaseMesh::TYPE

Indexed or nonindexec type of mesh.

Enumeration values:

TYPE_UNDEFINED Undefined: indicates, that the mesh has not been created yet

TYPE_INDEXED The mesh uses indexed vertices

Definition at line 75 of file pgBaseMesh.h.

```

75             {  TYPE_UNDEFINED,
76                TYPE_INDEXED,
77                TYPE_NONINDEXED  };
```

5.4.3 Member Function Documentation

5.4.3.1 virtual void pgBaseMesh::deleteDeviceObjects () [virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' [deleteDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

5.4.3.2 virtual bool pgBaseMesh::restoreDeviceObjects () [virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' [restoreDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

The documentation for this class was generated from the following file:

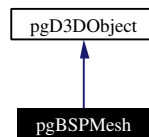
- pgBaseMesh.h

5.5 pgBSPMesh Class Reference

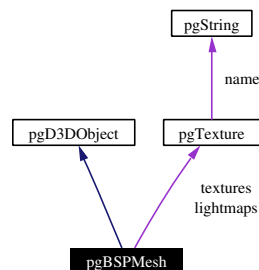
pgBSPMesh can load and render Q3 mesh objects

```
#include <pgBSPMesh.h>
```

Inheritance diagram for pgBSPMesh:



Collaboration diagram for pgBSPMesh:



Public Types

- enum { **LIGHTMAP_SIZE** = 128, **MAX_VERTICES** = 65536, **MAX_INDICES** = 65536 }
Limits of the pgBSPMesh class.

Public Methods

- bool **load** (const char *nBSPFileName)
Loads the ibsp and the corresponding shader file.
- void **setSubFact** (int nSubFact)
Sets the subdivision factor for bezier patches.
- void **render** ()
Renders the bsp with the current camera position.
- const char * **getReportString** ()
Fills a string with statistics about the level.
- bool **slideSphere** (const **pgVec3** &nPos0, float nRadius, const **pgVec3** &nPos1, **pgVec3** &nFinalPos)
Slides a sphere with radius nRadius with planned movement from nPos0 to nPos1 through the bsp level.

- bool `collideSphere` (const `pgVec3` &nSpherePos, float nRadius, const `pgVec3` &nVelocity, `pgVec3` &nNearestColSpherePos, `pgVec3` &nNearestColTriPos, float &nNearestDistance, bool &nStuck)
Returns true if the sphere collides with the bsp level.
- `pgVec3 findSavePos` (const `pgVec3` &nSavePos, float nRadius)
Returns a position near nSavePos which does not collide with the level.
- void `deleteDeviceObjects` ()
The implementing object has to destroy all device dependent objects.
- bool `restoreDeviceObjects` ()
The implementing object has to recreate all device dependent objects.

5.5.1 Detailed Description

pgBSPMesh can load and render Q3 mesh objects

Definition at line 39 of file pgBSPMesh.h.

5.5.2 Member Enumeration Documentation

5.5.2.1 anonymous enum

Limits of the pgBSPMesh class.

Enumeration values:

LIGHTMAP_SIZE Size of one lightmap

MAX_VERTICES Maximum number of vertices to be drawn at once

MAX_INDICES Maximum number of indices to be drawn at once

Definition at line 45 of file pgBSPMesh.h.

```

45         {
46             LIGHTMAP_SIZE = 128,
47             MAX_VERTICES = 65536,
48             MAX_INDICES = 65536
49         };

```

5.5.3 Member Function Documentation

5.5.3.1 bool pgBSPMesh::collideSphere (const `pgVec3` &nSpherePos, float nRadius, const `pgVec3` &nVelocity, `pgVec3` &nNearestColSpherePos, `pgVec3` &nNearestColTriPos, float &nNearestDistance, bool &nStuck)

Returns true if the sphere collides with the bsp level.

During movement from nSpherePos with nVelocity Returns the point of the sphere which will collide with a triangle (nNearestColSpherePos) the point on a triangle with which it will collide (nNearestColTriPos) the distance to go until the collision (nNearestDistance) stuck as true if the sphere was already colliding on the initial position true if there actually will be a collision

5.5.3.2 void pgBSPMesh::deleteDeviceObjects () [virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' `deleteDeviceObjects()` methods.

Implements `pgD3DObject`.

5.5.3.3 bool pgBSPMesh::restoreDeviceObjects () [virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' `restoreDeviceObjects()` methods.

Implements `pgD3DObject`.

5.5.3.4 void pgBSPMesh::setSubFact (int nSubFact) [inline]

Sets the subdivision factor for bezier patches.

The number of faces created for a bezier patch is $(2^n * 2^n)$. A value of 6 is therefore most times more than enough.

Definition at line 61 of file `pgBSPMesh.h`.

```
61 { patchSubFact = nSubFact; }
```

5.5.3.5 bool pgBSPMesh::slideSphere (const `pgVec3` & nPos0, float nRadius, const `pgVec3` & nPos1, `pgVec3` & nFinalPos)

Slides a sphere with radius `nRadius` with planned movement from `nPos0` to `nPos1` through the bsp level.

The final position is returned in `nFinalPos` This method returns true if there was a collision

The documentation for this class was generated from the following file:

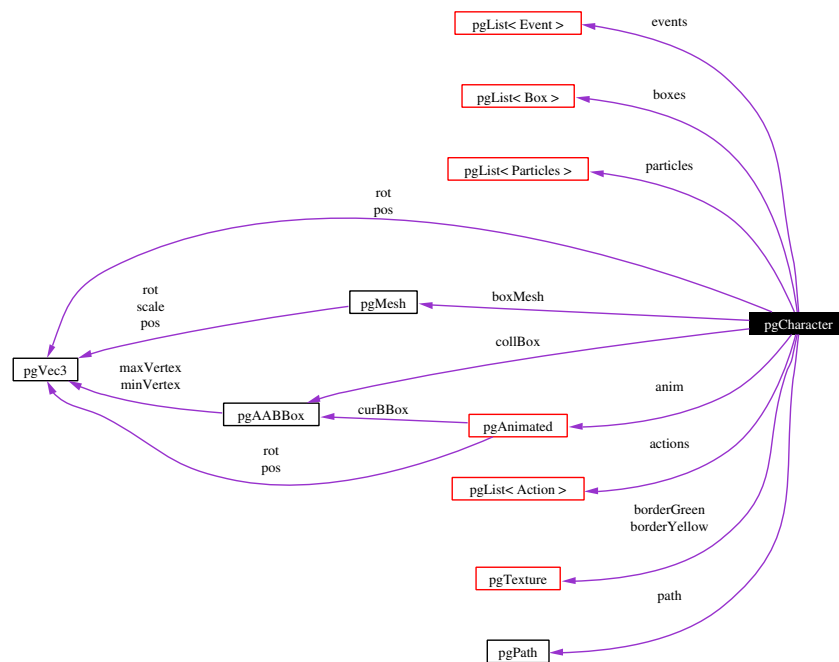
- `pgBSPMesh.h`

5.6 pgCharacter Class Reference

Animated Character Class.

```
#include <pgCharacter.h>
```

Collaboration diagram for pgCharacter:



Public Types

- enum **WAY** { **WAY_LINE**, **WAY_PATH** }
Type of way a character move along.
- enum **RELATION** { **REL_NONE**, **REL_ABS**, **REL_REL**, **REL_LOCAL**, **REL_GLOBAL** }
Type of relation between the character and a (trigger or collision) box or a particle system.
- enum **MOVEMENT** { **MOV_FOLLOW**, **MOV_FIX** }
Type of relation between the character and a (trigger or collision) box.
- enum **EVENT** { **EVENT_UNDEFINED**, **EVENT_STARTUP**, **EVENT_GUIDE**, **EVENT_PLAYER** }
Type of events.

Public Methods

- bool **load** (const char *nFileName, bool nFullPath=false)
Loads a character from a .char file.

- void **setEvent** (**EVENT** nEvent, const **pgAABBox** *nBox)
Tells the character, that an event has happened.
- **EVENT** **getEventTypeFromString** (**pgString** nEventStr)
Converts a string into an event.
- void **update** ()
Updates the character before it is rendered.
- bool **setGameProgress** (float nVal)
Sets how far the game progress currently is.
- virtual void **render** ()
Renders the character.

5.6.1 Detailed Description

Animated Character Class.

This class provides functionality to created scripted objects which can react onto events during the game.

Definition at line 41 of file pgCharacter.h.

5.6.2 Member Enumeration Documentation

5.6.2.1 enum pgCharacter::EVENT

Type of events.

Enumeration values:

- EVENT_UNDEFINED** No event
- EVENT_STARTUP** Startup event; sent after programm start
- EVENT_GUIDE** Event by the Guide
- EVENT_PLAYER** Event by the Player

Definition at line 69 of file pgCharacter.h.

```

69         {
70             EVENT_UNDEFINED,
71             EVENT_STARTUP,
72             EVENT_GUIDE,
73             EVENT_PLAYER
74     };

```

5.6.2.2 enum pgCharacter::MOVEMENT

Type of relation between the character and a (trigger or collision) box.

Enumeration values:

MOV_FOLLOW The box moves together with the character

MOV_FIX The box does not moves with the character (stays at its initial position)

Definition at line 62 of file pgCharacter.h.

```

62         {
63             MOV_FOLLOW,
64             MOV_FIX
65     };

```

5.6.2.3 enum pgCharacter::RELATION

Type of relation between the character and a (trigger or collision) box or a particle system.

Enumeration values:

REL_NONE No relation

REL_ABS The box is initially positioned in absolute coordinates

REL_REL The box is initially positioned relativ to the character

REL_LOCAL Emitted particles stay in the coordinate system of the character (follow each move)

REL_GLOBAL Emitted particles move independent of the character (do not follow)

Definition at line 52 of file pgCharacter.h.

```

52         {
53             REL_NONE,
54             REL_ABS,
55             REL_REL,
56             REL_LOCAL,
57             REL_GLOBAL
58     };

```

5.6.2.4 enum pgCharacter::WAY

Type of way a character move along.

Enumeration values:

WAY_LINE Moves along a line (defined by points in the .CHAR file)

WAY_PATH Moves along a path (defined by many points in a .PATH file)

Definition at line 45 of file pgCharacter.h.

```

45         {
46             WAY_LINE,
47             WAY_PATH
48     };

```

5.6.3 Member Function Documentation

5.6.3.1 `bool pgCharacter::load (const char * nFileName, bool nFullPath = false)`

Loads a character from a .char file.

If *nFullPath* is true the filename is used directly. Otherwise it is extended by the default path and extension

5.6.3.2 `void pgCharacter::setEvent (EVENT nEvent, const pgAABBox * nBox)`

Tells the character, that an event has happened.

Usually every frame there will be events such as player, guide, etc...

5.6.3.3 `bool pgCharacter::setGameProgress (float nVal)`

Sets how far the game progress currently is.

Values must be between 0.0 and 1.0 this value is used to

The documentation for this class was generated from the following file:

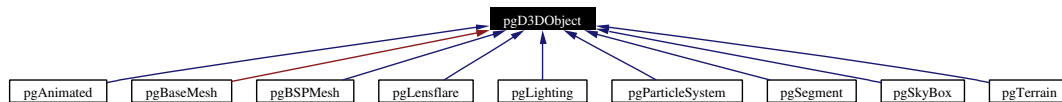
- pgCharacter.h

5.7 pgD3DObject Class Reference

This class is the base class of all pgLib objects which directly use the render device.

```
#include <pgD3DObject.h>
```

Inheritance diagram for pgD3DObject:



Public Methods

- bool [checkDevice](#) (const char *nMsg)
Checks if the render device is set or can be retrieved by pgDirectX.
- virtual void [deleteDeviceObjects](#) ()=0
The implementing object has to destroy all device dependent objects.
- virtual bool [restoreDeviceObjects](#) ()=0
The implementing object has to recreate all device dependent objects.

5.7.1 Detailed Description

This class is the base class of all pgLib objects which directly use the render device.

Definition at line 23 of file pgD3DObject.h.

5.7.2 Member Function Documentation

5.7.2.1 bool pgD3DObject::checkDevice (const char * nMsg)

Checks if the render device is set or can be retrieved by pgDirectX.

If the the render device can not be retrieved, the message nMsg is logged as an error and false is returned.

5.7.2.2 virtual void pgD3DObject::deleteDeviceObjects () [pure virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' [deleteDeviceObjects\(\)](#) methods.

Implemented in [pgBSPMesh](#), [pgAnimated](#), [pgBaseMesh](#), [pgLensflare](#), [pgLighting](#), [pgParticleSystem](#), [pgSegment](#), [pgSkyBox](#), and [pgTerrain](#).

5.7.2.3 virtual bool pgD3DObject::restoreDeviceObjects() [pure virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementating object recreate all device dependent objects and call all sub-objects' [restoreDeviceObjects\(\)](#) methods.

Implemented in [pgBSPMesh](#), [pgAnimated](#), [pgBaseMesh](#), [pgLensflare](#), [pgLighting](#), [pgParticleSystem](#), [pg-Segment](#), [pgSkyBox](#), and [pgTerrain](#).

The documentation for this class was generated from the following file:

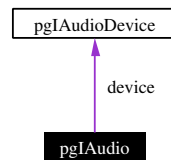
- [pgD3DObject.h](#)

5.8 pgIAudio Class Reference

Defines the basic audio interface.

```
#include <pgIAudio.h>
```

Collaboration diagram for pgIAudio:



Public Types

- enum **TYPE** { **TYPE_NONE**, **TYPE_FMOD** }

Type of audio devices to be used.

Static Public Methods

- void **init** (**TYPE** nType)
Must be called before any sound can be loaded or played.
- void **cleanup** ()
Should be called before quitting the program.
- void **update** ()
Must be called every frame to update the audio engine.
- int **getNumChannels** ()
Returns the total number of channels available for playing sounds.
- pgISample** * **loadSample** (const char *nName)
Loads a sound sample (.wav, .mp3, etc...).

5.8.1 Detailed Description

Defines the basic audio interface.

This class is the entry point for audio support in pgLib, such as loading audio samples.

Definition at line 29 of file pgIAudio.h.

5.8.2 Member Enumeration Documentation

5.8.2.1 enum pgIAudio::TYPE

Type of audio devices to be used.

Enumeration values:

TYPE_NONE No Audio Device

TYPE_FMOD FMOD Audio Engine

Definition at line 33 of file pgIAudio.h.

```
33         {  
34             TYPE_NONE,  
35             TYPE_FMOD  
36         };
```

5.8.3 Member Function Documentation

5.8.3.1 void pgIAudio::init (TYPE nType) [static]

Must be called before any sound can be loaded or played.

