



*Ninja
Library
Specification*



Ninja Library Specification

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1. System Functions

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njAlphaMode

Sets Alpha Mode.

FORMAT

```
#include <Ninja.h>
void njAlphaMode( mode );
Int mode
```

PARAMETERS

mode
alpha mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets alpha mode. Following shows the modes that can be set:

ON	Sets alpha mode ON.
OFF	Sets alpha mode OFF.

EXAMPLE

NOTES

RELATED TOPICS

njColorBlendingMode

Sets Color Blending Mode.

FORMAT

```
#include <Ninja.h>
void njColorBlendingMode( target, mode )
Int target
Int mode
```

PARAMETERS

target

Mode setting object

mode

Blending mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets blending mode.
- Targets that can be set:

NJD_SOURCE_COLOR	source color
NJD_DESTINATION_COLOR	destination color

- Following shows the modes that can be set for each target:

NJD_COLOR_BLENDEING_BOTHINVALPHA	Regardless of the target specification, multiply source color by (1-As, 1-As, 1-As, 1-As) and destination color by (As, As, As, As) and blend.
NJD_COLOR_BLENDEING_BOTHSRCALPHA	Regardless of the target specification, multiply source color by (As, As, As, As) and destination color by (1-As, 1-As, 1-As, 1-As), and blend.
NJD_COLOR_BLENDEING_DESTALPHA	Multiply specified target by (Ad, Ad, Ad, Ad) and blend.
NJD_COLOR_BLENDEING_DESTCOLOR	Use the destination color for the specified target.
NJD_COLOR_BLENDEING_INVDESTALPHA	Multiply specified target by (1-Ad, 1-Ad, 1-Ad, 1-Ad) and blend.
NJD_COLOR_BLENDEING_INVDESTCOLOR	Use (1-Ad, 1-Rd, 1-Gd, 1-Bd) for specified target.
NJD_COLOR_BLENDEING_INVSRCALPHA	Multiply specified target by (1-As, 1-As, 1-As, 1-As) and blend.
NJD_COLOR_BLENDEING_INVSRCOLOR	Use (1-As, 1-Rs, 1-Gs, 1-Bs) for specified target.
NJD_COLOR_BLENDEING_SRCALPHA	Multiply specified target by (As, As, As, As) and blend.
NJD_COLOR_BLENDEING_SRCOLOR	Use source color for specified target.
NJD_COLOR_BLENDEING_ONE	Multiply specified target by (1, 1, 1, 1) and blend.
NJD_COLOR_BLENDEING_ZERO	Multiply specified target by (0, 0, 0, 0) and blend.

EXAMPLE

NOTES

s and d represent source color and destination color, respectively.

Example: As means alpha of source color.

RELATED TOPICS

njExitSystem

Performs system termination processing.

FORMAT

```
#include <Ninja.h>
void njExitSystem( void )
```

PARAMETERS

None

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Performs system termination processing.
- Always end by using this command.

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
while(1) {
    .....
    .....
    if( ..... ) break;
    njWaitVSync();
}
njExitSystem();
```

NOTES

RELATED TOPICS

njInitSystem()

njIgnoreTextureAlphaMode

Sets Texture Alpha Mode.

FORMAT

```
#include <Ninja.h>
void njIgnoreTextureAlphaMode( mode );
Int mode
```

PARAMETERS

mode

alpha mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets texture alpha mode.
- The following modes can be set:

ON	Ignore the alpha bit of texture data
OFF	Do not ignore the alpha bit of texture data

EXAMPLE

NOTES

RELATED TOPICS

njInitSystem

Initializes the system.

FORMAT

```
#include <Ninja.h>
void njInitSystem( mode, frame, count )
Int  mode
Int  frame
Int  count
```

PARAMETERS

mode

Screen mode (resolution)

Specifies the screen resolution.

frame

Frame buffer mode.

count

Number of frames

Specifies the number of frames in 1/60-sec units.

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Initializes the system and sets the specified screen resolution mode.
- Makes the 2D clip area the same as the screen size.
- Sets Z-clip to -2.0 to -60000.0.
- Sets the 3D screen's projection surface distance to 500.
- Sets both X and Y aspect to 1.0.
- Sets the color mode to NJD_COLOR_MODE_NORMAL.
- Sets the number of frames in units of 1/60.
- For example, a setting 2 results in a frame change every 1/30 second.
- Frame changes are done with the njWaitVSync function.

Screen modes that can be set are as follows.

Display Mode

NJD_RESOLUTION_VGA	VGA
NJD_RESOLUTION_320x240_NTSCNI	NTSC non interlace 60Hz
NJD_RESOLUTION_320x240_NTSCI	NTSC interlace 30Hz
NJD_RESOLUTION_640x240_NTSCNI	NTSC non interlace 60Hz
NJD_RESOLUTION_640x240_NTSCI	NTSC interlace 30Hz
NJD_RESOLUTION_640x480_NTSCI	NTSC interlace 30Hz
NJD_RESOLUTION_320x240_PALNI	PAL non interlace 50Hz
NJD_RESOLUTION_320x240_PALI	PAL interlace 25Hz
NJD_RESOLUTION_640x240_PALNI	PAL non interlace 50Hz
NJD_RESOLUTION_640x240_PALI	PAL interlace 25Hz
NJD_RESOLUTION_640x480_PALI	PAL interlace 25Hz

Frame Buffer Mode

NJD_FRAMEBUFFER_MODE_RGB565
NJD_FRAMEBUFFER_MODE_RGB555
NJD_FRAMEBUFFER_MODE_ARGB4444
NJD_FRAMEBUFFER_MODE_ARGB1555
NJD_FRAMEBUFFER_MODE_RGB888
NJD_FRAMEBUFFER_MODE_ARGB8888

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
```

Sets the screen resolution to 640x480, with a frame every 1/60 second.

NOTES

Be sure to do this at the beginning of each program.

Depending on hardware configuration, some modes may not be available.

RELATED TOPICS

`njExitSystem()`

`njWaitVSync()`

`njSetScreen()`

`njSetAspect()`

`njSetColorMode()`

`njClip2D()`

`njClipZ()`

njInitVertexBuffer Allocates the buffers for registration of vertex data.

FORMAT

```
#include <Ninja.h>
void njInitVertexBuffer( op, om, tp, tm );
Uint32 op
Uint32 om
Uint32 tp
Uint32 tm
```

PARAMETERS

op:

buffer size for non-transparent polygon registration

om:

buffer size for non-transparent modifier volume registration

tp:

buffer size for translucent polygon registration

tm:

buffer size for translucent modifier volume registration

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Allocates the buffers for registration of vertex data.
- Size for each is given # of bytes/4.

EXAMPLE

```
njInitVertexBuffer( 100000, 0, 100000, 0 );
```

It reserves vertex buffers for non-transparent polygon and translucent polygon 400KB for each.

NOTES

- When displaying debug characters, reserve registration buffer for translucent polygons.

RELATED TOPICS

njMipmapAdjust

Adjusts Mipmap Level of Textures.

FORMAT

```
#include <Ninja.h>
void njMipmapAdjust( level )
Int level
```

PARAMETERS

level

Mipmap adjust level

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

Sets 'D' parameter to adjust mipmap level.

Values can be set are 1 thru 15.

The following shows the actual D parameter values:

1	0.25
2	0.50
3	0.75
4	1.00
5	1.25
6	1.50
7	1.75
8	2.00
9	2.25
10	2.50
11	2.75
12	3.00
13	3.25
14	3.50
15	3.75

EXAMPLE

NOTES

RELATED TOPICS

njModifierVolumeMode

Sets Modifier Volume Mode

FORMAT

```
#include <Ninja.h>
void njModifierVolumeMode( mode );
Int mode
```

PARAMETERS

mode

modifier volume mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets modifier volume mode.
- The following modes can be set:

ON	Use modifier volume.
OFF	Do not use modifier volume.

EXAMPLE

NOTES

RELATED TOPICS

njPolygonCullingMode

Sets Polygon Culling Mode

FORMAT

```
#include <Ninja.h>
void njPolygonCullingMode( mode );
Int mode
```

PARAMETERS

mode

polygon culling mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets polygon culling mode
- The following modes can be set:

NJD_POLYGON_NOCULLING	Do not perform culling at all.
NJD_POLYGON_CULLINGSMALL	Perform culling for small polygons.
NJD_POLYGON_CULLINGACW	Perform culling to counter-clockwise polygons.
NJD_POLYGON_CULLINGCW	Perform culling to clockwise polygons.

EXAMPLE

NOTES

- In the NJD_POLYGON_CULLINGSMALL mode, the polygon size to be culled can be changed by the njPolygonCullingSize function.
- Default value: size = 0.01f.

RELATED TOPICS

njPolygonCullingSize

njPolygonCullingSize

Sets Polygon Size for Culling

FORMAT

```
#include <Ninja.h>
void njPolygonCullingSize( size );
Float size
```

PARAMETERS

size

Culling polygon size

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

Sets culling polygon size for NJD_POLYGON_CULLINGSMALL culling mode.

EXAMPLE

NOTES

RELATED TOPICS

[njPolygonCullingMode](#)

njSetBackColor

Sets background color.

FORMAT

```
#include <Ninja.h>
void njSetBackColor( color0, color1, color2 )
Uint32 color0
Uint32 color1
Uint32 color2
```

PARAMETERS

color0

Upper left color

color1

Upper right color

color2

Bottom left color

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

Sets background color.

Colors should be specified with ARGB32bit.

Bottom right color is set automatically.

EXAMPLE

This sample makes a background with blue in upper and black at the bottom side of the screen.

```
njSetBackColor( 0xff0000ff,0xff0000ff,0xff000000 );  
while(1) {  
    njDrawLine2D( ... );  
    ....  
    njWaitVSync();  
}
```

NOTES

RELATED TOPICS

[njWaitVSync\(\)](#)

njSetVSyncFunction

Registers the vertical sync interrupt callback function.

FORMAT

```
#include <Ninja.h>
void njSetVSyncFunction( func )
void (*func)()
```

PARAMETERS

func

Pointer to the vertical sync interrupt callback function

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Registers the vertical sync interrupt callback function.
- Only one such function can be registered.
- Specifying NULL deletes the registered function.

EXAMPLE

```
static Int count=0;
void foo(void)
{
    count++;
}

njSetVSyncFunction( foo );

while(1) {
    ....
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

[njWaitVSync\(\)](#)

njSpecularMode

Sets Specular Mode

FORMAT

```
#include <Ninja.h>
void njSpecularMode( mode );
Int mode
```

PARAMETERS

mode

specular mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets specular mode.
- The following modes can be set:

ON	Set specular mode ON.
OFF	Set specular mode OFF.

EXAMPLE

NOTES

RELATED TOPICS

njSuperSampleMode

Sets texture super sample.

FORMAT

```
#include <Ninja.h>
void njSuperSampleMode( mode )
Int mode
```

PARAMETERS

mode

Texture super sample mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets texture super sample.
- The following modes can be set:

ON	Super sample filter ON
OFF	Super sample filter OFF

EXAMPLE

NOTES

RELATED TOPICS

njTextureClampMode

Sets the texture clamp.

FORMAT

```
#include <Ninja.h>
void njTextureClampMode( mode )
Int mode
```

PARAMETERS

mode

texture clamp mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets the texture clamp.
- The following modes can be set:

NJD_TEXTURECLAMP_NOCLAMP	No clamp
NJD_TEXTURECLAMP_CLAMP_V	V clamp
NJD_TEXTURECLAMP_CLAMP_U	U clamp
NJD_TEXTURECLAMP_CLAMP_UV	UV clamp

EXAMPLE

NOTES

RELATED TOPICS

njTextureFilterMode

Sets the texture filter.

FORMAT

```
#include <Ninja.h>
void njTextureFilterMode( mode )
Int mode
```

PARAMETERS

mode

texture filter mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets the texture filter.
- The following modes can be set:

NJD_TEXTUREFILTER_POINT_SAMPLE	Point sample
NJD_TEXTUREFILTER_BILINEAR	Bilinear filter
NJD_TEXTUREFILTER_TRILINEAR	Trilinear filter

EXAMPLE

Sets the texture filter to bilinear filter.

```
njTextureFilterMode( NJD_TEXTUREFILTER_BILINEAR );
while(1) {
    njDrawLine2D( ... );
    ....
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

`njWaitVSync()`

njTextureFlipMode

Sets the texture flip.

FORMAT

```
#include <Ninja.h>
void njTextureFlipMode( mode )
Int mode
```

PARAMETERS

mode

texture flip mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets the texture flip.
- Modes can be set are

NJD_TEXTUREFLIP_NOFLIP	no flip
NJD_TEXTUREFLIP_FLIP_V	V flip
NJD_TEXTUREFLIP_FLIP_U	U flip
NJD_TEXTUREFLIP_FLIP_UV	UV flip

EXAMPLE

NOTES

RELATED TOPICS

njTextureShadingMode

Sets Texture Shading Mode

FORMAT

```
#include <Ninja.h>
void njTextureShadingMode( mode );
Int mode
```

PARAMETERS

mode

texture shading mode

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets texture shading mode.
- The following modes can be set:

NJD_TEX_SHADING_MODE_MODULATE	Multiply texture color by the shading effect color.
NJD_TEX_SHADING_MODE_DECALALPHA	Blend texture color with shading color.
NJD_TEX_SHADING_MODE_MODULATEALPHA	Multiply texture color by shading color.

EXAMPLE

NOTES

RELATED TOPICS

njVersion

Gets the library version.

FORMAT

```
#include <Ninja.h>
Uint32 njVersion( void )
```

PARAMETERS

None

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Gets the version number of the library.
- The version number is maintained as an 8-digit hexadecimal number.