Currently only FMOD is supported as underlying audio engine.

The documentation for this class was generated from the following file:

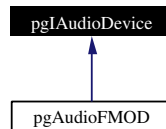
- pgIAudio.h

5.9 pgIAudioDevice Class Reference

This interface is used internally by [pgIAudio](#).

```
#include <pgIAudioDevice.h>
```

Inheritance diagram for pgIAudioDevice:



Protected Methods

- virtual void [init](#) ()=0
must be called before any sound can be loaded or played
- virtual void [cleanup](#) ()=0
should be called before quitting the program
- virtual void [update](#) ()=0
must be called every frame to update the audio engine
- virtual int [getNumChannels](#) ()=0
returns the total number of channels available for playing sounds
- virtual [pgISample](#) * [loadSample](#) (const char *nName)=0
loads a sound sample (.wav, .mp3, etc...)

Friends

- class [pgIAudio](#)

5.9.1 Detailed Description

This interface is used internally by [pgIAudio](#).

All audiodrivers which should be created by [pgIAudio](#) have to implement this interface

Definition at line 27 of file `pgIAudioDevice.h`.

The documentation for this class was generated from the following file:

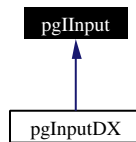
- `pgIAudioDevice.h`

5.10 pgIInput Class Reference

This class defines a basic input device.

```
#include <pgIInput.h>
```

Inheritance diagram for pgIInput:



Public Types

- enum **TYPE** { **KEYBOARD** = 1, **MOUSE** = 2 }
Input type.
- enum **BUTTON** { **BUTTON_LEFT** = 1, **BUTTON_MIDDLE** = 2, **BUTTON_RIGHT** = 4 }
Mouse Buttons.
- enum **KEY**
Key definitions (identical to dxinput).

Public Methods

- virtual bool **init** (int nTypes, HINSTANCE hInst, HWND hWnd)=0
Has to be called before the first update and get methods can be called.
- virtual void **cleanup** ()=0
Should be called at the end of the program.
- virtual void **update** ()=0
Update() has to be called every frame before any get methods are called.
- virtual bool **isKeyDown** (**KEY** nKey) const=0
Returns true if the given key is currently pressed down.
- virtual bool **isKeyNewDown** (**KEY** nKey) const=0
Returns true if the given key is currently down and was not down last frame.
- virtual int **getMouseX** () const=0
Returns the x-position of the mouse in screen coordinates.
- virtual int **getMouseY** () const=0
Returns the y-position of the mouse in screen coordinates.

- virtual bool `isButtonDown` (`BUTTON` nButton) const=0
Returns true if the given button is currently pressed down.
- virtual void `processWindowMsg` (HWND hWnd, UINT uMsg, WPARAM wParam, LPARAM lParam)=0
Processes windows messages.

5.10.1 Detailed Description

This class defines a basic input device.

Definition at line 21 of file pgIInput.h.

5.10.2 Member Enumeration Documentation

5.10.2.1 enum pgIInput::BUTTON

Mouse Buttons.

Enumeration values:

BUTTON_LEFT Left mouse button

BUTTON_MIDDLE Middle mouse button

BUTTON_RIGHT Right mouse button

Definition at line 32 of file pgIInput.h.

```

32          {
33          BUTTON_LEFT = 1,
34          BUTTON_MIDDLE = 2,
35          BUTTON_RIGHT = 4
36      };

```

5.10.2.2 enum pgIInput::TYPE

Input type.

Enumeration values:

KEYBOARD Creates a keyboard input device

MOUSE Creates a mouse input device

Definition at line 25 of file pgIInput.h.

```

25          {
26          KEYBOARD = 1,
27          MOUSE = 2
28      };

```

5.10.3 Member Function Documentation

5.10.3.1 virtual void pgIInput::processWindowMsg (HWND *hWnd*, UINT *uMsg*, WPARAM *wParam*, LPARAM *lParam*) [pure virtual]

Processes windows messages.

For some device type - such as mouse input - it is necessary that the input device has access to the window procedure. This method is automatically called by the framework for every message that is received by the application.

Implemented in [pgInputDX](#).

The documentation for this class was generated from the following file:

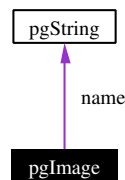
- pgIInput.h

5.11 pgImage Class Reference

pgImage objects store images

```
#include <pgImage.h>
```

Collaboration diagram for pgImage:



Public Types

- enum **FORMAT** { **UNKNOWN** = D3DFMT_UNKNOWN, **RGB888** = D3DFMT_R8G8B8, **ARGB8888** = D3DFMT_A8R8G8B8, **XRGB8888** = D3DFMT_X8R8G8B8, **RGB565** = D3DFMT_R5G6B5, **XRGB1555** = D3DFMT_X1R5G5B5, **ARGB1555** = D3DFMT_A1R5G5B5, **ARGB4444** = D3DFMT_A4R4G4B4, **A8** = D3DFMT_A8, **P8** = D3DFMT_P8, **L8** = D3DFMT_L8, **DXT1** = D3DFMT_DXT1, **DXT2** = D3DFMT_DXT2, **DXT3** = D3DFMT_DXT3, **DXT4** = D3DFMT_DXT4, **DXT5** = D3DFMT_DXT5 }

Image format specification.

Public Methods

- **pgImage** ()
*Creates an undefined image (size 0*0).*
- **pgImage** (int nWidth, int nHeight, **FORMAT** nFormat, const **pgString** &nName, unsigned char *nData=NULL, bool nCopy=true)
*Creates an image with size nWidth * nHeight and format nFormat.*
- int **getWidth** () const
Returns the width of the image in pixels.
- int **getHeight** () const
Returns the height of the image in pixels.
- const unsigned char * **getData** () const
Returns a pointer to the image's pixels.
- unsigned char * **getData** ()
Returns a pointer to the image's pixels.
- int **getPixelSize** () const
Returns the number of bytes a single pixel takes in the image.

- bool `isCompressed` () const
Returns true if the current image format is a compressed format.
- const `pgString` & `getName` () const
Returns the name of the image which was set during construction.

Static Public Methods

- int `getPixelSize` (FORMAT nFormat)
Toolmethod to calculate the pixelsize from a format.
- `pgString` `getFormatString` (D3DFORMAT nFormat)
Returns the name of the format as a string.
- `pgString` `getFormatString` (FORMAT nFormat)
Returns the name of the format as a string.
- D3DFORMAT `getD3DFormat` (FORMAT nFormat)
Converts a D3D pixel format into a pgLib pixel format.
- bool `isCompressed` (FORMAT nFormat)
Returns true if the passed image format is a compressed format.

5.11.1 Detailed Description

pgImage objects store images

Each image is defined by its resolution and format

Definition at line 28 of file pgImage.h.

5.11.2 Member Enumeration Documentation

5.11.2.1 enum pgImage::FORMAT

Image format specification.

Enumeration values:

UNKNOWN Undefined Format

RGB888 24-bit RGB

ARGB8888 32-bit ARGB

XRGB8888 32-bit RGB

RGB565 16-bit RGB

XRGB1555 16-bit RGB

ARGB1555 16-bit ARGB

ARGB4444 16-bit ARGB
A8 8-bit Alpha
P8 8-bit Indexed
L8 8-bit Gray
DXT1 Opaque / one-bit alpha
DXT2 Explicit alpha (premultiplied)
DXT3 Explicit alpha
DXT4 Interpolated alpha (premultiplied)
DXT5 Interpolated alpha

Definition at line 32 of file pgImage.h.

```

32         {
33             UNKNOWN = D3DFMT_UNKNOWN,
34             RGB888 = D3DFMT_R8G8B8,
35             ARGB8888 = D3DFMT_A8R8G8B8,
36             XRGB8888 = D3DFMT_X8R8G8B8,
37             RGB565 = D3DFMT_R5G6B5,
38             XRGB1555 = D3DFMT_X1R5G5B5,
39             ARGB1555 = D3DFMT_A1R5G5B5,
40             ARGB4444 = D3DFMT_A4R4G4B4,
41             A8 = D3DFMT_A8,
42             P8 = D3DFMT_P8,
43             L8 = D3DFMT_L8,
44             DXT1 = D3DFMT_DXT1,
45             DXT2 = D3DFMT_DXT2,
46             DXT3 = D3DFMT_DXT3,
47             DXT4 = D3DFMT_DXT4,
48             DXT5 = D3DFMT_DXT5
49     };

```

5.11.3 Constructor & Destructor Documentation

5.11.3.1 pgImage::pgImage (int *nWidth*, int *nHeight*, **FORMAT** *nFormat*, const **pgString** & *nName*, unsigned char * *nData* = NULL, bool *nCopy* = true)

Creates an image with size *nWidth* * *nHeight* and format *nFormat*.

If *nData* is unequal to NULL the data is taken to initialize the image object. If *nCopy* is true the data is copied and not just referenced.

5.11.4 Member Function Documentation

5.11.4.1 int pgImage::getPixelSize (**FORMAT** *nFormat*) [static]

Toolmethod to calculate the pixelsize from a format.

The pixelsize is returned as number of bytes each pixel takes using the passed format

The documentation for this class was generated from the following file:

- pgImage.h

5.12 pgIMathTool Class Reference

pgIMathTool provides mathematical routines for 3d calculations

```
#include <pgIMathTool.h>
```

Static Public Methods

- void [initSinCos](#) ()
Initializes the tables used by [sin\(\)](#) and [cos\(\)](#).
- float [sin](#) (float nVal)
Uses a sine table for fast sinus calculation.
- float [cos](#) (float nVal)
Uses a cosine table for fast calculation.
- float [random](#) (float nMin, float nMax)
Calculates a random number that lies between nMin and nMax.
- bool [isPointInSphere](#) (const [pgVec3](#) &nPoint, const [pgVec3](#) &nSpherePos, float nRadius)
Returns true if nPoint lies in the sphere.
- bool [isPointInTriangle](#) (const [pgVec3](#) &nPoint, const [pgVec3](#) &nA, const [pgVec3](#) &nB, const [pgVec3](#) &nC)
Returns true if the point lies inside the triangle.
- [pgVec3](#) [getClosestPointOnLine](#) (const [pgVec3](#) &nPoint, const [pgVec3](#) &nA, const [pgVec3](#) &nB)
Returns the closest point from nPoint on the given line.
- [pgVec3](#) [getClosestPointOnTriangle](#) (const [pgVec3](#) &nPoint, const [pgVec3](#) &nA, const [pgVec3](#) &nB, const [pgVec3](#) &nC)
Returns the closest point from nPoint which lies on the triangles edges.
- float [getDistanceToPlane](#) (const [pgVec3](#) &nPos, const [pgPlane](#) &nPlane)
Returns the signed distance of the given position to the plane.
- bool [isPointBehindPlane](#) (const [pgVec3](#) &nPos, const [pgPlane](#) &nPlane)
Returns true if a point lies behind a plane (planes are always directed).
- bool [isPointBehindPlanes](#) (const [pgVec3](#) &nPos, int nNumPlanes, const [pgPlane](#) *nPlanes)
Returns true if a point lies behind all planes.
- bool [isPointOnPlane](#) (const [pgVec3](#) &nPos, const [pgPlane](#) &nPlane)
Returns true if a point lies on the plane.
- bool [arePointsBehindPlane](#) (int numPos, const [pgVec3](#) *nPos, const [pgPlane](#) &nPlane)
Returns true if at least one of the points lies behind the plane.

- bool `findIntersectionRaySphere` (const `pgVec3` &nPos0, const `pgVec3n` &nDir0, const `pgVec3` &nSpherePos, float nRadius, float &nT)
Finds the intersection of a ray and a sphere.
- bool `findIntersectionRayPlane` (const `pgPlane` &nPlane, const `pgVec3` &nPos0, const `pgVec3n` &nDir, `pgVec3` &nPos, float &nT)
Finds the intersection of a ray and a plane.
- bool `findIntersectionPlanes` (const `pgPlane` &nPlane1, const `pgPlane` &nPlane2, const `pgPlane` &nPlane3, `pgVec3` &nPoint)
Finds the intersection of three planes.
- bool `findIntersectionSphereTriangle` (const `pgVec3` &nSpherePos, float nRadius, const `pgVec3` &nDir, const `pgVec3` &nCorner1, const `pgVec3` &nCorner2, const `pgVec3` &nCorner3, const `pgPlane` *nPlane, float &nDist, `pgVec3` &nColSpherePos, `pgVec3` &nColTrianglePos, bool &nStuck)
Finds the intersection of the given sphere moving into direction nDir with the given triangle.

5.12.1 Detailed Description

pgIMathTool provides mathematical routines for 3d calculations

Definition at line 40 of file pgIMathTool.h.

5.12.2 Member Function Documentation

5.12.2.1 float pgIMathTool::cos (float nVal) [static]

Uses a cosine table for fast calculation.

Returns the cosine of nVal CAUTION: nVal has to be passed in degrees

5.12.2.2 bool pgIMathTool::findIntersectionPlanes (const `pgPlane` &nPlane1, const `pgPlane` &nPlane2, const `pgPlane` &nPlane3, `pgVec3` &nPoint) [static]

Finds the intersection of three planes.

Returns the point in nPoint Returns true if nPoint is valid

5.12.2.3 bool pgIMathTool::findIntersectionRayPlane (const `pgPlane` &nPlane, const `pgVec3` &nPos0, const `pgVec3n` &nDir, `pgVec3` &nPos, float &nT) [static]

Finds the intersection of a ray and a plane.

Returns the position in parameter pos and signed distance of nPos0 and pos in nT Returns true as return value if there was an intersection

5.12.2.4 bool pgIMathTool::findIntersectionRaySphere (const `pgVec3` &nPos0, const `pgVec3n` &nDir0, const `pgVec3` &nSpherePos, float nRadius, float &nT) [static]

Finds the intersection of a ray and a sphere.

Returns the length of the ray in nT Returns true if the ray really hit the sphere

5.12.2.5 `bool pgIMathTool::findIntersectionSphereTriangle (const pgVec3 & nSpherePos, float nRadius, const pgVec3 & nDir, const pgVec3 & nCorner1, const pgVec3 & nCorner2, const pgVec3 & nCorner3, const pgPlane * nPlane, float & nDist, pgVec3 & nColSpherePos, pgVec3 & nColTrianglePos, bool & nStuck) [static]`

Finds the intersection of the given sphere moving into direction nDir with the given triangle.

If the sphere did already collide with the triangle nStuck is set to true If nPlane is not NULL it must lie inside the triangle Returns: the distance the sphere moves until it collides the position on the sphere, that will collide with the triangle the position on the triangle that will collide with the sphere sets nStuck to true if there was already a collision on the initial position

5.12.2.6 `pgVec3 pgIMathTool::getClosestPointOnTriangle (const pgVec3 & nPoint, const pgVec3 & nA, const pgVec3 & nB, const pgVec3 & nC) [static]`

Returns the closest point from nPoint which lies on the triangles edges.

It's assumed that nPoint lies NOT inside the triangle

5.12.2.7 `void pgIMathTool::initSinCos () [static]`

Initializes the tables used by [sin\(\)](#) and [cos\(\)](#).

This method must be called before [sin\(\)](#) or [cos\(\)](#) can be called.

5.12.2.8 `bool pgIMathTool::isPointInTriangle (const pgVec3 & nPoint, const pgVec3 & nA, const pgVec3 & nB, const pgVec3 & nC) [static]`

Returns true if the point lies inside the triangle.

It's assumed that the point always lies in the triangles plane

5.12.2.9 `float pgIMathTool::sin (float nVal) [static]`

Uses a sine table for fast sinus calculation.

Returns the sine of nVal CAUTION: nVal has to be passed in degrees

The documentation for this class was generated from the following file:

- `pgIMathTool.h`

5.13 pgInFile Class Reference

Base class for file reading classes.

```
#include <pgInFile.h>
```

5.13.1 Detailed Description

Base class for file reading classes.

Definition at line 20 of file pgInFile.h.

The documentation for this class was generated from the following file:

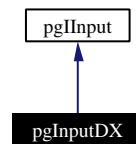
- pgInFile.h

5.14 pgInputDX Class Reference

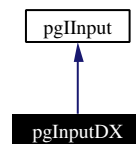
This class implements the pgInput interface using directinput.

```
#include <pgInputDX.h>
```

Inheritance diagram for pgInputDX:



Collaboration diagram for pgInputDX:



Public Methods

- virtual bool **init** (int nTypes, HINSTANCE hInst, HWND hWnd)
Has to be called before the first update and get methods can be called.
- virtual void **cleanup** ()
Should be called at the end of the program.
- virtual void **update** ()
Update() has to be called every frame before any get methods are called.
- virtual bool **isKeyDown** (KEY nKey) const
Returns true if the given key is currently pressed down.
- virtual bool **isKeyNewDown** (KEY nKey) const
Returns true if the given key is currently down and was not down last frame.
- virtual void **processWindowMsg** (HWND hWnd, UINT uMsg, WPARAM wParam, LPARAM lParam)
Processes windows messages.
- virtual int **getMouseX** () const
Returns the x-position of the mouse in screen coordinates.
- virtual int **getMouseY** () const
Returns the y-position of the mouse in screen coordinates.

- virtual bool [isButtonDown](#) ([BUTTON](#) nButton) const
Returns true if the given button is currently pressed down.

5.14.1 Detailed Description

This class implements the pgInput interface using directinput.

See pgInput for more documentation

Definition at line 27 of file pgInputDX.h.

5.14.2 Member Function Documentation

5.14.2.1 virtual void pgInputDX::processWindowMsg (HWND *hWnd*, UINT *uMsg*, WPARAM *wParam*, LPARAM *lParam*) [virtual]

Processes windows messages.

For some device type - such as mouse input - it is necessary that the input device has access to the window procedure. This method is automatically called by the framework for every message that is received by the application.

Implements [pgIInput](#).

The documentation for this class was generated from the following file:

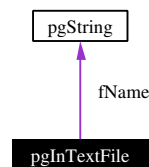
- pgInputDX.h

5.15 pgInTextFile Class Reference

This class provides basic methods for reading text files.

```
#include <pgInTextFile.h>
```

Collaboration diagram for pgInTextFile:



Public Methods

- [pgInTextFile \(\)](#)
Creates a pgInTextFile object which is not yet attached to a file.
- virtual bool [open](#) (const [pgString](#) &nFullPath)
Opens a text file in text mode. If the file could not be opened false is returned.
- virtual void [close](#) ()
Closes an open text file.
- virtual int [read](#) (unsigned char *nBuffer, int nMaxRead)
Reads up to nMaxRead bytes into nBuffer.
- virtual int [getFileSize](#) ()
Returns the filesize of a file.
- const char * [readLine](#) ()
Reads one line of a file and returns the data as a pointer.
- virtual bool [eof](#) ()
Returns true if the end of the file was reached.

5.15.1 Detailed Description

This class provides basic methods for reading text files.

You should always use this class if you want to pass a text file object to a pgLib class, since standard c FILE pointers can not be passed over DLL boundaries (parts of the FILE objects data is stored as static members in the C lib and unfortunately not "DLL safe")

Definition at line 31 of file pgInTextFile.h.

5.15.2 Member Function Documentation

5.15.2.1 `virtual void pgInTextFile::close ()` [virtual]

Closes an open text file.

If the file is not open, this call is ignored.

5.15.2.2 `virtual int pgInTextFile::getFileSize ()` [virtual]

Returns the filesize of a file.

Before you can call this method a file must have been opened.

5.15.2.3 `virtual int pgInTextFile::read (unsigned char * nBuffer, int nMaxRead)` [virtual]

Reads up to *nMaxRead* bytes into *nBuffer*.

The return value resembles the number of actually read bytes.

The documentation for this class was generated from the following file:

- `pgInTextFile.h`

5.16 pgISample Class Reference

Basic sound sample interface.

```
#include <pgISample.h>
```

Public Methods

- virtual const char * [getSampleName](#) () const=0
returns the name of the sound sample
- virtual void [destroy](#) ()=0
Sets the sample to be destroyed as soon as possible.
- virtual void [play](#) (bool nLoop=false)=0
Starts playing a sound.
- virtual void [stop](#) ()=0
Stops playing the sound immediately.
- virtual void [stopLooping](#) ()=0
Keeps on playing the sound is finished, but the sound will not loop anymore.
- virtual bool [isPlaying](#) ()=0
Returns true if the sound is currently playing.

5.16.1 Detailed Description

Basic sound sample interface.

Use this interface to play samples. Samples can be played once or looped.

Definition at line 24 of file pgISample.h.

5.16.2 Member Function Documentation

5.16.2.1 virtual void pgISample::destroy () [pure virtual]

Sets the sample to be destroyed as soon as possible.

It is not guaranteed when the sample will be destroyed. The concrete time of destroying and freeing up of resources is up to the audio engine.

5.16.2.2 virtual void pgISample::play (bool nLoop = false) [pure virtual]

Starts playing a sound.

If nLoop is passed as true the sound will play looped until [stop\(\)](#) is called.

5.16.2.3 virtual void pgISample::stop () [pure virtual]

Stops playing the sound immediately.

How "immediately" the sound stops playing is up to the underlying audio engine. Durations around 50ms can be seen as "very immediately"

5.16.2.4 virtual void pgISample::stopLooping () [pure virtual]

Keeps on playing the sound is finished, but the sound will not loop anymore.

After this method is called the sample keeps on playing until it is finished but will not loop again.

The documentation for this class was generated from the following file:

- pgISample.h

5.17 pgISettings Class Reference

Stores general Settings.

```
#include <pgISettings.h>
```

Static Public Methods

- void `init()`
`init()` has to be called before any path can be retrieved
- const char * `getAppPath()`
Returns the path where the exe file is located.
- char * `tmpFullPath` (const char *nFileName, const char *nExt=0)
Returns a temporary copy of an ani-extended path. nExt is added.
- const char * `getAniPath()`
Returns the path where the ani files are stored.
- void `extendToAniPath` (const char *nFileName, char *nFullName)
Extends a path by prefixing the bsp path.
- char * `tmpFullAniPath` (const char *nFileName, const char *nExt=0)
Returns a temporary copy of an ani-extended path. nExt is added.
- const char * `getBSPPath()`
Returns the path where the bsp files are stored.
- void `extendToBSPPath` (const char *nFileName, char *nFullName)
Extends a path by prefixing the bsp path.
- char * `tmpFullBSPPath` (const char *nFileName, const char *nExt=0)
Returns a temporary copy of an bsp-extended path. nExt is added.

5.17.1 Detailed Description

Stores general Settings.

The class pgISettings has only static members, since it is not expected and can not be instantiated. Its primary work is to store global settings and do path calculations.

Definition at line 26 of file pgISettings.h.

The documentation for this class was generated from the following file:

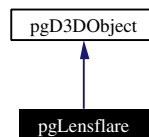
- pgISettings.h

5.18 pgLensflare Class Reference

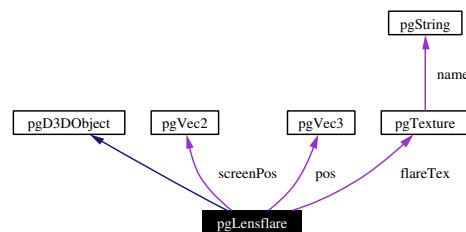
Renders a lensflare.

```
#include <pgLensflare.h>
```

Inheritance diagram for pgLensflare:



Collaboration diagram for pgLensflare:



Public Methods

- void `setPosition` (const `pgVec3` &nPos)
Sets the position of the lensflare.
- void `loadStdFlareImages` ()
Loads a set of standard lensflare images.
- void `render` ()
Renders the lensflare. The viewing direction is retrieved from `pgIDirectX`.
- void `setBaseAlpha` (float nAlpha)
Sets the basic alpha value of the lensflare.
- virtual void `deleteDeviceObjects` ()
The implementing object has to destroy all device dependent objects.
- virtual bool `restoreDeviceObjects` ()
The implementing object has to recreate all device dependent objects.

5.18.1 Detailed Description

Renders a lensflare.

This class draws a nice lensflare onto the screen. Currently only a set of standard images can be loaded. The lensflare is drawn on a line between the set position and the center of the screen.

Definition at line 33 of file pgLensflare.h.

5.18.2 Member Function Documentation

5.18.2.1 virtual void pgLensflare::deleteDeviceObjects () [inline, virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' [deleteDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

Definition at line 66 of file pgLensflare.h.

```
66 {}
```

5.18.2.2 virtual bool pgLensflare::restoreDeviceObjects () [inline, virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' [restoreDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

Definition at line 67 of file pgLensflare.h.

```
67 { return true; }
```

5.18.2.3 void pgLensflare::setBaseAlpha (float *nAlpha*) [inline]

Sets the basic alpha value of the lensflare.

The lower the alpha value is, the less the lensflare will be visible. nAlpha must be in range [0.0-1.0]

Definition at line 63 of file pgLensflare.h.

```
63 { baseAlpha = nAlpha; }
```

5.18.2.4 void pgLensflare::setPosition (const [pgVec3](#) & *nPos*) [inline]

Sets the position of the lensflare.

If the lensflare shall follow a specific object (such as a skybox) it is important, that this position lies on the object and not just in that direction.

Definition at line 47 of file pgLensflare.h.

```
47 {   pos = nPos; }
```

The documentation for this class was generated from the following file:

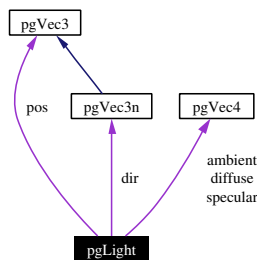
- [pgLensflare.h](#)

5.19 pgLight Class Reference

pgLight stores all information about a light

```
#include <pgLight.h>
```

Collaboration diagram for pgLight:



Public Types

- enum **TYPE** { **TYPE_POINT** = D3DLIGHT_POINT, **TYPE_SPOT** = D3DLIGHT_SPOT, **TYPE_DIRECTIONAL** = D3DLIGHT_DIRECTIONAL }

Type of light source.

Public Methods

- **pgLight** ()
Creates a default white light.
- **pgLight** (TYPE nType, const **pgVec3n** &nDir, const **pgVec3** &nPos, const **pgVec4** &nAmbient, const **pgVec4** &nDiffuse, const **pgVec4** &nSpecular, float nRange)
Creates a light where the most important values are set.
- void **setColors** (const **pgVec4** &nAmbient, const **pgVec4** &nDiffuse, const **pgVec4** &nSpecular)
Sets all color values at once.
- void **setType** (TYPE nType)
Sets the type of light (point, spot, directional).
- void **setDirection** (const **pgVec3n** &nDir)
Sets the direction of the light.
- void **setPosition** (const **pgVec3** &nPos)
Sets the position of the light.
- void **setAmbient** (const **pgVec4** &nAmbient)
Sets the ambient color property.
- void **setDiffuse** (const **pgVec4** &nDiffuse)

Sets the diffuse color property.

- void `setSpecular` (const `pgVec4` &nSpecular)

Sets the specular color property.

- void `setRange` (float nRange)

Sets the range of the light.

Friends

- class `pgLighting`

5.19.1 Detailed Description

`pgLight` stores all information about a light

`pgLight` object can be a point, a spot or a directional light. Some of the properties only make sense for specific light types.

Definition at line 30 of file `pgLight.h`.

5.19.2 Member Enumeration Documentation

5.19.2.1 enum `pgLight::TYPE`

Type of light source.

Enumeration values:

TYPE_POINT Point light: direction has to be calculated for each vertex

TYPE_SPOT Spot light: the slowest type of light

TYPE_DIRECTIONAL Directional light: fastest type of light. direction is same for each vertex

Definition at line 35 of file `pgLight.h`.

```

35         {
36             TYPE_POINT = D3DLIGHT_POINT,
37             TYPE_SPOT = D3DLIGHT_SPOT,
38             TYPE_DIRECTIONAL = D3DLIGHT_DIRECTIONAL
39         };

```

5.19.3 Member Function Documentation

5.19.3.1 void `pgLight::setDirection` (const `pgVec3n` & *nDir*)

Sets the direction of the light.

This property is only valid for spot or directional lights.

5.19.3.2 void pgLight::setPosition (const pgVec3 & nPos)

Sets the position of the light.

This property is only valid for point and spot lights.

5.19.3.3 void pgLight::setRange (float nRange)

Sets the range of the light.

This property is only valid for point and spot lights.