8-digit hexadecimal number

```
ooooo000
| | | | | | | |
| | | | + + + + ---Build number
| | + + + + + + + + ---Revision
+ + + + + + + + ---Version
```

EXAMPLE

```
version = njVersion();
```

NOTES

RELATED TOPICS

njWaitVSync

Waits for a vertical interrupt.

FORMAT

```
#include <Ninja.h>
void njWaitVSync()
```

PARAMETERS

None

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Waits for a vertical interrupt.
- Performs a frame change and clears the screen.
- Calls the vertical sync interrupt callback function.

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
njInitVertexBuffer( 100000, 0, 100000, 0 );
while(1) {
    njDrawLine2D( ... );
    ....
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

[njSetVSyncFunction\(\)](#)

[njSetBackColor\(\)](#)



2. Matrix Functions

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njAddMatrix

Performs matrix addition.

FORMAT

```
#include <Ninja.h>

void njAddMatrix(*md, *ms)
NJS_MATRIX *md
NJS_MATRIX *ms
```

PARAMETERS

NJS_MATRIX *md

destination matrix

NJS_MATRIX *ms

matrix to be added

RETURN VALUE

None

FUNCTION

- Performs matrix addition ($[md] = [md] + [ms]$).
- If parameter md is NULL, the current matrix becomes the destination matrix.

EXAMPLE

NOTES

RELATED TOPICS

NJS_MATRIX

njAddVector

Performs vector addition.

FORMAT

```
#include <Ninja.h>

void njAddVector(*vd, *vs)
NJS_VECTOR *vd
NJS_VECTOR *vs
```

PARAMETERS

NJS_VECTOR *vd

destination vector

NJS_VECTOR *vs

vector to be added

RETURN VALUE

None

FUNCTION

- Adds vectors and stores the result in vector vd.

vd = vd + vs

EXAMPLE

NOTES

RELATED TOPICS

NJS_VECTOR

njCalcPoint

Applies matrix conversion to an arbitrary point.

FORMAT

```
#include <Ninja.h>

void njCalcPoint(*m, *ps, *pd)
NJS_MATRIX *m
NJS_POINT3 *ps
NJS_POINT3 *pd
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

NJS_POINT3 *ps

arbitrary point

NJS_POINT3 *pd

point after conversion

RETURN VALUE

None

FUNCTION

- Applies matrix conversion to arbitrary point *ps*, then stores the post conversion coordinates of the point in *pd*.
- When parameter *m* is NULL, the current matrix is taken as the calculation matrix.

EXAMPLE

The following rotates point ps(100, 0, 0) by 45 degrees around the Y axis.

```
NJS_MATRIX m;
NJS_POINT3 ps, pd;

ps.x = 100.f;
ps.y = 0.f;
ps.z = 0.f;
njUnitMatrix(&m);
njRotateY(&m, NJM_DEG_ANG(45));
njCalcPoint(&m, &ps, &pd);

% result %
pd(70.710701, 00.000000, -70.710701)
```

NOTES

RELATED TOPICS

njCalcVector

Applies matrix conversion to an arbitrary vector.

FORMAT

```
#include <Ninja.h>

void njCalcVector(*m, *vs, *vd)
NJS_MATRIX *m
NJS_VECTOR *vs
NJS_VECTOR *vd
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

NJS_VECTOR *vs

arbitrary vector

NJS_VECTOR *vd

post-conversion vector

RETURN VALUE

None

FUNCTION

- Applies matrix conversion to arbitrary vector *vs*, then stores the vector resulting from conversion in *vd*.
- When parameter *m* is NULL, the current matrix is taken as the calculation matrix.

EXAMPLE

The following rotates vector $vs(100, 0, 0)$ 45 degrees around the Y axis.

```
NJS_MATRIX m;
NJS_VECTOR vs, vd;

vs.x = 100.f;
vs.y = 0.f;
vs.z = 0.f;
njUnitMatrix(&m);
njRotateY(&m, NJM_DEG_ANG(45));
njCalcVector(&m, &vs, &vd);

% result %
vd(70.710701, 00,000000, -70.710701)
```

NOTES

RELATED TOPICS

njClearMatrix

Clears the matrix stack.

FORMAT

```
#include <Ninja.h>

njClearMatrix()
```

PARAMETERS

None

RETURN VALUE

None

FUNCTION

- Clears the matrix stack with the current view matrix.
- The current matrix pointer is restored to the base matrix pointer.
- See the View function View.txt file (in the Ninja root folder) for how to use this function.

EXAMPLE

The following prepares and initializes a matrix stack and sets it with the current view.

```
NJS_MATRIX stack[10];

NJS_VIEW view;

njInitMatrix(stack, 10);

njInitView(&view);

njSetView(&view);

njClearMatrix();
```

NOTES

RELATED TOPICS

[njInitMatrix\(\)](#)
[VIEW function](#)

njDetMatrix

Determines a matrix expression.

FORMAT

```
#include <Ninja.h>

float njDetMatrix(*m)
NJS_MATRIX *m
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

RETURN VALUE

Determines the matrix

FUNCTION

- Determines the matrix expression of arbitrary matrix m.
- When parameter m is NULL, the expression is determined from the current matrix.

EXAMPLE

Determines the matrix expression of the current matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;
Float det;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
det = njDetMatrix(NULL);
njPopMatrix(1);
```

NOTES

RELATED TOPICS

njGetMatrix

Gets a copy of the current matrix.

FORMAT

```
#include <Ninja.h>

void njGetMatrix(*m)
NJS_MATRIX *m
```

PARAMETERS

NJS_MATRIX *m

copy destination matrix

RETURN VALUE

None

FUNCTION

- Copies the current matrix to matrix m

EXAMPLE

Copies the current matrix to matrix m.

```
NJS_MATRIX m;
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njGetMatrix(&m);
```

NOTES

RELATED TOPICS

njInitMatrix

Initializes the matrix stack.

FORMAT

```
#include <Ninja.h>

void njInitMatrix(*m, n flag)
NJS_MATRIX *m
Sint32 n
Int flag
```

PARAMETERS

m

matrix stack

n

size of matrix stack

Flag

(true) use light matrix

(false) do not use light matrix

RETURN VALUE

None

FUNCTION

- Initializes the matrix stack.
- The matrix stack (an array) must be allocated by the user.
- Also, the stacked matrix is defined in the array of Float size 32.
- The 16(4x4) of the front half is used for the normal matrix operation and the 16(4x4) of the latter half is for the Light operation.
- In the case of using the 16 matrices of the front half for the Light operation, it is possible to skip the 16 matrix operations of the latter half by assigning 0 to the third argument.

EXAMPLE

The following allocates a matrix stack of size 10 and initializes it.

```
NJS_MATRIX stack[10];  
njInitMatrix(stack, 10, 0);
```

NOTES

- In this release, Model functions do not support light from the matrix.
- If you use Model functions, assign 0 to the flag.

RELATED TOPICS

NJS_MATRIX

njInnerProduct

Obtains the inner product of two vectors.