The documentation for this class was generated from the following file:

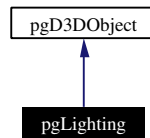
- pgLight.h

5.20 pgLighting Class Reference

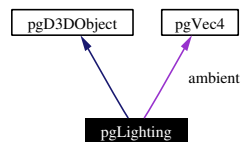
A pgLighting is a fix set of lights which can be applied to an object up to be rendered.

```
#include <pgLighting.h>
```

Inheritance diagram for pgLighting:



Collaboration diagram for pgLighting:



Public Methods

- void `addLight` (`pgLight *nLight`)
Adds a light (only up to 8 lights are allowed).
- int `getNumLights` () const
Returns how many lights are set.
- `pgLight *` `getLight` (int nIndex)
Retrieves a specific light from the lighting.
- void `removeLight` (int nIndex)
Removes a light.
- void `removeAllLights` ()
Removes all lights at once.
- void `setBaseAmbient` (const `pgVec4 &nColor`)
Sets the base ambient color value.
- void `applyLighting` ()
Applies the lighting to the render device.
- virtual void `deleteDeviceObjects` ()
The implementing object has to destroy all device dependent objects.
- virtual bool `restoreDeviceObjects` ()

The implementing object has to recreate all device dependent objects.

- void [turnOffLighting](#) ()

Turns of lighting.

5.20.1 Detailed Description

A pgLighting is a fix set of lights which can be applied to an object up to be rendered.

A pgLighting can consist of up to 8 lights. Additionally a common base ambient value can be set.

Definition at line 31 of file pgLighting.h.

5.20.2 Member Function Documentation

5.20.2.1 void pgLighting::applyLighting ()

Applies the lighting to the render device.

This method activates lighting. After this method was called lighting is enabled until [turnOffLighting\(\)](#) is called

5.20.2.2 virtual void pgLighting::deleteDeviceObjects () [inline, virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device dependent objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' [deleteDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

Definition at line 75 of file pgLighting.h.

```
75 {}
```

5.20.2.3 virtual bool pgLighting::restoreDeviceObjects () [inline, virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' [restoreDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

Definition at line 76 of file pgLighting.h.

```
76 { return true; }
```

5.20.2.4 void pgLighting::setBaseAmbient (const pgVec4 & *nColor*)

Sets the base ambient color value.

This ambient color value is added to all lights

The documentation for this class was generated from the following file:

- pgLighting.h

5.21 pgList< TYPE > Class Template Reference

pgList is a template class for storing simple objects directly in the list (no pointers)

```
#include <pgList.h>
```

Inheritance diagram for pgList< TYPE >:



Public Methods

- **int** `getSize ()` const
Returns the number of objects currently stored in the list.
- **bool** `isEmpty ()` const
Returns true if the list is empty.
- **bool** `checkIndex (int index)` const
Checks if the index is valid.
- **void** `setGrowingSize (int size)`
Sets how many elements the list grows when growing is done.
- **bool** `enlargeList (int size=-1)`
Lets the list grow 'size' elemens.
- **bool** `enlargeListSet (int size=-1)`
Enlarge the lists by a given size and set the lists size.
- **int** `setSize (int nSize)`
Enlarges/Reduces the list to a given size.
- **virtual int** `addHead (const TYPE &item)`
Adds one element to the head of the list (SLOW).
- **virtual int** `addTail (const TYPE &item)`
Adds one element to the tail of the list.
- **virtual int** `addTailAgain ()`
Adds the last element of the list to the list again.
- **virtual int** `addTail (const TYPE *item, int nSize)`
Adds 'nSize' elements to the tail of the list.
- **virtual int** `insertAfter (int index, const TYPE &item)`
Inserts one element after the given index (SLOW).

- virtual int [insertBefore](#) (int index, const TYPE &item)
Inserts one element before the given index (SLOW).
- virtual bool [setList](#) (const TYPE *item, int nSize)
Takes 'nSize' elements starting at the given address and copies them into the list.
- virtual bool [setAt](#) (int index, const TYPE &item)
Overwrites one element.
- virtual bool [replaceIndices](#) (int nIndexA, int nIndexB)
Replaces the indices of the 2 items.
- virtual bool [replace](#) (const TYPE &old, const TYPE &item)
Replaces the first found element which is equal to 'old' with 'item'.
- virtual bool [replaceAll](#) (const TYPE &old, const TYPE &item)
Replaces all elements which are equal to 'old' with 'item'.
- bool [getHead](#) (TYPE &item) const
Returns the first element of the list.
- TYPE & [getHead](#) () const
Returns the first element of the list.
- bool [getTail](#) (TYPE &item) const
Returns the last element of the list.
- TYPE & [getTail](#) () const
Returns the last element of the list.
- bool [getAt](#) (int index, TYPE &item) const
Returns the element at the given position.
- TYPE & [getAt](#) (int index) const
Returns the element at the given position.
- bool [removeHead](#) ()
Removing the first element of the list (SLOW).
- bool [removeTail](#) ()
Removing the last element of the list.
- bool [removeItem](#) (const TYPE &item)
Removes the first element in the list which is equal to 'item'.
- virtual bool [removeIndex](#) (int index)
Removes the element a position 'index'.
- virtual bool [removeAll](#) ()
Empties the list.

- int `find` (const TYPE &item)
Finds the first element which is equal to 'item'.
- int `findAfter` (const TYPE &item, int after)
Finds the first element which is equal to 'item' and positioned after 'after'.
- int `findBefore` (const TYPE &item, int before)
Finds the first element which is equal to 'item' and positioned before 'before'.
- virtual pgList * `getSubList` (int from, int to)
Returns a part of the list.
- TYPE & `operator[]` (unsigned index) const
Gives direct access to the list members.
- pgList< TYPE > & `operator=` (const pgList< TYPE > &other)
Copies a list from another list.

Friends

- bool `operator==` (const pgList &, const pgList &)
Compares two lists.

5.21.1 Detailed Description

template<class TYPE> class pgList< TYPE >

pgList is a template class for storing simple objects directly in the list (no pointers)

See also: plPtrList

Definition at line 30 of file pgList.h.

5.21.2 Member Function Documentation

5.21.2.1 template<class TYPE> bool pgList< TYPE >::getAt (int index, TYPE & item) const
[inline]

Returns the element at the given position.

Returns false if the list is empty

Definition at line 620 of file pgList.h.

References pgList< TYPE >::checkIndex().

```

622 {
623     if (!checkIndex(index))
624     {
625         raiseError("IndexError");

```

```

626         assert(1);
627         return false;
628     }
629     try
630     {
631         item = array[index];
632     }
633     catch(...)
634     {
635         raiseError("in Get At");
636         return false;
637     }
638     return true;

```

5.21.2.2 **template<class TYPE> bool pgList< TYPE >::getHead (TYPE & *item*) const** [inline]

Returns the first element of the list.

Returns false if the list is empty

Definition at line 548 of file pgList.h.

```

550 {
551     if (actualItemCount>0)
552     {
553         raiseError("Item not found");
554         return false;
555     }
556     try
557     {
558         item = array[0];
559     }
560     catch(...)
561     {
562         raiseError("in GetHead");
563         return false;
564     }
565     return true;

```

5.21.2.3 **template<class TYPE> bool pgList< TYPE >::getTail (TYPE & *item*) const** [inline]

Returns the last element of the list.

Returns false if the list is empty

Definition at line 584 of file pgList.h.

```

586 {
587     if (actualItemCount<1)
588     {
589         raiseError("Item not found");
590         return false;
591     }
592     try
593     {
594         item = array[actualItemCount-1];
595     }
596     catch(...)

```

```
597     {  
598         raiseError("in GetTail");  
599         return false;  
600     }  
601     return true;
```

5.21.3 Friends And Related Function Documentation

5.21.3.1 `template<class TYPE> bool operator==(const pgList< TYPE > &, const pgList< TYPE > &) [friend]`

Compares two lists.

Each item is compared. (therefore TYPE must have an operator==). If all items are ident, true is returned.

Definition at line 228 of file pgList.h.

```
229 { return false; }
```

The documentation for this class was generated from the following file:

- pgList.h

5.22 pgLog Class Reference

Use this class from anywhere to do logging into a file.

```
#include <pgLog.h>
```

Static Public Methods

- void [init](#) (const char *nLogFileName)
[init\(\)](#) has to be called before the first log can be saved.
- void [info](#) (const char *szFormat,...)
Logs an info message.
- void [error](#) (const char *szFormat,...)
Logs an error message.
- void [trace](#) (const char *szFormat,...)
Writes a message to debug output in visual studio.

5.22.1 Detailed Description

Use this class from anywhere to do logging into a file.

Before the first logging method is invoked, [init\(\)](#) must be called.

Definition at line 23 of file pgLog.h.

5.22.2 Member Function Documentation

5.22.2.1 void pgLog::error (const char * szFormat, ...) [static]

Logs an error message.

Parameters work same as for printf

5.22.2.2 void pgLog::info (const char * szFormat, ...) [static]

Logs an info message.

Parameters work same as for printf

5.22.2.3 void pgLog::init (const char * nLogFileName) [static]

[init\(\)](#) has to be called before the first log can be saved.

Since most of pgLibs classes do logging during their initialization, this method has to be called, before any other initialization is done. Therefore calling [pgLog::init\(\)](#) should be the first call of any pgLib method.

5.22.2.4 void pgLog::trace (const char * *szFormat*, ...) [static]

Writes a message to debug output in visual studio.

Parameters work same as for printf

The documentation for this class was generated from the following file:

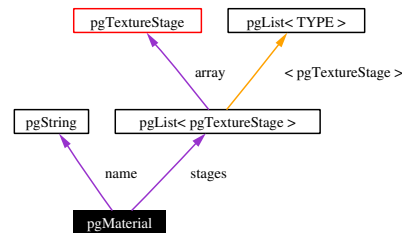
- pgLog.h

5.23 pgMaterial Class Reference

pgMaterial defines the properties of a surface

```
#include <pgMaterial.h>
```

Collaboration diagram for pgMaterial:



Public Types

- enum **CULLING** { **CULL_NONE** = D3DCULL_NONE, **CULL_CW** = D3DCULL_CW, **CULL_CCW** = D3DCULL_CCW }

Type of culling performed for each triangle.

- enum **BLEND** { **BLEND_NONE** = 0, **BLEND_ZERO** = D3DBLEND_ZERO, **BLEND_ONE** = D3DBLEND_ONE, **BLEND_SRCCOLOR** = D3DBLEND_SRCCOLOR, **BLEND_INVSRCOLOR** = D3DBLEND_INVSRCOLOR, **BLEND_SRCALPHA** = D3DBLEND_SRCALPHA, **BLEND_INVSRCALPHA** = D3DBLEND_INVSRCALPHA, **BLEND_DESTALPHA** = D3DBLEND_DESTALPHA, **BLEND_INVDESTALPHA** = D3DBLEND_INVDESTALPHA, **BLEND_DESTCOLOR** = D3DBLEND_DESTCOLOR, **BLEND_INVDESTCOLOR** = D3DBLEND_INVDESTCOLOR }

Type of calculation how stage sources are combined.

Public Methods

- void **addStage** (const **pgTextureStage** &nStage)
Adds a texture stage to the material.
- void **setCulling** (**CULLING** nCull)
Sets a culling method (clockwise, counterclockwise or none).
- D3DMATERIAL8 * **getDDMaterial** ()
Returns the underlying Direct3D material which is applied to the render device.

Friends

- class **pgSegment**

5.23.1 Detailed Description

pgMaterial defines the properties of a surface

A pgMaterial object defines lighting properties (how the surface reacts to lights) and texture stages. Each [pgSegment](#) object must have a pgMaterial in order to be rendered.

Definition at line 34 of file pgMaterial.h.

5.23.2 Member Enumeration Documentation

5.23.2.1 enum pgMaterial::BLEND

Type of calculation how stage sources are combined.

Enumeration values:

- BLEND_NONE** Undefined
- BLEND_ZERO** Value is replaced (multiplied) by zero
- BLEND_ONE** Value is multiplied by one (unchanged)
- BLEND_SRCCOLOR** Value is multiplied by source color
- BLEND_INVSRCOLOR** Value is multiplied by one minus source color
- BLEND_SRCALPHA** Value is multiplied by source alpha
- BLEND_INVSRCALPHA** Value is multiplied by one minus source alpha
- BLEND_DESTALPHA** Value is multiplied by destination alpha
- BLEND_INVDESTALPHA** Value is multiplied by one minus destination alpha
- BLEND_DESTCOLOR** Value is multiplied by destination color
- BLEND_INVDESTCOLOR** Value is multiplied by one minus destination color

Definition at line 47 of file pgMaterial.h.

```

47         {   BLEND_NONE           = 0,
48             BLEND_ZERO           = D3DBLEND_ZERO,
49             BLEND_ONE            = D3DBLEND_ONE,
50             BLEND_SRCCOLOR       = D3DBLEND_SRCCOLOR,
51             BLEND_INVSRCOLOR     = D3DBLEND_INVSRCOLOR,
52             BLEND_SRCALPHA       = D3DBLEND_SRCALPHA,
53             BLEND_INVSRCALPHA    = D3DBLEND_INVSRCALPHA,
54             BLEND_DESTALPHA     = D3DBLEND_DESTALPHA,
55             BLEND_INVDESTALPHA   = D3DBLEND_INVDESTALPHA,
56             BLEND_DESTCOLOR     = D3DBLEND_DESTCOLOR,
57             BLEND_INVDESTCOLOR   = D3DBLEND_INVDESTCOLOR,
58             BLEND_SRCALPHASAT    = D3DBLEND_SRCALPHASAT,
59             BLEND_BOTHSRCALPHA   = D3DBLEND_BOTHSRCALPHA,
60             BLEND_BOTHINVSRCALPHA = D3DBLEND_BOTHINVSRCALPHA
61         };

```

5.23.2.2 enum pgMaterial::CULLING

Type of culling performed for each triangle.

Enumeration values:

- CULL_NONE** No culling performed

CULL_CW Clockwise culling

CULL_CCW Counterclockwise culling

Definition at line 40 of file pgMaterial.h.

```
40          { CULL_NONE = D3DCULL_NONE,
41            CULL_CW = D3DCULL_CW,
42            CULL_CCW = D3DCULL_CCW
43          };
```

5.23.3 Member Function Documentation

5.23.3.1 void pgMaterial::addStage (const [pgTextureStage](#) & nStage) [inline]

Adds a texture stage to the material.

Up to 8 texture stages are allowed Keep care that the render device can not render more stages than [pg-
IDirectX::getNumTextureBlendStages\(\)](#) returns

Definition at line 88 of file pgMaterial.h.

```
88 { stages.addTail(nStage); }
```

The documentation for this class was generated from the following file:

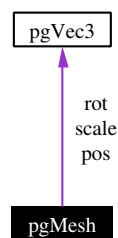
- pgMaterial.h

5.24 pgMesh Class Reference

A pgMesh is a complex 3D object which can consist of several segments.

```
#include <pgMesh.h>
```

Collaboration diagram for pgMesh:



Public Methods

- void **addSegment** (**pgSegment** *nSegment)
Adds a segment to the mesh.
- int **getNumFrames** () const
Returns the number of frames the segments have.
- int **renderTweenedWithBlendTextures** (float nFrame, int nMinFrame, int nMaxFrame, **pgTexturePtr** nTexture0, **pgTexturePtr** nTexture1, float nTexBlend)
Renders the mesh by blending each segment between two frames.
- int **renderTweened** (float nFrame, int nMinFrame, int nMaxFrame)
Renders the mesh by blending each segment between two frames.
- void **render** (int nFrame=0, int nSegment=-1)
Renders the set frame. if nSegment is -1 all segments are rendered.
- **pgAABBox** **getBBox** (int nIndex)
Returns a bounding box which contains the frame number nIndex in all segments.

Friends

- class **pgMeshUtil**

5.24.1 Detailed Description

A pgMesh is a complex 3D object which can consist of several segments.

A pgMesh object contains one or more segment in order to support more than one texture per mesh. A pgMesh object has to be created/loaded by **pgMeshUtil**.

Definition at line 31 of file pgMesh.h.

5.24.2 Member Function Documentation

5.24.2.1 void pgMesh::addSegment ([pgSegment](#) * *nSegment*) [inline]

Adds a segment to the mesh.

The mesh can consist of any number of segments

Definition at line 42 of file pgMesh.h.

```
42 { segments.addTail(nSegment); }
```

5.24.2.2 int pgMesh::getNumFrames () const [inline]

Returns the number of frames the segments have.

It's considered that each segment has the same number of frames.

Definition at line 55 of file pgMesh.h.

```
55 { return segments.getSize() ? segments[0]->getNumFrames() : 0; }
```

5.24.2.3 int pgMesh::renderTweened (float *nFrame*, int *nMinFrame*, int *nMaxFrame*)

Renders the mesh by blending each segment between two frames.

Works exactly the as renderTweenedWithBlendTextures, except that the texture settings are used from the segments' stage settings

5.24.2.4 int pgMesh::renderTweenedWithBlendTextures (float *nFrame*, int *nMinFrame*, int *nMaxFrame*, [pgTexturePtr](#) *nTexture0*, [pgTexturePtr](#) *nTexture1*, float *nTexBlend*)

Renders the mesh by blending each segment between two frames.

this methods expects the mesh to have at least nMaxFrame frames nFrame must be between 0.0 and 1.0. the method automatically determines between which two frames it has to tween nTexture0 must always be !=NULL. if nTexture1 is !=NULL and nTexBlend != 0.0 then a blending between the two textures is performed

The documentation for this class was generated from the following file:

- pgMesh.h

5.25 pgMeshUtil Class Reference

Creates and updates [pgBaseMesh](#) and [pgMesh](#) objects.

```
#include <pgMeshUtil.h>
```

Static Public Methods

- [pgBaseMesh](#) * [createBox](#) (const [pgAABBox](#) &nBox, DWORD nColor)
Creates a box mesh with texture coordinates. All vertices get the given color.
- bool [updateBox](#) ([pgBaseMesh](#) *nMesh, const [pgAABBox](#) &nBox, DWORD nColor)
Updates the mesh to be a box with the given coordinates.
- [pgBaseMesh](#) * [loadMD2](#) (const char *nName, bool nLighting=false)
Creates an [pgBaseMesh](#) from an MD2 file.
- [pgMesh](#) * [loadOBJ](#) (const char *nName, bool nLighting=true)
Creates an [pgMesh](#) from an OBJ file.

5.25.1 Detailed Description

Creates and updates [pgBaseMesh](#) and [pgMesh](#) objects.

Definition at line 36 of file [pgMeshUtil.h](#).

5.25.2 Member Function Documentation

5.25.2.1 [pgBaseMesh](#)* [pgMeshUtil::loadMD2](#) (const char * nName, bool nLighting = false)
[static]

Creates an [pgBaseMesh](#) from an MD2 file.

If nLighting is true a mesh with lighting support (normals, no fix vertex colors) is created

5.25.2.2 [pgMesh](#)* [pgMeshUtil::loadOBJ](#) (const char * nName, bool nLighting = true) [static]

Creates an [pgMesh](#) from an OBJ file.

If nLighting is true a mesh with lighting support (normals) is created

5.25.2.3 bool [pgMeshUtil::updateBox](#) ([pgBaseMesh](#) * nMesh, const [pgAABBox](#) & nBox, DWORD nColor) [static]

Updates the mesh to be a box with the given coordinates.

Number of vertices and indices must already be correct (usually the mesh will already be a box, which only gets new coordinates)

The documentation for this class was generated from the following file:

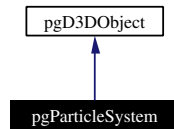
- pgMeshUtil.h

5.26 pgParticleSystem Class Reference

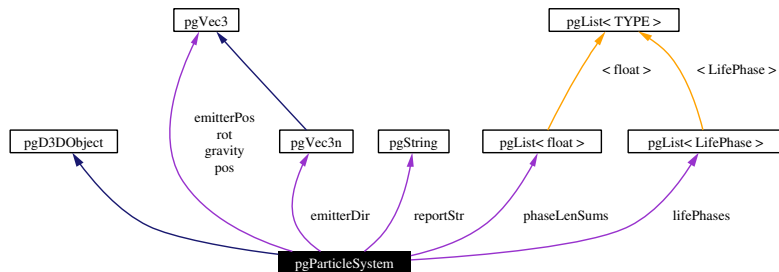
Creates and animates a particle system from a .ps file.

```
#include <pgParticleSystem.h>
```

Inheritance diagram for pgParticleSystem:



Collaboration diagram for pgParticleSystem:



Public Types

- enum
- enum `EFFECT` { `EFFECT_NORMAL`, `EFFECT_SPHERE_NORMAL`, `EFFECT_SPHERE_FLEE`, `EFFECT_CYLINDER_NORMAL`, `EFFECT_CYLINDER_FLEE` }

Predefined effect type.

- enum `BLEND` { `BLEND_UNKNOWN` = 0, `BLEND_ZERO` = `D3DBLEND_ZERO`, `BLEND_ONE` = `D3DBLEND_ONE`, `BLEND_SRCCOLOR` = `D3DBLEND_SRCCOLOR`, `BLEND_INVSRCOLOR` = `D3DBLEND_INVSRCOLOR`, `BLEND_SRCALPHA` = `D3DBLEND_SRCALPHA`, `BLEND_INVSRCALPHA` = `D3DBLEND_INVSRCALPHA`, `BLEND_DESTALPHA` = `D3DBLEND_DESTALPHA`, `BLEND_INVDESTALPHA` = `D3DBLEND_INVDESTALPHA`, `BLEND_DESTCOLOR` = `D3DBLEND_DESTCOLOR`, `BLEND_INVDESTCOLOR` = `D3DBLEND_INVDESTCOLOR` }

Type of calculation how stage sources are combined.

Public Methods

- bool `load` (const char *nFile)
Loads settings from a .ps file.
- void `setEffect` (`EFFECT` nEffect)

This methods are only needed if the particle system is created manually.

- bool `create` (int nMaxParticles)
Creates the particle system after all properties have been set.
- void `cleanup` ()
Frees all resource from the particle system.
- void `emitParticles` (int nNum)
Tells the particle system to emit (additional) nNum new particles during the next update.
- void `update` ()
Updates the particle system. All particles are moved and "grow older".
- void `render` ()
Renders the particle system.
- void `startEmitting` ()
Tells the particle system to automatically emit as many particles per second as set with `setEmitPerSecond()`.
- void `stopEmitting` ()
Stops automatic particle emitting.
- bool `isEmitting` ()
Returns true if the automatic particle emitting is currently active.
- virtual void `deleteDeviceObjects` ()
The implementing object has to destroy all device dependent objects.
- virtual bool `restoreDeviceObjects` ()
The implementing object has to recreate all device dependent objects.

5.26.1 Detailed Description

Creates and animates a particle system from a .ps file.

For more information about .ps files see the manual

Definition at line 31 of file pgParticleSystem.h.

5.26.2 Member Enumeration Documentation

5.26.2.1 enum pgParticleSystem::BLEND

Type of calculation how stage sources are combined.

Enumeration values:

BLEND_UNKNOWN Undefined

BLEND_ZERO Value is replaced (multiplied) by zero

BLEND_ONE Value is multiplied by one (unchanged)
BLEND_SRCCOLOR Value is multiplied by source color
BLEND_INVSRCOLOR Value is multiplied by one minus source color
BLEND_SRCALPHA Value is multiplied by source alpha
BLEND_INVSRCALPHA Value is multiplied by one minus source alpha
BLEND_DESTALPHA Value is multiplied by destination alpha
BLEND_INVDESTALPHA Value is multiplied by one minus destination alpha
BLEND_DESTCOLOR Value is multiplied by destination color
BLEND_INVDESTCOLOR Value is multiplied by one minus destination color

Definition at line 65 of file pgParticleSystem.h.

```

65         {
66             BLEND_UNKNOWN           = 0,
67             BLEND_ZERO              = D3DBLEND_ZERO,
68             BLEND_ONE               = D3DBLEND_ONE,
69             BLEND_SRCCOLOR          = D3DBLEND_SRCCOLOR,
70             BLEND_INVSRCOLOR        = D3DBLEND_INVSRCOLOR,
71             BLEND_SRCALPHA          = D3DBLEND_SRCALPHA,
72             BLEND_INVSRCALPHA       = D3DBLEND_INVSRCALPHA,
73             BLEND_DESTALPHA         = D3DBLEND_DESTALPHA,
74             BLEND_INVDESTALPHA      = D3DBLEND_INVDESTALPHA,
75             BLEND_DESTCOLOR         = D3DBLEND_DESTCOLOR,
76             BLEND_INVDESTCOLOR      = D3DBLEND_INVDESTCOLOR,
77             BLEND_SRCALPHASAT       = D3DBLEND_SRCALPHASAT,
78             BLEND_BOTHSRCALPHA      = D3DBLEND_BOTHSRCALPHA,
79             BLEND_BOTHINVSRCALPHA  = D3DBLEND_BOTHINVSRCALPHA
80         };

```

5.26.2.2 enum pgParticleSystem::EFFECT

Predefined effect type.

Enumeration values:

EFFECT_NORMAL Particles emit at the emitter and work only with gravity : DEFAULT
EFFECT_SPHERE_NORMAL Particles emit on a sphere and work only with gravity
EFFECT_SPHERE_FLEE Particles emit on a sphere and move away from the center
EFFECT_CYLINDER_NORMAL Particles emit on a cylinder and work only with gravity
EFFECT_CYLINDER_FLEE Particles emit on a cylinder and move away from the center axis

Definition at line 55 of file pgParticleSystem.h.

```

55         {
56             EFFECT_NORMAL,
57             EFFECT_SPHERE_NORMAL,
58             EFFECT_SPHERE_FLEE,
59             EFFECT_CYLINDER_NORMAL,
60             EFFECT_CYLINDER_FLEE,
61             EFFECT_CYLINDER_ROTATE };

```

5.26.3 Member Function Documentation

5.26.3.1 `bool pgParticleSystem::create (int nMaxParticles)`

Creates the particle system after all properties have been set.

If the particle system was created manually (without loading from file) the creation process has to be finished by calling `create()`.

5.26.3.2 `virtual void pgParticleSystem::deleteDeviceObjects ()` [virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' `deleteDeviceObjects()` methods.

Implements `pgD3DObject`.

5.26.3.3 `bool pgParticleSystem::load (const char * nFile)`

Loads settings from a .ps file.

`create()` is called internally

5.26.3.4 `virtual bool pgParticleSystem::restoreDeviceObjects ()` [virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' `restoreDeviceObjects()` methods.

Implements `pgD3DObject`.

5.26.3.5 `void pgParticleSystem::setEffect (EFFECT nEffect)` [inline]

This methods are only needed if the particle system is created manually.

See the technical manual for a description of these settings.

Definition at line 116 of file `pgParticleSystem.h`.

```
116 {   effect = nEffect; }
```

The documentation for this class was generated from the following file:

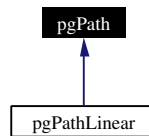
- `pgParticleSystem.h`

5.27 pgPath Class Reference

This class defines the basic path interface which all path classes have to implement.

```
#include <pgPath.h>
```

Inheritance diagram for pgPath:



Public Types

- enum `TYPE` { `TYPE_NONE`, `TYPE_LINEAR` }

Types of paths.

Public Methods

- virtual `pgVec3 getPosition` (float `nPos`)=0
Returns the interpolated position on the path.
- virtual `pgVec3n getDirection` (float `nPos`)=0
Returns the interpolated rotation on the path.
- virtual int `getPosDir` (float `nPos`, `pgVec3` &`nPosition`, `pgVec3n` &`nDirection`)=0
Returns the interpolated position and rotation.
- virtual `TYPE getType` () const
Returns the type of the path.
- virtual float `getLength` () const=0
Returns the length of the path.

5.27.1 Detailed Description

This class defines the basic path interface which all path classes have to implement.

Some of the get-methods are not constant, since a path might want to cache request data (section of last request, etc...)

Definition at line 26 of file `pgPath.h`.

5.27.2 Member Enumeration Documentation

5.27.2.1 enum pgPath::TYPE

Types of paths.

Enumeration values:

TYPE_NONE Undefined Path Type

TYPE_LINEAR Linear Path

Definition at line 30 of file pgPath.h.

```

31         {
32             TYPE_NONE,
33             TYPE_LINEAR

```

5.27.3 Member Function Documentation

5.27.3.1 virtual pgVec3n pgPath::getDirection (float nPos) [pure virtual]

Returns the interpolated rotation on the path.

nPos must be in range [0.0-1.0]

Implemented in [pgPathLinear](#).

5.27.3.2 virtual int pgPath::getPosDir (float nPos, pgVec3 & nPosition, pgVec3n & nDirection) [pure virtual]

Returns the interpolated position and rotation.

This method is far more efficient than calling [getPosition\(\)](#) and [getRotation\(\)](#) separately nPos must be in range [0.0-1.0] Returns the index of the base vertex used

Implemented in [pgPathLinear](#).

5.27.3.3 virtual pgVec3 pgPath::getPosition (float nPos) [pure virtual]

Returns the interpolated position on the path.

nPos must be in range [0.0-1.0]

Implemented in [pgPathLinear](#).