FORMAT

```
#include <Ninja.h>

Float njInnerProduct(*v1, *v2)
NJS_VECTOR *v1
NJS_VECTOR *v2
```

PARAMETERS

NJS_VECTOR *v1

vector 1

NJS_VECTOR *v2

Vector 2

RETURN VALUE

Value of inner product

FUNCTION

- Obtains the inner product of two vectors.

Return value=v1 * v2

EXAMPLE

NOTES

RELATED TOPICS

NJS_VECTOR

njInvertMatrix

Obtains the inverse (reversed rows/columns) of a matrix.

FORMAT

```
#include <Ninja.h>

void njInvertMatrix(*m)
NJS_MATRIX *m
```

PARAMETERS

NJS_MATRIX *m

source matrix

RETURN VALUE

None

FUNCTION

- Inverts the rows and columns of an arbitrary matrix.
- When parameter *m* is NULL, the current matrix is inverted.

EXAMPLE

The following inverts the current matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;
NJS_VECTOR v;

v.x = 0.5f;
v.y = 1.f;
v.z = 2.f;
njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njInvertMatrix(NULL);
njPopMatrix(1);
```

NOTES

- If the arbitrary matrix is given as $[M]$, the result is $[M] = [M]^{-1}$.

RELATED TOPICS

njMirror Obtains the mirror image of an arbitrary boundary surface.

FORMAT

```
#include <Ninja.h>

void njMirror(*m, *pl)
NJS_MATRIX *m
NJS_PLANE *pl
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

NJS_PLANE *pl

boundary surface

RETURN VALUE

None

FUNCTION

- Obtains the mirror image of arbitrary boundary surface pl.
- When parameter m is NULL, the calculation is performed on the current matrix.

EXAMPLE

The following obtains the mirror image through the origin of the boundary surface containing vector (0, 1, 1).

```
NJS_MATRIX stack[10];
NJS_VIEW view;
NJS_PLANE pl;

pl.px = 0.f;
pl.py = 0.f;
pl.pz = 0.f;
pl.vx = 0.f;
pl.vy = 1.f;
pl.vz = 1.f;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njMirror(NULL, &pl);
njPopMatrix(1);
```

NOTES

RELATED TOPICS

njMultiMatrix

Performs matrix multiplication.

FORMAT

```
#include <Ninja.h>

void njMultiMatrix(*md, *ms)
NJS_MATRIX *md
NJS_MATRIX *ms
```

PARAMETERS

NJS_MATRIX *md

destination matrix

NJS_MATRIX *ms

calculation matrix

RETURN VALUE

None

FUNCTION

- Performs matrix multiplication. ($[md] = [ms] * [md]$)
- When parameter m is NULL, the current matrix is taken as the destination matrix.

EXAMPLE

NOTES

RELATED TOPICS

NJS_MATRIX

njOuterProduct

Obtains the outer product of two vectors.

FORMAT

```
#include <Ninja.h>

Float njOuterProduct(*v1, *v2, *ov)
NJS_VECTOR *v1
NJS_VECTOR *v2
NJS_VEDTOR *ov
```

PARAMETERS

NJS_VECTOR *v1

vector 1

NJS_VECTOR *v2

vector 2

NJS_VEDTOR *ov

output vector

RETURN VALUE

Absolute value of outer product

FUNCTION

- Obtains the outer product of two vectors and returns the absolute value of the result.

Return value = $|v1 * v2|$

EXAMPLE

NOTES

RELATED TOPICS

NJS_VECTOR

njPopMatrix

Pops the matrix stack.

FORMAT

```
#include <Ninja.h>

Bool njPopMatrix(n)
Uint32 n
```

PARAMETERS

Uint32 n

Number of items to pop from the matrix stack

RETURN VALUE

TRUE

Successful

FALSE

Failure (stack underflow)

FUNCTION

- Pops n items from the matrix stack.

EXAMPLE

The following pops two items from the matrix stack.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njPushMatrix(NULL);
njPopMatrix(2);
```

NOTES

- The number of items popped is the same as the number of items pushed.

RELATED TOPICS

njProject Throws a parallel project onto an arbitrary picture plane.

FORMAT

```
#include <Ninja.h>

void njProject(*m, *pl)
NJS_MATRIX *m
NJS_PLANE *pl
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

NJS_PLANE *pl

picture plane

RETURN VALUE

None

FUNCTION

- Throws a parallel projection onto arbitrary picture plane pl.
- When parameter m is NULL, calculation is performed on the current matrix.

EXAMPLE

The following throws a parallel projection through the origin onto the plane.

```
NJS_MATRIX stack[10];
NJS_VIEW view;
NJS_PLANE pl;

pl.px = 0.f;
pl.py = 0.f;
pl.pz = 0.f;
pl.vx = 0.f;
pl.vy = 1.f;
pl.vz = 1.f;
njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njProject(NULL, &pl);
njPopMatrix(1);
```

NOTES

RELATED TOPICS

njProject2

Projects a transparent view onto an arbitrary picture plane.

FORMAT

```
#include <Ninja.h>

void njProject2(*m, *pl, *v, *p)
NJS_MATRIX *m
NJS_PLANE *pl
NJS_POINT3 *v
NJS_POINT3 *p
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

NJS_PLANE *pl

picture plane

NJS_POINT3 *v

projection viewpoint

NJS_POINT3 *p

center point of object to be projected

RETURN VALUE

None

FUNCTION

- Projects a transparent image onto arbitrary plane pl from viewpoint p.
- When parameter m is NULL, the current matrix is used for calculation.

EXAMPLE

This projects a transparent image through the origin onto the plane containing vector (0, 1, 1) from point $v(0, 100, 100)$.

Center point of the object is at $p(0, 10, 10)$.

```
NJS_MATRIX stack[10];
NJS_VIEW view;
NJS_PLANE pl;
NJS_POINT v, p;

pl.px = 0.f;
pl.py = 0.f;
pl.pz = 0.f;
pl.vx = 0.f;
pl.vy = 1.f;
pl.vz = 1.f;
v.x = 0.f;
v.y = 100.f;
v.z = 100.f;
p.x = 0.f;
p.y = 10.f;
p.z = 10.f;
njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njProject2(NULL, &pl, &v, &p);
njPopMatrix(1);
```

NOTES

RELATED TOPICS

njProjectScreen

Projects an arbitrary point onto the screen.

FORMAT

```
#include <Ninja.h>

void njProjectScreen(*m, *p3, *p2)
NJS_MATRIX *m
NJS_POINT3 *p3
NJS_POINT2 *p2
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

NJS_POINT3 *p3

coordinates of arbitrary point

NJS_POINT2 *p2

point coordinates after projection

RETURN VALUE

None

FUNCTION

- Projects an arbitrary point onto the screen.
- When parameter m is NULL, the current matrix is used for calculation.