The documentation for this class was generated from the following file:

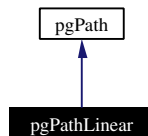
- pgPath.h

5.28 pgPathLinear Class Reference

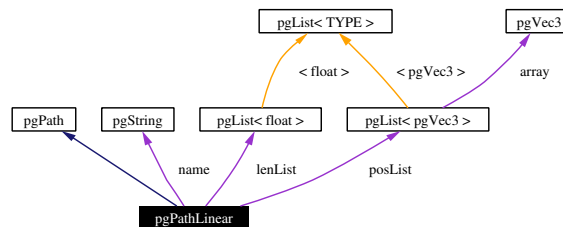
This class implements the basic [pgPath](#) interface.

```
#include <pgPathLinear.h>
```

Inheritance diagram for pgPathLinear:



Collaboration diagram for pgPathLinear:



Public Methods

- bool [load](#) (const char *nFileName)
Loads a path from the file.
- void [setInterpolateRotation](#) (bool nEnable)
Enables interpolation of the rotation.
- int [getNumCorners](#) () const
Returns the number of corners, which build this linear path.
- const [pgVec3](#) & [getCorner](#) (int nIndex) const
Returns a specific corner.
- virtual [pgVec3](#) [getPosition](#) (float nPos)
Returns the interpolated position on the path.
- virtual [pgVec3n](#) [getDirection](#) (float nPos)
Returns the interpolated rotation on the path.
- virtual int [getPosDir](#) (float nPos, [pgVec3](#) &nPosition, [pgVec3n](#) &nDirection)
Returns the interpolated position and rotation.
- virtual float [getLength](#) () const
Returns the length of the path.

5.28.1 Detailed Description

This class implements the basic [pgPath](#) interface.

It provides a path constructed of linear subsection (polyline). the rotation can be interpolated if requested.

Definition at line 27 of file `pgPathLinear.h`.

5.28.2 Member Function Documentation

5.28.2.1 virtual [pgVec3n](#) `pgPathLinear::getDirection (float nPos)` [virtual]

Returns the interpolated rotation on the path.

`nPos` must be in range [0.0-1.0]

Implements [pgPath](#).

5.28.2.2 virtual int `pgPathLinear::getPosDir (float nPos, pgVec3 & nPosition, pgVec3n & nDirection)` [virtual]

Returns the interpolated position and rotation.

This method is far more efficient than calling [getPosition\(\)](#) and [getRotation\(\)](#) separately `nPos` must be in range [0.0-1.0] Returns the index of the base vertex used

Implements [pgPath](#).

5.28.2.3 virtual [pgVec3](#) `pgPathLinear::getPosition (float nPos)` [virtual]

Returns the interpolated position on the path.

`nPos` must be in range [0.0-1.0]

Implements [pgPath](#).

5.28.2.4 bool `pgPathLinear::load (const char * nFileName)`

Loads a path from the file.

This method load a path from a file Each line must contain three float values. In order to support 3dsMAX the y & z values are exchanged.

5.28.2.5 void `pgPathLinear::setInterpolateRotation (bool nEnable)` [inline]

Enables interpolation of the rotation.

Not implemented yet.

Definition at line 46 of file `pgPathLinear.h`.

```
46 {  interpolRot = nEnable; }
```

The documentation for this class was generated from the following file:

- `pgPathLinear.h`

5.29 pgPlane Class Reference

This class implements a plane.

```
#include <pgPlane.h>
```

5.29.1 Detailed Description

This class implements a plane.

Definition at line 24 of file pgPlane.h.

The documentation for this class was generated from the following file:

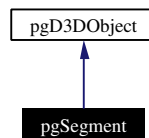
- pgPlane.h

5.30 pgSegment Class Reference

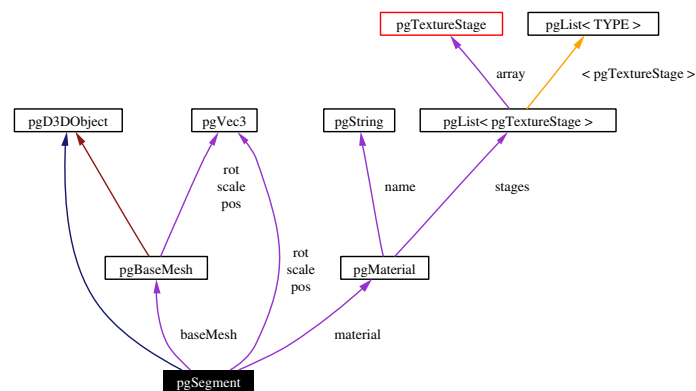
A pgSegment object can render a 3d object having exactly one material.

```
#include <pgSegment.h>
```

Inheritance diagram for pgSegment:



Collaboration diagram for pgSegment:



Public Types

- enum `SETTINGS` { `SET_LIGHT` = 1, `SET_ZTEST` = 2, `SET_ZWRITE` = 4, `SET_ALPHATEST` = 8, `SET_FILL` = 16, `SET_TEXTURED` = 32 }

Properties of a pgSegment.

Public Methods

- void `setBaseMesh` (`pgBaseMesh` *nBaseMesh)
Sets the base mesh, which is rendered during `render()`.
- void `setRenderSettings` (int nSettings)
Sets the current render settings. all previous render settings are lost.
- void `enableRenderSettings` (int nSettings)
Enables specific render settings.
- void `disableRenderSettings` (int nSettings)

Disables specific render settings.

- void [setMaterial](#) ([pgMaterial](#) *nMaterial)
Sets the material to use during rendering.
- void [updateRenderSettings](#) ()
Updates the render settings().
- int [getNumFrames](#) () const
Returns the number of frames which are stored in the base mesh.
- int [renderTweenedWithBlendTextures](#) (float nFrame, int nMinFrame, int nMaxFrame, [pgTexturePtr](#) nTexture0, [pgTexturePtr](#) nTexture1, float nTexBlend)
Renders the mesh by blending each segment between two frames.
- int [renderTweened](#) (float nFrame, int nMinFrame, int nMaxFrame)
Renders the mesh by blending each segment between two frames.
- void [render](#) (int nFrame)
Renders the set frame.
- [pgAABBox](#) * [getBBox](#) (int nIndex)
Returns the basemesh's bounding box.
- void [deleteDeviceObjects](#) ()
The implementing object has to destroy all device dependent objects.
- bool [restoreDeviceObjects](#) ()
The implementing object has to recreate all device dependent objects.

Friends

- class [pgMeshUtil](#)

5.30.1 Detailed Description

A pgSegment object can render a 3d object having exactly one material.

For optimal rendering speed it is necessary to store triangles sorted by material. A pgSegment object has exactly one material and can therefore be rendered by one single DirectX call. In order to create/use objects consisting of more than one material use [pgMesh](#) which stores an arbitrary number of pgSegments.

Definition at line 37 of file pgSegment.h.

5.30.2 Member Enumeration Documentation

5.30.2.1 enum pgSegment::SETTINGS

Properties of a pgSegment.

Enumeration values:

- SET_LIGHT** Mesh will render with light
- SET_ZTEST** Mesh will do z-tests
- SET_ZWRITE** Mesh will do z-testing
- SET_ALPHATEST** Mesh will do alpha testing
- SET_FILL** Mesh will fill its triangles
- SET_TEXTURED** Mesh will draw textures

Definition at line 43 of file pgSegment.h.

```

43         {
44             SET_LIGHT      = 1,
45             SET_ZTEST      = 2,
46             SET_ZWRITE     = 4,
47             SET_ALPHATEST  = 8,
48             SET_FILL       = 16,
49             SET_TEXTURED   = 32
50     };

```

5.30.3 Member Function Documentation

5.30.3.1 void pgSegment::deleteDeviceObjects () [virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' [deleteDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

5.30.3.2 int pgSegment::renderTweened (float *nFrame*, int *nMinFrame*, int *nMaxFrame*)

Renders the mesh by blending each segement between two frames.

Works exactly the as [renderTweenedWithBlendTextures](#), except that the texture settings are used from the segments' stage settings

5.30.3.3 int pgSegment::renderTweenedWithBlendTextures (float *nFrame*, int *nMinFrame*, int *nMaxFrame*, [pgTexturePtr](#) *nTexture0*, [pgTexturePtr](#) *nTexture1*, float *nTexBlend*)

Renders the mesh by blending each segement between two frames.

this methods expects the mesh to have at least *nMaxFrame* frames *nFrame* must be between 0.0 and 1.0. the method automatically determines between which two frames it has to tween *nTexture0* must always be !=NULL. if *nTexture1* is !=NULL and *nTexBlend* != 0.0 then a blending between the two textures is performed

5.30.3.4 bool pgSegment::restoreDeviceObjects () [virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' [restoreDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

5.30.3.5 void pgSegment::setRenderSettings (int *nSettings*) [inline]

Sets the current render settings. all previous render settings are lost.

See pgSegment::SETTING for a list of all possible settings. (all settings can be combined freely)

Definition at line 68 of file pgSegment.h.

```
68 { settings = nSettings; }
```

5.30.3.6 void pgSegment::updateRenderSettings ()

Updates the render settings().

If any render setting of property of the set material is changed, this method has to be called in order to update the render settings

The documentation for this class was generated from the following file:

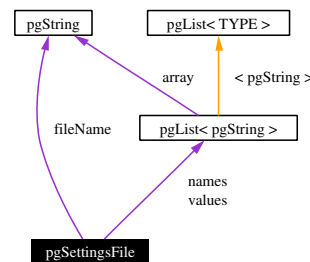
- pgSegment.h

5.31 pgSettingsFile Class Reference

This class loads settings (ini) files.

```
#include <pgSettingsFile.h>
```

Collaboration diagram for pgSettingsFile:



Public Methods

- void **reset** ()
*Removes all names and values which were retrieved by a **load()** call.*
- bool **load** (const **pgString** &nFileName)
Opens a setting file and reads all names and values from it.
- void **setLogging** (bool nSet)
Activates or deactivates logging.
- bool **getValueYes** (const **pgString** &nName, bool &nYes) const
Returns true if the value of nName is 'yes'.
- bool **getValueString** (const **pgString** &nName, **pgString** &nString) const
Returns the value of nName as a string.
- bool **getValueInt** (const **pgString** &nName, int &nInt) const
Returns the value of nName as an integer.
- bool **getValueFloat** (const **pgString** &nName, float &nFloat) const
Returns the value of nName as a float.
- bool **getValueVec2** (const **pgString** &nName, **pgVec2** &nVec2) const
Returns the value of nName as a vec2.
- bool **getValueVec3** (const **pgString** &nName, **pgVec3** &nVec3) const
Returns the value of nName as a vec3.
- bool **getValueVec4** (const **pgString** &nName, **pgVec4** &nVec4) const
Returns the value of nName as a vec4.

5.31.1 Detailed Description

This class loads settings (ini) files.

Each setting consists of the parts: a name and a value. Values can consists of more than one item. E.g.: a vec3 consists of three floats. In values consisting of more than one element all elements must be seperated by a space (no ”,” oder ”;”) All lines which are empty or start with # are ignored

Definition at line 36 of file pgSettingsFile.h.

5.31.2 Member Function Documentation

5.31.2.1 bool pgSettingsFile::getValueFloat (const pgString & nName, float & nFloat) const

Returns the value of nName as a float.

If the nName is not found false is returned.

5.31.2.2 bool pgSettingsFile::getValueInt (const pgString & nName, int & nInt) const

Returns the value of nName as an integer.

If the nName is not found false is returned.

5.31.2.3 bool pgSettingsFile::getValueString (const pgString & nName, pgString & nString) const

Returns the value of nName as a string.

If the nName is not found false is returned.

5.31.2.4 bool pgSettingsFile::getValueVec2 (const pgString & nName, pgVec2 & nVec2) const

Returns the value of nName as a vec2.

If the nName is not found or the value can not be converted into a vec2, false is returned.

5.31.2.5 bool pgSettingsFile::getValueVec3 (const pgString & nName, pgVec3 & nVec3) const

Returns the value of nName as a vec3.

If the nName is not found or the value can not be converted into a vec3, false is returned.

5.31.2.6 bool pgSettingsFile::getValueVec4 (const pgString & nName, pgVec4 & nVec4) const

Returns the value of nName as a vec4.

If the nName is not found or the value can not be converted into a vec4, false is returned.

5.31.2.7 bool pgSettingsFile::getValueYes (const pgString & nName, bool & nYes) const

Returns true if the value of nName is 'yes'.

If the nName is not found false is returned.

5.31.2.8 `bool pgSettingsFile::load (const pgString & nFileName)`

Opens a setting file and reads all names and values from it.

The list of names and values is not cleared, which allows to gather information from several setting files and merge them in one pgSettingsFile object.

5.31.2.9 `void pgSettingsFile::setLogging (bool nSet)` `[inline]`

Activates or deactivates logging.

If logging is enabled all names which are not found in the name list are logged as errors.

Definition at line 61 of file pgSettingsFile.h.

```
61 { doLogging = nSet; }
```

The documentation for this class was generated from the following file:

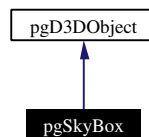
- pgSettingsFile.h

5.32 pgSkyBox Class Reference

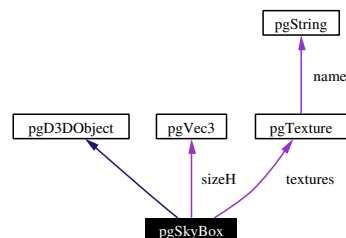
Creates and renders a skybox.

```
#include <pgSkyBox.h>
```

Inheritance diagram for pgSkyBox:



Collaboration diagram for pgSkyBox:



Public Methods

- `pgSkyBox` (bool `nDownSide`=true)
If `nDownSide` is false the bottom texture of the skybox is not drawn.
- void `setTextures` (pgTexture *nFront, pgTexture *nBack, pgTexture *nLeft, pgTexture *nRight, pgTexture *nUp, pgTexture *nDown)
Sets the textures for the six sides of the skybox cube.
- void `create` ()
Creates the skybox mesh.
- void `render` ()
Renders the skybox.
- void `deleteDeviceObjects` ()
The implementing object has to destroy all device dependent objects.
- bool `restoreDeviceObjects` ()
The implementing object has to recreate all device dependent objects.

5.32.1 Detailed Description

Creates and renders a skybox.

The skybox is automatically rotated to the direction retrieved from [pglDirectX](#)

Definition at line 27 of file `pgSkyBox.h`.

5.32.2 Constructor & Destructor Documentation

5.32.2.1 `pgSkyBox::pgSkyBox (bool nDownSide = true)`

If `nDownSide` is false the bottom texture of the skybox is not drawn.

In order to save texture memory `nDown` should be passed as NULL if `nDownSide` is true.