EXAMPLE

The following projects point p3(100, 200, 300) onto the screen.

```
NJS_MATRIX stack[10];
NJS_VIEW view;
NJS_POINT3 p3;
NJS_POINT2 p2;

p3.x = 100.f;
p3.y = 200.f;
p3.z = 300.f;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njProjectScreen(NULL, &p3, &p2);
njPopMatrix(1);

% Result %
p2(153.333328, 573.333374)
```

NOTES

RELATED TOPICS

njPushMatrix

Pushes the matrix stack.

FORMAT

```
#include <Ninja.h>

Bool njPushMatrix(*m)
NJS_MATRIX *m
```

PARAMETERS

NJS_MATRIX *m

matrix to be pushed

RETURN VALUE

TRUE

successful

FALSE

failed (stack overflow)

FUNCTION

- Pushes matrix *m* onto the matrix stack.
- When parameter *m* is NULL, this function pushes the current matrix.

EXAMPLE

The following pushes a unit matrix onto the matrix stack.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(_unit_matrix_);
```

NOTES

RELATED TOPICS

njResMatrix

(Unsupported)

FORMAT

PARAMETERS

RETURN VALUE

FUNCTION

EXAMPLE

NOTES

RELATED TOPICS

njRotate

Rotates a matrix around an arbitrary axis.

FORMAT

```
#include <Ninja.h>

void njRotateX(*m, *v, ang)
NJS_MATRIX *m
NJS_VECTOR *v
Angle ang
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

NJS_VECTOR *v

data for arbitrary axis

Angle ang

rotation angle

RETURN VALUE

None

FUNCTION

- Rotates matrix m around an arbitrary axis.
- When parameter m is NULL, the current matrix is used for calculation.

EXAMPLE

The following rotates the current matrix 90 degrees around the arbitrary axis containing vector $v(1,1,1)$.

```
NJS_MATRIX stack[10];
NJS_VIEW view;
NJS_VECTOR v;

v.x = 1.f;
v.y = 1.f;
v.z = 1.f;
njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njRotate(NULL, &v, NJM_DEG_ANG(90));
njPopMatrix(1);
```

NOTES

- For a matrix $[M]$ and multiplicative rotational matrix $[R]$, $[M] = [R] * [M]$.
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njRotateX

Applies a matrix that gives a rotation around the X axis.

FORMAT

```
#include <Ninja.h>

void njRotateX(*m, ang)
NJS_MATRIX *m
Angle ang
```

PARAMETERS

NJS_MATRIX *m

destination matrix

Angle ang

rotation angle

RETURN VALUE

None

FUNCTION

- Applies a matrix that gives rotation around the X axis to the matrix m.
- When parameter m is NULL, the current matrix will be the destination.

EXAMPLE

The following applies a matrix that gives rotation of 90 degrees around the X axis to the current matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njRotateX(NULL, NJM_DEG_ANG(90));
njPopMatrix(1);
```

NOTES

- For a matrix [M] and multiplicative rotational matrix [R], $[M] = [R] * [M]$.
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njRotateY

Applies a matrix that gives rotation around Y axis.

FORMAT

```
#include <Ninja.h>

void njRotateY(*m, ang)
NJS_MATRIX *m
Angle ang
```

PARAMETERS

NJS_MATRIX *m
destination matrix

Angle ang
rotation angle

RETURN VALUE

None

FUNCTION

- Applies a matrix that gives rotation around the Y axis to the matrix m.
- When parameter m is NULL, the current matrix will be the destination.

EXAMPLE

The following applies a matrix that gives rotation of 90 degrees around the Y axis to the current matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njRotateY(NULL, NJM_DEG_ANG(90));
njPopMatrix(1);
```

NOTES

- For a matrix [M] and multiplicative rotational matrix [R], $[M] = [R] * [M]$.
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njRotateZ

Applies a matrix that gives rotation around Z axis.

FORMAT

```
#include <Ninja.h>

void njRotateZ(*m, ang)
NJS_MATRIX *m
Angle ang
```

PARAMETERS

NJS_MATRIX *m
destination matrix

Angle ang
rotation angle

RETURN VALUE

None

FUNCTION

- Applies a matrix that gives rotation around the Z axis to the matrix m.
- When parameter m is NULL, the current matrix will be the destination.

EXAMPLE

The following applies a matrix that gives rotation of 90 degrees around the Z axis to the current matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njRotateZ(NULL, NJM_DEG_ANG(90));
njPopMatrix(1);
```

NOTES

- For a matrix [M] and multiplicative rotational matrix [R], $[M] = [R] * [M]$.
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njRotateXYZ

Applies a matrix that gives rotation around X, Y, and Z axes.

FORMAT

```
#include <Ninja.h>

void njRotateXYZ(*m, ang)
NJS_MATRIX *m
Angle angx
Angle angy
Angle angz
```

PARAMETERS

NJS_MATRIX *m

destination matrix

Angle angx

x rotation angle

Angle angy

y rotation angle

Angle angz

z rotation angle

RETURN VALUE

None

FUNCTION

- Apply a matrix that gives rotation around the X, Y, and Z axes to the matrix m, in that order.
- When parameter m is NULL, the current matrix will be the destination.

EXAMPLE

The following applies a matrix that gives rotation of 30 degrees around the X axis, 60 degrees around the Y axis, and 90 degrees around the Z axis to the current matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njRotateXYZ(NULL, NJM_DEG_ANG(30), NJM_DEG_ANG(60), NJM_DEG_ANG(90));
njPopMatrix(1);
```

NOTES

- For a matrix [M] and multiplicative rotational matrix [R], $[M] = [R] * [M]$.
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njScale

Scales a matrix.

FORMAT

```
#include <Ninja.h>

void njScale(*m, sx, sy, sz)
NJS_MATRIX *m
Float sx
Float sy
Float sz
```

PARAMETERS

NJS_MATRIX *m

calculation matrix

Float sx

scaling ratio along the X axis

Float sy

scaling ratio along the Y axis

Float sz

scaling ratio along the Z axis

RETURN VALUE

None

FUNCTION

- Scales arbitrary matrix m.
- When parameter m is NULL, the current matrix is scaled.

EXAMPLE

The following scales the current matrix by 0.5 along the X axis, 1 along the Y axis, and 2 along the Z axis.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njScale(NULL, 0.5f, 1.f, 2.f);
njPopMatrix(1);
```

NOTES

- For arbitrary matrix [M] and multiplicative scaling matrix [R], $[M] = [S] * [M]$.
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njScaleV

Scales a matrix.

FORMAT

```
#include <Ninja.h>

void njScale(*m, *v)
NJS_MATRIX *m
NJS_VECTOR *v
```

PARAMETERS

NJS_MATRIX *m

pointer to the calculation matrix

NJS_VECTOR *v

scaling ratio along the X, Y, and Z axes

RETURN VALUE

None

FUNCTION

- Scales arbitrary matrix m.
- When parameter m is NULL, the current matrix is scaled.

EXAMPLE

The following scales the current matrix by 0.5 along the X axis, 1 along the Y axis, and 2 along the Z axis.

```
NJS_MATRIX stack[10];
NJS_VIEW view;
NJS_VECTOR v;

v.x = 0.5f;
v.y = 1.f;
v.z = 2.f;
njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njScale(NULL, &v);
njPopMatrix(1);
```

NOTES

- For arbitrary matrix [M] and multiplicative scaling matrix [R], $[M] = [S] * [M]$.
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njScalor

Returns the scalar of an arbitrary vector.

FORMAT

```
#include <Ninja.h>

Float njScalor(*v)
NJS_VECTOR *v
```

PARAMETERS

NJS_VECTOR *v
arbitrary vector

RETURN VALUE

Size of vector (scalar)

FUNCTION

- Returns the scalar of an arbitrary vector.

EXAMPLE

The following returns the size of vector $v(3, 3, 3)$.

```
NJS_VECTOR v;
Float scalar;

v.x = 3.f;
v.y = 3.f;
v.z = 3.f;

scalar = njScalor(&v)

% Result %
scalar = 5.196152
```

NOTES

RELATED TOPICS

njScalor2 Returns the square of the scalar of an arbitrary vector.

FORMAT

```
#include <Ninja.h>

Float njScalor2(*v)
NJS_VECTOR *v
```

PARAMETERS

NJS_VECTOR *v

arbitrary vector

RETURN VALUE

Square of the vector size (scalar)

FUNCTION

- Returns the square of the scalar of an arbitrary vector.

EXAMPLE

The following returns the square of the scalar of vector v(3, 3, 3).

```
NJS_VECTOR v;
Float scalar2;

v.x = 3.f;
v.y = 3.f;
v.z = 3.f;

scalar2 = njScalor2(&v)

% Result %
scalar2 = 27
```

NOTES

RELATED TOPICS

njSetMatrix

Copies an arbitrary matrix.

FORMAT

```
#include <Ninja.h>

void njSetMatrix(*md, *ms)
NJS_MATRIX *md
NJS_MATRIX *ms
```

PARAMETERS

NJS_MATRIX *md

copy destination matrix

NJS_MATRIX *ms

copy source matrix

RETURN VALUE

FUNCTION

- Copies arbitrary matrix md to matrix ms.
- When parameter md is NULL, the current matrix is copied.

EXAMPLE

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njSetMatrix(NULL, _unit_matrix_);
njPopMatrix(1);
```

NOTES

RELATED TOPICS

NJS_MATRIX

njSubMatrix

Performs matrix subtraction.

FORMAT

```
#include <Ninja.h>

void njSubMatrix(*md, *ms)
NJS_MATRIX *md
NJS_MATRIX *ms
```

PARAMETERS

NJS_MATRIX *md

minuend matrix

NJS_MATRIX *ms

subtrahend matrix

RETURN VALUE

None

FUNCTION

- Subtracts one matrix from another. ($[md] = [md] - [ms]$)
- When parameter m is NULL, the current matrix is taken as the minuend.

EXAMPLE

NOTES

RELATED TOPICS

NJS_MATRIX

njSubVector

Performs vector subtraction.

FORMAT

```
#include <Ninja.h>

void njSubVector(*vd, *vs)
NJS_VECTOR *vd
NJS_VECTOR *vs
```

PARAMETERS

NJS_VECTOR *vd

minuend vector

NJS_VECTOR *vs

subtrahend matrix

RETURN VALUE

FUNCTION

- Subtracts one vector from another and stores the result in vector vd.

vd = vd - vs

EXAMPLE

NOTES

RELATED TOPICS

NJS_VECTOR

njTranslate

Applies a matrix that gives parallel translation along each axis.

FORMAT

```
#include <Ninja.h>

void njTranslate(*m, x, y, z)
NJS_MATRIX *m
Float x
Float y
Float z
```

PARAMETERS

NJS_MATRIX *m

destination matrix

Float x

amount of translation along the X axis

Float y

amount of translation along the Y axis

Float z

amount of translation along the Z axis

RETURN VALUE

FUNCTION

- Applies a matrix that gives parallel translation along each axis to the matrix m.
- When parameter m is NULL, the current matrix will be the destination.

EXAMPLE

The following applies a matrix that gives parallel translation of 10 along the X axis, 20 along the Y axis, and 30 along the Z axis to the current matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njTranslate(NULL, 10.f, 20.f, 30.f);
njPopMatrix(1);
```

NOTES

- For matrix [M] and matrix translated through multiplication [T],[M] = [T] * [M].
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njTranslateV

Moves a matrix laterally.

FORMAT

```
#include <Ninja.h>

void njTranslateV(*m, *v)
NJS_MATRIX *m
NJS_VECTOR *v
```

PARAMETERS

NJS_MATRIX *m

matrix to be moved

NJS_VECTOR *v

amount of movement along the various axes

RETURN VALUE

None

FUNCTION

- Moves arbitrary matrix m laterally.
- When parameter m is NULL, the current matrix is moved.

EXAMPLE

The following moves the current matrix by 10 along the X axis, 20 along the Y axis, and 30 along the Z axis.

```
NJS_MATRIX stack[10];
NJS_VIEW view;
NJS_VECTOR v;

v.x = 10.f;
v.y = 20.f;
v.z = 30.f;
njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njTranslateV(NULL, &v);
njPopMatrix(1);
```

NOTES

- For matrix [M] and matrix translated through multiplication [T], $[M] = [T] * [M]$.
- Care must be taken with the order in which matrices are multiplied.

RELATED TOPICS

njTransposeMatrix

Transposes a matrix.

FORMAT

```
#include <Ninja.h>

void njTransposeMatrix(*m)
NJS_MATRIX *m
```

PARAMETERS

NJS_MATRIX *m

matrix to be transposed

RETURN VALUE

FUNCTION

- Transposes arbitrary matrix m.
- When parameter m is NULL, the current matrix is transposed.

EXAMPLE

The following transposes the current matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njTransposeMatrix(NULL);
njPopMatrix(1);
```

NOTES

For arbitrary matrix M, $[M] = [M]^t$.

RELATED TOPICS

njUnitMatrix

Converts an arbitrary matrix to a unit matrix.

FORMAT

```
#include <Ninja.h>

void njUnitMatrix(*m)
NJS_MATRIX *m
```

PARAMETERS

NJS_MATRIX *m

matrix to be unitized

RETURN VALUE

None

FUNCTION

- Converts an arbitrary matrix to a unit matrix.
- When parameter *m* is NULL, the current matrix is unitized.

EXAMPLE

The following converts the current matrix to a unit matrix.

```
NJS_MATRIX stack[10];
NJS_VIEW view;

njInitMatrix(stack, 10);
njInitView(&view);
njSetView(&view);
njClearMatrix();
njPushMatrix(NULL);
njUnitMatrix(NULL);
njPopMatrix(1);
```

NOTES

RELATED TOPICS

NJS_MATRIX

njUnitVector

Converts an arbitrary vector to a unit vector.