5.32.3 Member Function Documentation

5.32.3.1 `void pgSkyBox::deleteDeviceObjects () [virtual]`

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' [deleteDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

5.32.3.2 `bool pgSkyBox::restoreDeviceObjects () [virtual]`

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' [restoreDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

The documentation for this class was generated from the following file:

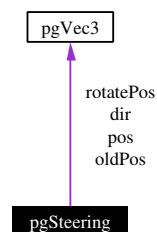
- `pgSkyBox.h`

5.33 pgSteering Class Reference

pgSteering provides basic camera movement.

```
#include <pgSteering.h>
```

Collaboration diagram for pgSteering:



Public Types

- enum `MODE` { `MODE_INSPECT`, `MODE_FLY`, `MODE_ROTATE` }
Steering Mode.

Public Methods

- void `setMode` (`MODE` nMode)
Sets a new movement mode.
- void `switchMode` ()
Switches to the next movement mode.
- void `setNewPosition` (const `pgVec3` &nPos)
Sets the current position.
- void `setOldPosition` (const `pgVec3` &nPos)
Sets the position before update was called.
- void `setDirection` (const `pgEuler` &nDir)
Sets a new direction.
- void `setInspectModeSpeed` (float nForwardSpeed, float nPitchSpeed, float nUpSpeed, float nRotateSpeed)
Sets the inspect-mode moving and rotation speed.
- void `setInspectModeFactors` (float nSpeedupFactor, float nMouseXFactor, float nMouseYFactor)
Sets the inspect-mode speedup and mouse factors.
- void `setFlyModeHead` (float nDHeadSpeed, float nMaxHeadSpeed)
Sets heading properties for fly-mode.

- void [setFlyModePitch](#) (float nDPitchSpeed, float nMaxPitchSpeed, float nMaxPitch)
Sets pitching properties for fly-mode.
- void [setFlyModeForward](#) (float nDForwardSpeed, float nMaxForwardSpeed)
Sets forward moving properties for fly-mode.
- void [setRotateModeSpeed](#) (float nForwardSpeed, float nPitchSpeed, float nUpSpeed, float nRotateSpeed)
Sets the rotate-mode moving and rotation speed.
- void [setRotateModeFactors](#) (float nSpeedupFactor, float nMouseXFactor, float nMouseYFactor)
Sets the rotate-mode speedup and mouse factors.
- void [setFlySpeedupFactor](#) (float nSpeedupFactor)
Sets the fly speedup factor.
- [MODE](#) [getMode](#) () const
Returns the currently set mode.
- const [pgVec3](#) & [getOldPosition](#) () const
Returns the position before [update\(\)](#) was called.
- const [pgVec3](#) & [getNewPosition](#) () const
Returns the new position.
- const [pgEuler](#) & [getDirection](#) () const
Returns the direction.
- void [update](#) (const [pgInput](#) &nInput)
Calculates a new position and direction.
- void [createViewMatrix](#) (bool nApply=true)
Creates a matrix from current position and rotation.
- const [pgMatrix](#) & [getViewMatrix](#) () const
Returns the current view matrix.
- void [formatPositionString](#) ([pgString](#) &nString)
Formats a string containing the current position.
- void [formatDirectionString](#) ([pgString](#) &nString)
Formats a string containing the current direction.
- void [formatModeString](#) ([pgString](#) &nString)
Formats a string containing the mode.

5.33.1 Detailed Description

pgSteering provides basic camera movement.

pgSteering has two moving modes: `MODE_INSPECT` and `MODE_FLY`. `MODE_INSPECT` is designed to provide as precise and free movement as possible. `MODE_FLY` moves the camera like a flying aeroplane.

Definition at line 39 of file `pgSteering.h`.

5.33.2 Member Enumeration Documentation

5.33.2.1 enum pgSteering::MODE

Steering Mode.

Enumeration values:

MODE_INSPECT Designed to provide as precise and free movement as possible

MODE_FLY Moves the camera like a flying aeroplane

MODE_ROTATE Rotates the camera around a point in front of it instead of strafing

Definition at line 45 of file `pgSteering.h`.

```

45         {
46             MODE_INSPECT,
47             MODE_FLY,
48             MODE_ROTATE,
49         };

```

5.33.3 Member Function Documentation

5.33.3.1 void pgSteering::createViewMatrix (bool nApply = true)

Creates a matrix from current position and rotation.

If `nApply` is true `pgSteering` calls `pgIDirectX::setViewMatrix()` to set the matrix as current rendering view matrix.

5.33.3.2 void pgSteering::setFlySpeedupFactor (float nSpeedupFactor) [inline]

Sets the fly speedup factor.

Speedup is activated if the speedup key is pressed. (Default: left shift)

Definition at line 114 of file `pgSteering.h`.

```

114 {   flySpeedupFactor = nSpeedupFactor; }

```

5.33.3.3 void pgSteering::setInspectModeFactors (float nSpeedupFactor, float nMouseXFactor, float nMouseYFactor) [inline]

Sets the inspect-mode speedup and mouse factors.

Speedup is activated if the speedup key is pressed. (Default: left shift)

Definition at line 86 of file pgSteering.h.

```
86 { inspectSpeedupFactor = nSpeedupFactor; inspectMouseXFactor = nMouseXFactor; inspectMouseYFactor = nMouseYFactor; }
```

5.33.3.4 void pgSteering::setOldPosition (const pgVec3 & nPos) [inline]

Sets the position before update was called.

pgSteering stores the previous (old) position when a new one is calculated, which is needed for collision handling. This method lets you specify this old position explicitly.

Definition at line 70 of file pgSteering.h.

```
70 { oldPos = nPos; }
```

The documentation for this class was generated from the following file:

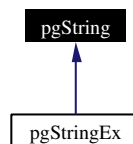
- pgSteering.h

5.34 pgString Class Reference

Class for storing and formating single byte character strings.

```
#include <pgString.h>
```

Inheritance diagram for pgString:



Public Methods

- **pgString** ()
Creates an empty string.
- **pgString** (const pgString &other)
Creates a string as a copy of another pgString object.
- **pgString** (const char *nString)
Creates a string as a copy of a char pointer.
- pgString & **set** (const char *nString,...)
Formats the given string and stores it.
- pgString & **cat** (const char *nString)
Formats the given string and adds it.
- void **setBuffer** (char *nBuffer)
Sets a new buffer directly.
- int **length** () const
Returns the length of the string.
- int **getLength** () const
Returns the length of the string.
- bool **consistsJustOf** (const pgString &cSet) const
Does the string consists just the chars of the cSet??
- int **getIndex** (const char c, bool forward=true) const
Returns the first/last occurence of c;.
- int **getIndex** (int start, const char c, bool forward=true) const
Returns the first/last occurence of c; after start.
- int **getIndexNot** (const char c, bool forward=true) const

Returns the first/last char that is not c.

- int [getIndexNot](#) (int start, const char c, bool forward=true) const
- int [getIndex](#) (const pgString &other, bool forward=true) const

Returns the first/last occurrence of str;.

- int [getIndex](#) (int start, const pgString &other, bool forward=true) const
- int [getCNum](#) (const char c) const

Returns the amount of occurrence of c.

- const char * [get](#) () const

Gives direct access to the string's data.

- pgString [getSubString](#) (int from, int count) const

Returns a substring.

- pgString & [toLower](#) ()

Converts all character to lower characters.

- pgString & [toUpper](#) ()

Converts all character to upper characters.

- pgString & [cutC](#) (const char c, bool forward=true)

Cuts all leading/ending c-s.

- pgString & [cut](#) (char c)

Cuts all chars c of.

- int [find](#) (const pgString &nSubString)

Returns the index of the substring. Returns -1 of not found.

Static Public Methods

- char [toLower](#) (char nC)

Returns the lower of the passed character.

- char [toUpper](#) (char nC)

Returns the upper of the passed character.

Friends

- pgString [operator+](#) (const pgString &left, const pgString &right)

concatenates two strings

5.34.1 Detailed Description

Class for storing and forming single byte character strings.

Definition at line 22 of file pgString.h.

5.34.2 Member Function Documentation

5.34.2.1 `bool pgString::consistsJustOf (const pgString & cSet) const`

Does the string consists just the chars of the cSet??

If the string only contains the characters in cSet true is returned.

5.34.2.2 `int pgString::getIndex (int start, const pgString & other, bool forward = true) const`

Returns the first/last occurrence of str If start==-1, then the search begins either at index 0 or Last()

5.34.2.3 `int pgString::getIndex (int start, const char c, bool forward = true) const`

Returns the first/last occurrence of c; after start.

If start is -1, then the search begins either at index 0 or Last()

5.34.2.4 `int pgString::getIndexNot (int start, const char c, bool forward = true) const`

Returns the first/last char that is not c. If start==-1, then the search begins either at index 0 or Last().

5.34.2.5 `void pgString::setBuffer (char * nBuffer)`

Sets a new buffer directly.

CAUTION: the pgString object takes the ownership of the buffer; so do not delete it.

The documentation for this class was generated from the following file:

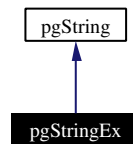
- pgString.h

5.35 pgStringEx Class Reference

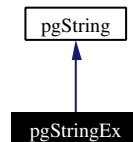
pgStringEx has a formating contructor

```
#include <pgString.h>
```

Inheritance diagram for pgStringEx:



Collaboration diagram for pgStringEx:



Public Methods

- **pgStringEx** (const char *nString,...)
Lets you create a [pgString](#) object with a formated string.

5.35.1 Detailed Description

pgStringEx has a formating contructor

Definition at line 184 of file pgString.h.

5.35.2 Constructor & Destructor Documentation

5.35.2.1 pgStringEx::pgStringEx (const char * nString, ...)

Lets you create a [pgString](#) object with a formated string.

Formating works same as sprintf()

The documentation for this class was generated from the following file:

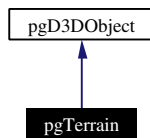
- pgString.h

5.36 pgTerrain Class Reference

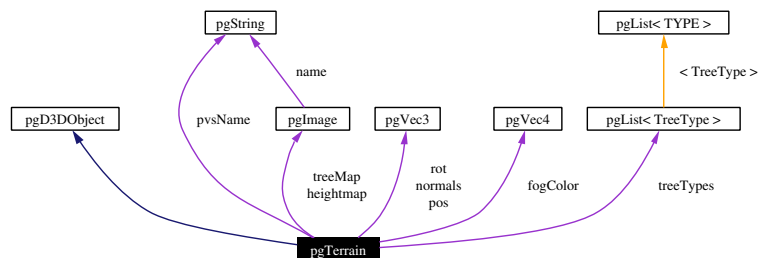
pgTerrain can render terrain by using geo-mipmapping

```
#include <pgTerrain.h>
```

Inheritance diagram for pgTerrain:



Collaboration diagram for pgTerrain:



Public Types

- enum `RENDERMODE` { `UNIFIED`, `SPLIT`, `MORPH_SW`, `MORPH_HW` }
Settings how the terrain is rendered.

Public Methods

- void `setRenderMode` (`RENDERMODE` nMode)
Sets a new render mode.
- void `setMipmapFilter` (`pgTextureStage::FILTER` nFilter)
Sets a mipmap filter.
- void `setBasePass` (`pgTexture` *nColorTexture, float nRepeatX, float nRepeatY, `pgTexture` *nLightmap)
Sets the base passes texture repeat rate and lightmap.
- void `addPass` (`pgTexture` *nColorTexture, float nRepeatX, float nRepeatY, `pgTexture` *nTransTexture)
Adds another pass to the terrain.
- void `setHeightMap` (`pgImage` *nImage)

Sets the height map.

- void [setPVSTName](#) (const [pgString](#) &nName)
Defines the name of the pvs map file.
- void [setTreeMap](#) ([pgImage](#) *nImage)
Sets a map which defines where trees are inserted.
- void [setSkyMap](#) ([pgTexture](#) *nSkyMap, float nRepeatX, float nRepeatY, float nSpeedX, float nSpeedY)
Sets a texture which will be painted on the terrain to show cloud shadows.
- void [setNumPatches](#) (int nX, int nY)
Sets the size of the landscape in number of patches.
- void [setPatchSize](#) (float nSizeX, float nSizeY, float nSizeZ)
Sets how large one patch is.
- void [setMaxError](#) (float nErr)
Sets the maximum error which is allowed for patch rendering.
- float [getMaxError](#) () const
Returns the maximum error, which was set by [setMaxError\(\)](#).
- void [setFogRange](#) (float nNear, float nFar)
Sets the fog's range.
- void [setFogColor](#) (const [pgVec4](#) &nCol)
Sets the fog's color (default: (1.0, 1.0, 1.0, 1.0)).
- void [setDesiredFPS](#) (int nFPS)
Sets the fps which shall be achieved.
- int [getDesiredFPS](#) () const
Returns the desired fps set with [setDesiredFPS\(\)](#).
- void [build](#) ()
Build the landscape after all properties have been set.
- void [render](#) ()
Renders the landscape.
- void [update](#) ()
Updates the landscapes tessellation.
- bool [intersectLine](#) (const [pgVec3](#) &nPos0, const [pgVec3](#) &nPos1, float &nScalarPos) const
Does not yet work correctly.
- bool [projectDown](#) (const [pgVec3](#) &nPos, [pgVec3](#) &nProjected) const
Calculates the position on landscape's surface below nPos.

- bool `moveAboveSurface` (`pgVec3` &nPos, float nHeight, float nGlideFactor) const
Moves nPos to stay above the surface.
- int `getNumPatchesRendered` ()
Returns the number of patches which were rendered in the last frame.
- void `fillInfoString` (`pgString` &nStr)
Fills a string with information about the last rendered terrain.
- virtual void `deleteDeviceObjects` ()
The implementing object has to destroy all device dependent objects.
- virtual bool `restoreDeviceObjects` ()
The implementing object has to recreate all device dependent objects.

5.36.1 Detailed Description

pgTerrain can render terrain by using geo-mipmapping

pgTerrain uses geo-mipmapping in order to display large landscapes at a high framerate. An arbitrary number of texture passes can be applied. An alpha map defines, where each texture is visible on the landscape and where not.

Definition at line 42 of file pgTerrain.h.

5.36.2 Member Enumeration Documentation

5.36.2.1 enum pgTerrain::RENDERMODE

Settings how the terrain is rendered.