FORMAT

```
#include <Ninja.h>

Float njUnitVector(*v)
NJS_VECTOR *v
```

PARAMETERS

NJS_VECTOR *v

arbitrary vector

RETURN VALUE

Size of the original vector. (scalar)

FUNCTION

- Converts an arbitrary vector to a unit vector.

EXAMPLE

The following converts vector $v(3, 3, 3)$ to a unit vector.

```
NJS_VECTOR v;
Float scalar;

v.x = 3.f;
v.y = 3.f;
v.z = 3.f;

scalar = njUnitVector(&v)

% result %
v(0.577350, 0.577350, 0.577350)
scalar = 5.196152
```

NOTES

RELATED TOPICS



3. Collision Functions

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njCollisionCheckBB

Checks Collision for 2 Hexahedron.

FORMAT

```
#include <Ninja.h>
Int njCollisionCheckBB(*h1, *h2)
NJS_BOX *h1
NJS_BOX *h2
```

PARAMETERS

***h1**

Hexahedron object #1 to be collision checked

***h2**

Hexahedron object #2 to be collision checked

RETURN VALUE

1: Hit

0: Not hit

ERROR VALUE

None

FUNCTION

Checks collision for two hexahedrons.

EXAMPLE

Check collision for two hexahedron h1 and h2:

```
NJS_BOX h1, h2;
```

```
h1.v[0].x = -150.f; h1.v[0].y = 100.f; h1.v[0].z = 100;
h1.v[1].x = -150.f; h1.v[1].y = 100.f; h1.v[1].z = -100;
h1.v[2].x = 50.f; h1.v[2].y = 100.f; h1.v[2].z = -100;
h1.v[3].x = 50.f; h1.v[3].y = 100.f; h1.v[3].z = 100;
h1.v[4].x = -150.f; h1.v[4].y = -100.f; h1.v[4].z = 100;
h1.v[5].x = -150.f; h1.v[5].y = -100.f; h1.v[5].z = -100;
h1.v[6].x = 50.f; h1.v[6].y = -100.f; h1.v[6].z = -100;
h1.v[7].x = 50.f; h1.v[7].y = -100.f; h1.v[7].z = 100;
```

```
h2.v[0].x = -50.f; h2.v[0].y = 100.f; h2.v[0].z = 100;  
h2.v[1].x = -50.f; h2.v[1].y = 100.f; h2.v[1].z = -100;  
h2.v[2].x = 150.f; h2.v[2].y = 100.f; h2.v[2].z = -100;  
h2.v[3].x = 150.f; h2.v[3].y = 100.f; h2.v[3].z = 100;  
h2.v[4].x = -50.f; h2.v[4].y = -100.f; h2.v[4].z = 100;  
h2.v[5].x = -50.f; h2.v[5].y = -100.f; h2.v[5].z = -100;  
h2.v[6].x = 150.f; h2.v[6].y = -100.f; h2.v[6].z = -100;  
h2.v[7].x = 150.f; h2.v[7].y = -100.f; h2.v[7].z = 100;  
  
njsCollisionCheckBB(&h1, &h2);
```

Result

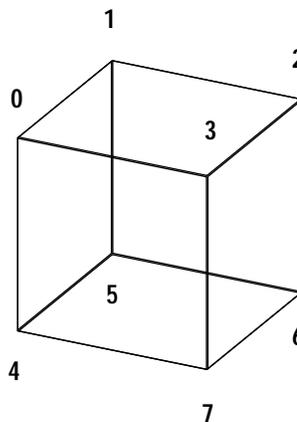
Return value: 1

NOTES

NJS_BOX structure (box type)

```
typedef struct{  
    NJS_POINT3 v[8]; /* hexahedron vertex list */  
} NJS_BOX;
```

Corresponding vertices with the vertex list index



RELATED TOPICS

njCollisionCheckBC

Checks collision for a hexahedron and a capsule.

FORMAT

```
#include <Ninja.h>
Int njCollisionCheckBC( *box, *capsule )
NJS_BOX      *box
NJS_CAPSULE  *capsule
```

PARAMETERS

***box**

Hexahedron to be collision checked

***capsule**

Capsule to be collision checked

RETURN VALUE

1: Hit

0: Not hit

ERROR VALUE

None

FUNCTION

Checks collision for a hexahedron and a capsule

EXAMPLE

Hexahedron (box) and capsule (capsule) collision checking.

```
NJS_BOX box;
NJS_CAPSULE capsule;

box.v[0].x = -150.f; box.v[0].y = 100.f; box.v[0].z = 100;
box.v[1].x = -150.f; box.v[1].y = 100.f; box.v[1].z = -100;
box.v[2].x = 50.f; box.v[2].y = 100.f; box.v[2].z = -100;
box.v[3].x = 50.f; box.v[3].y = 100.f; box.v[3].z = 100;
box.v[4].x = -150.f; box.v[4].y = -100.f; box.v[4].z = 100;
box.v[5].x = -150.f; box.v[5].y = -100.f; box.v[5].z = -100;
box.v[6].x = 50.f; box.v[6].y = -100.f; box.v[6].z = -100;
box.v[7].x = 50.f; box.v[7].y = -100.f; box.v[7].z = 100;
```

```

capsule.c1.x = 100.f;
capsule.c1.y = 0.f;
capsule.c1.z = 0.f;
capsule.c2.x = 200.f;
capsule.c2.y = 0.f;
capsule.c2.z = 0.f;
capsule.r    = 100.f;

njCollisionCheckBC(&box, &capsule);

```

Result

Return value: 1

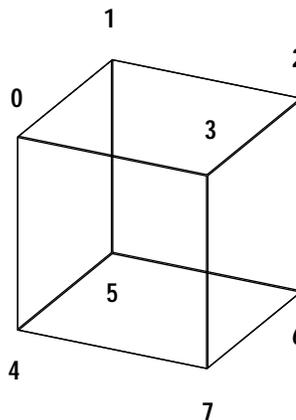
NOTES**RELATED TOPICS****NJS_BOX structure(box type)**

```

typedef struct{
    NJS_POINT3 v[8]; /* vertex list for hexahedron */
} NJS_BOX;

```

Corresponding vertices with vertex list index

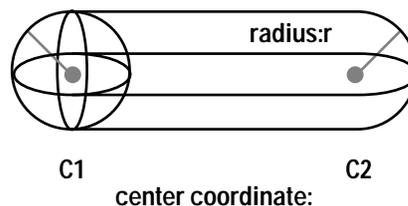
**NJS_CAPSULE structure(capsule type)**

```

typedef struct{
    NJS_POINT3 c1;
    NJS_POINT3 c2;
    Float      r;
} NJS_CAPSULE;

```

A capsule consists of a half sphere with center coordinate = c1 and radius = r one side, and another half sphere with center coordinate = c2 and radius = r the other side.



njCollisionCheckBS

Checking for collision for a hexahedron and a sphere.