Enumeration values:

UNIFIED Renders the terrain with one DrawIndexedPrimitive() call

SPLIT Renders the each patch seperated

MORPH_SW Does Vertex Morphing between two tessellation stages to reduce pops

MORPH_HW Does Vertex Morphing using Hardware Tweeming between two tessellation stages to reduce pops

Definition at line 49 of file pgTerrain.h.

```

49         {
50             UNIFIED,
51             SPLIT,
52             MORPH_SW,
53             MORPH_HW
54         };

```

5.36.3 Member Function Documentation

5.36.3.1 void pgTerrain::addPass ([pgTexture](#) * *nColorTexture*, float *nRepeatX*, float *nRepeatY*, [pgTexture](#) * *nTransTexture*)

Adds another pass to the terrain.

This method works same as setBasePass, except that the lightmap has to have an alpha channel, which defines, where the colortexture is visible and where not.

5.36.3.2 virtual void pgTerrain::deleteDeviceObjects () [virtual]

The implementing object has to destroy all device dependent objects.

When switching to fullscreen or changing window size the render device has to be destroyed and afterwards recreated. This enforces, that all device depended objects are destroyed and recreated too. Its the duty of the implementing object destroy all device dependent objects and call all sub-objects' [deleteDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

5.36.3.3 int pgTerrain::getDesiredFPS () const [inline]

Returns the desired fps set with [setDesiredFPS\(\)](#).

By default the automatic fps feature is disabled and [getDesiredFPS\(\)](#) will return 0.

Definition at line 174 of file pgTerrain.h.

```
174 { return desiredFPS; }
```

5.36.3.4 bool pgTerrain::moveAboveSurface ([pgVec3](#) & *nPos*, float *nHeight*, float *nGlideFactor*) const

Moves nPos to stay above the surface.

(nGlideFactor is not used yet)

5.36.3.5 bool pgTerrain::projectDown (const [pgVec3](#) & *nPos*, [pgVec3](#) & *nProjected*) const

Calculates the position on landscape's surface below nPos.

If nPos is not above the landscape false is returned.

5.36.3.6 virtual bool pgTerrain::restoreDeviceObjects () [virtual]

The implementing object has to recreate all device dependent objects.

Its the duty of the implementing object recreate all device dependent objects and call all sub-objects' [restoreDeviceObjects\(\)](#) methods.

Implements [pgD3DObject](#).

5.36.3.7 void pgTerrain::setBasePass (pgTexture * nColorTexture, float nRepeatX, float nRepeatY, pgTexture * nLightmap)

Sets the base passes texture repeat rate and lightmap.

Sets a texture for the base pass. nRepeatX and nRepeatY define how often the texture is repeated (wrapped) throughout the whole terrain. (1.0 means to stretch the texture to cover the whole terrain without repeating). The lightmap is not repeated.

5.36.3.8 void pgTerrain::setDesiredFPS (int nFPS) [inline]

Sets the fps which shall be achieved.

If the value is not zero, the terrain will automatically been drawn coarser or finer in order to achieve the desired fps. Pass 0 in order to turn of fps achievment.

Definition at line 166 of file pgTerrain.h.

```
166 {   desiredFPS = nFPS; }
```

5.36.3.9 void pgTerrain::setFogRange (float nNear, float nFar) [inline]

Sets the fog's range.

If this method is not called no fog is used

Definition at line 153 of file pgTerrain.h.

```
153 {   fogNear = nNear;   fogFar = nFar; }
```

5.36.3.10 void pgTerrain::setHeightMap (pgImage * nImage)

Sets the height map.

A height value of 0 will create a vertex at pos.y. A height value of 255 will create a vertex at pos.y + sizeY

5.36.3.11 void pgTerrain::setMaxError (float nErr) [inline]

Sets the maximum error which is allowed for patch rendering.

If the projected error of a patch on the render window exceeds maxError, the next more detailed tessellation is used.

Definition at line 142 of file pgTerrain.h.

```
142 {   maxError = nErr; }
```

5.36.3.12 void pgTerrain::setMipmapFilter (pgTextureStage::FILTER nFilter) [inline]

Sets a mipmap filter.

Default filter is LINEAR.

Definition at line 71 of file pgTerrain.h.

References `pgTextureStage::FILTER`.

```
71 { mipFilter = nFilter; }
```

5.36.3.13 void pgTerrain::setNumPatches (int *nX*, int *nY*) [inline]

Sets the size of the landscape in number of patches.

nX and *nY* must correlate to the image which was set as heightmap. The heightmaps size must be $(nX*16)+1$ x $(nY*16)+1$.

Definition at line 126 of file pgTerrain.h.

```
126 { patchesX = nX; patchesY = nY; }
```

5.36.3.14 void pgTerrain::setPatchSize (float *nSizeX*, float *nSizeY*, float *nSizeZ*)

Sets how large one patch is.

The size of the complete landscape can be calculated by: $patchesX*nSizeX$ x $nSizeY$ x $patchesY*nSizeZ$

5.36.3.15 void pgTerrain::setRenderMode ([RENDERMODE](#) *nMode*) [inline]

Sets a new render mode.

Default mode is SPLIT.MORPH. The render mode can not be changed after [build\(\)](#) has been called.

Definition at line 64 of file pgTerrain.h.

```
64 { renderMode = nMode; }
```

5.36.3.16 void pgTerrain::setSkyMap ([pgTexture](#) * *nSkyMap*, float *nRepeatX*, float *nRepeatY*, float *nSpeedX*, float *nSpeedY*)

Sets a texture which will be painted on the terrain to show cloud shadows.

nRepeatX and *nRepeatY* define of often the texture is repeated (wrapped). *nSpeedX* and *nSpeedY* define how much (in texture coordinates) the texture moves in one second.

5.36.3.17 void pgTerrain::update ()

Updates the landscapes tessellation.

It's important that the camera's final position for the current frame has already been set, since it is used to calculate the tessellation depth for each patch.

The documentation for this class was generated from the following file:

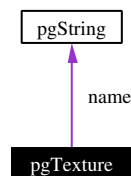
- pgTerrain.h

5.37 pgTexture Class Reference

pgTexture class

```
#include <pgTexture.h>
```

Collaboration diagram for pgTexture:



Public Methods

- `LPDIRECT3DTEXTURE8` [getD3DTexture](#) ()
Returns a pointer to the underlying Direct3D texture.
- `operator LPDIRECT3DTEXTURE8` ()
Cast operator to cast the texture to a Direct3D texture.
- `bool` [isCompressed](#) () const
Returns true if the texture is in a compressed format.
- `int` [getWidth](#) () const
Returns the width of the texture.
- `int` [getHeight](#) () const
Returns the height of the texture.
- `const pgString &` [getName](#) () const
Returns the name of the texture.
- `bool` [getData](#) (unsigned char *&nData, int &nPitch, int nLevel=0, bool nReadOnly=true)
Retrieves a pointer to the texture data.
- `void` [releaseData](#) ()
Releases a texture which was by [getData](#)().

5.37.1 Detailed Description

pgTexture class

Definition at line 26 of file `pgTexture.h`.

5.37.2 Member Function Documentation

5.37.2.1 LPDIRECT3DTEXTURE8 pgTexture::getD3DTexture () [inline]

Returns a pointer to the underlying Direct3D texture.

The special case the texture object is invalid (NULL) is caught and NULL is returned

Definition at line 39 of file pgTexture.h.

```
39 { return (this==NULL) ? NULL : d3dTexture; }
```

5.37.2.2 bool pgTexture::getData (unsigned char *& nData, int & nPitch, int nLevel = 0, bool nReadOnly = true)

Retrieves a pointer to the texture data.

In order to get a pointer to the texture's data, the texture must be locked. Before the texture can be used for further rendering it must be unlocked by calling [releaseData\(\)](#)

5.37.2.3 pgTexture::operator LPDIRECT3DTEXTURE8 () [inline]

Cast operator to cast the texture to a Direct3D texture.

The special case the texture object is invalid (NULL) is caught and NULL is returned

Definition at line 47 of file pgTexture.h.

```
47 { return (this==NULL) ? NULL : d3dTexture; }
```

The documentation for this class was generated from the following file:

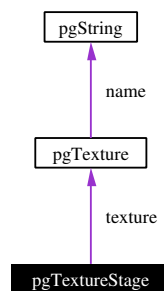
- pgTexture.h

5.38 pgTextureStage Class Reference

pgTextureStage is part of a [pgMaterial](#)

```
#include <pgTextureStage.h>
```

Collaboration diagram for pgTextureStage:



Public Types

- enum `FILTER` { `FILTER_NONE` = `D3DTEXF_NONE`, `FILTER_POINT` = `D3DTEXF_POINT`, `FILTER_LINEAR` = `D3DTEXF_LINEAR`, `FILTER_ANISOTROPIC` = `D3DTEXF_ANISOTROPIC` }

Filder method.

Friends

- class [pgSegment](#)

5.38.1 Detailed Description

pgTextureStage is part of a [pgMaterial](#)

pgTextureStage defines the setup of a specific texture stage for a segment.

Definition at line 28 of file `pgTextureStage.h`.

5.38.2 Member Enumeration Documentation

5.38.2.1 enum pgTextureStage::FILTER

Filder method.

Enumeration values:

FILTER_NONE No filtering (only valid for mipmap, means: no mipmapping)

FILTER_POINT Nearest neighbour

FILTER_LINEAR Linear interpolation

FILTER_ANISOTROPIC Anisotropic filtering

Definition at line 33 of file pgTextureStage.h.

Referenced by pgTerrain::setMipmapFilter().

```
33         {
34             FILTER_NONE = D3DTEXF_NONE,
35             FILTER_POINT = D3DTEXF_POINT,
36             FILTER_LINEAR = D3DTEXF_LINEAR,
37             FILTER_ANISOTROPIC = D3DTEXF_ANISOTROPIC
38         };
```

The documentation for this class was generated from the following file:

- pgTextureStage.h

5.39 pgTimeInstance Class Reference

this class represents a specific instance in time (a distinct point on the timeline)

```
#include <pgITime.h>
```

5.39.1 Detailed Description

this class represents a specific instance in time (a distinct point on the timeline)

Definition at line 22 of file pgITime.h.

The documentation for this class was generated from the following file:

- pgITime.h

5.40 pgVec2 Class Reference

2D vector class

```
#include <pgVec2.h>
```

Public Methods

- [pgVec2](#) ()
Creates a default vec2 (0,0).
- [pgVec2](#) (float x, float y)
Creates a vec2 from to floats.
- [pgVec2](#) (float *nValues)
Creates a vec2 from a pointer to two floats.
- [pgVec2](#) (const pgVec2 &other)
Creates a vec2 as a copy from an other one.
- float & [operator](#)[] (unsigned index)
access to members (x,y) by indices
- const float & [operator](#)[] (unsigned index) const
access to members (x,y) by indices
- pgVec2 & [operator](#)= (const pgVec2 &)
copy a vec2 from an other
- pgVec2 [operator](#)+ () const
addition same as for normal value type
- pgVec2 & [operator](#)+= (const pgVec2 &)
add an other vec2 to this one
- pgVec2 [operator](#)- () const
subtraction same as for normal value type
- pgVec2 & [operator](#)-= (const pgVec2 &)
subtract an other vec2 to this one
- pgVec2 & [operator](#) *= (float mult)
multiply this vec2 with a float
- pgVec2 & [operator](#) /= (float div)
divide this vec2 by a float
- pgVec2 & [add](#) (const pgVec2 &v1, const pgVec2 &v2)
Adds two vec2 and saves the result in this vec2.

- pgVec2 & [addScaled](#) (const pgVec2 &v1, float s, const pgVec2 &v2)
Adds two vec2 scaling the second one and saves the result in this vec2.
- bool [almostEqual](#) (const pgVec2 &nV, float nTol) const
Returns true if this vec2 and nV are at maximum nTol different.
- pgVec2 & [combine](#) (float s1, const pgVec2 &v1, float s2, const pgVec2 &v2)
Adds two vec2 scaling both and saves the result in this vec2.
- pgVec2 & [copy](#) (const pgVec2 &v)
Same as [operator=\(\)](#).
- float [distance](#) (const pgVec2 &nV) const
Returns the arithmetic distance between this vec2 and nV.
- float [sqrDistance](#) (const pgVec2 &nV) const
Returns the squared arithmetic distance between this vec2 and nV.
- float [dot](#) (const pgVec2 &nV) const
Returns the dot product between this vec2 and nV.
- bool [equal](#) (const pgVec2 &v) const
Same as [operator==\(\(\)\)](#).
- float [length](#) () const
Returns the length of this vec2.
- void [negate](#) ()
Negates this vec2.
- float [normalize](#) ()
Normalizes this vec2.
- pgVec2 & [scale](#) (float nS)
Multiplies this vec2 by nS.
- pgVec2 & [scale](#) (float nS, const pgVec2 &nV)
Multiplies nV by nS and stores the result in this vec2.
- pgVec2 & [scaleBy](#) (const pgVec2 &tensor)
Multiplies this vector component-wise by tensor.
- void [set](#) (float x, float y)
Sets new x and y values.
- void [set](#) (const float xy[2])
Sets new x and y values.
- pgVec2 & [sub](#) (const pgVec2 &v1, const pgVec2 &v2)
Subtracts two vec2 and stores the result in this vec2.

Static Public Methods

- float `cosine` (const pgVec2 &left, Axis nAxis=X_AXIS)
Returns the angle between the vector and one axis.
- float `cosine` (const pgVec2 &left, const pgVec2 &right)
Return the angle between the two vectors.

5.40.1 Detailed Description

2D vector class

Definition at line 21 of file pgVec2.h.

The documentation for this class was generated from the following file:

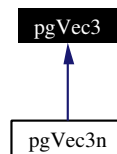
- pgVec2.h

5.41 pgVec3 Class Reference

3D vector class

```
#include <pgVec3.h>
```

Inheritance diagram for pgVec3:



Public Methods

- float [dot](#) (const pgVec3 &nV) const
Returns the dot product between this vec3 and nV.

5.41.1 Detailed Description

3D vector class

Definition at line 25 of file pgVec3.h.

The documentation for this class was generated from the following file:

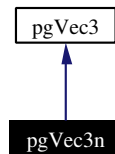
- pgVec3.h

5.42 pgVec3n Class Reference

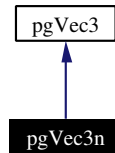
3D normalized vector class

```
#include <pgVec3n.h>
```

Inheritance diagram for pgVec3n:



Collaboration diagram for pgVec3n:



5.42.1 Detailed Description

3D normalized vector class

Definition at line 21 of file pgVec3n.h.

The documentation for this class was generated from the following file:

- pgVec3n.h

5.43 pgVec4 Class Reference

4D vector class

```
#include <pgVec4.h>
```

5.43.1 Detailed Description

4D vector class

Definition at line 20 of file pgVec4.h.

The documentation for this class was generated from the following file:

- pgVec4.h

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