FORMAT

```
#include <Ninja.h>
Int njCollisionCheckBS( *box, *sphere )
NJS_BOX *box
NJS_SPHERE *sphere
```

PARAMETERS

***box**

Hexahedron to be collision checked

***sphere**

Sphere to be collision checked

RETURN VALUE

1: Hit

0: Not hit

ERROR VALUE

None

FUNCTION

Checks collision for a hexahedron and a sphere.

EXAMPLE

Hexahedron (box) and sphere (sphere) collision checking.

```
NJS_BOX box;
NJS_SPHERE sphere;
```

```
box.v[0].x = -150.f; box.v[0].y = 100.f; box.v[0].z = 100;
box.v[1].x = -150.f; box.v[1].y = 100.f; box.v[1].z = -100;
box.v[2].x = 50.f; box.v[2].y = 100.f; box.v[2].z = -100;
box.v[3].x = 50.f; box.v[3].y = 100.f; box.v[3].z = 100;
box.v[4].x = -150.f; box.v[4].y = -100.f; box.v[4].z = 100;
box.v[5].x = -150.f; box.v[5].y = -100.f; box.v[5].z = -100;
box.v[6].x = 50.f; box.v[6].y = -100.f; box.v[6].z = -100;
box.v[7].x = 50.f; box.v[7].y = -100.f; box.v[7].z = 100;
```

```

sphere.c.x = 100.f;
sphere.c.y =  0.f;
sphere.c.z =  0.f;
sphere.r   = 100.f;

njCollisionCheckBS(&box, &sphere);

```

Result

Return value: 1

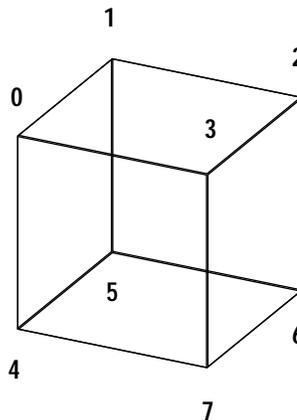
NOTES**NJS_BOX structure(box type)**

```

typedef struct{
    NJS_POINT3 v[8]; /* vertex list for hexahedron */
} NJS_BOX;

```

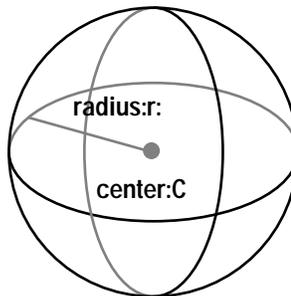
Corresponding vertices with vertex list index

**NJS_SPHERE structure(sphere)**

```

typedef struct{
    NJS_POINT3 c; /* center of the sphere */
    Float      r; /* radius of the sphere */
} NJS_SPHERE;

```



A sphere consists of center coordinate c and radius r

RELATED TOPICS

njCollisionCheckCC

Checks collision for two capsules.

FORMAT

```
#include <Ninja.h>
Int njCollisionCheckCC( *h1, *h2 )
NJS_CAPSULE *h1
NJS_CAPSULE *h2
```

PARAMETERS

***h1**

Collision checked object capsule #1

***h2**

Collision checked object capsule #2

RETURN VALUE

1: Hit

0: Not hit

ERROR VALUE

None

FUNCTION

Checks collision for two capsules.

EXAMPLE

Check collision for two capsules h1 and h2.

```

NJS_CAPSULE h1,h2;

h1.c1.x = -80.f;
h1.c1.y = 0.f;
h1.c1.z = 0.f;
h1.c2.x = -180.f;
h1.c2.y = 0.f;
h1.c2.z = 0.f;
h1.r = 100.f;

h2.c1.x = 80.f;
h2.c1.y = 0.f;
h2.c1.z = 0.f;
h2.c2.x = 180.f;
h2.c2.y = 0.f;
h2.c2.z = 0.f;
h2.r = 100.f;

njCollisionCheckCC(&h1, &h2);

```

Result

Return value: 1

NOTES

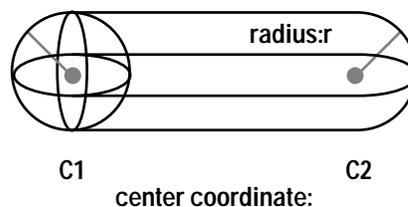
NJS_CAPSULE structure (capsule type)

```

typedef struct{
    NJS_POINT3 c1;
    NJS_POINT3 c2;
    Float      r;
} NJS_CAPSULE;

```

A capsule consists of a half sphere with center coordinate = c1 and radius = r on one side, and another half sphere with center coordinate = c2 and radius = r on the other side.



RELATED TOPICS

njCollisionCheckSC

Checks collision for a sphere and a capsule.

FORMAT

```
#include <Ninja.h>
Int njCollisionCheckSC( *sphere, *capsule)
NJS_SPHERE *sphere
NJS_CAPSULE *capsule
```

PARAMETERS

***sphere**

Sphere to be collision checked

***capsule**

Capsule to be collision checked

RETURN VALUE

1: Hit

0: Not hit

ERROR VALUE

None

FUNCTION

Checks collision for a sphere and a capsule.

EXAMPLE

Checks collision for a sphere and a capsule.

```
NJS_SPHERE *sphere
NJS_CAPSULE *capsule

sphere.c.x = -80.f;
sphere.c.y = 0.f;
sphere.c.z = 0.f;
sphere.r = 100.f;

capsule.c1.x = 80.f;
capsule.c1.y = 0.f;
```

```
capsule.c1.z = 0.f;
capsule.c2.x = 180.f;
capsule.c2.y = 0.f;
capsule.c2.z = 0.f;
capsule.r = 100.f;

njCollisionCheckSC(&sphere, &capsule);
```

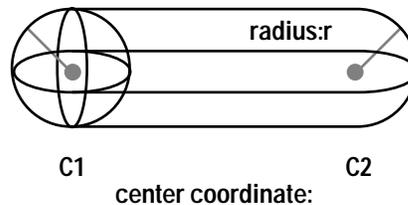
Result

Return value: 1

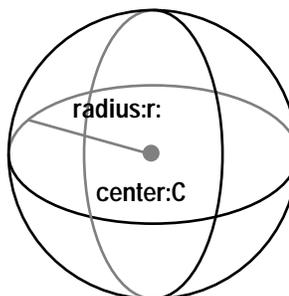
NOTES**NJS_CAPSULE structure (capsule type)**

```
typedef struct{
    NJS_POINT3 c1;
    NJS_POINT3 c2;
    Float      r;
} NJS_CAPSULE;
```

A capsule consisted of a half sphere with center coordinate = c1 and radius = r one side, and another half sphere with center coordinate = c2 and radius = r the other side.

**NJS_SPHEREstructure (sphere)**

```
typedef struct{
    NJS_POINT3 c; /* center of sphere */
    Float      r; /* radius of sphere */
} NJS_SPHERE;
```



A sphere consists of center coordinate c and radius r.

RELATED TOPICS

njCollisionCheckSS

Checks collision for two spheres.

FORMAT

```
#include <Ninja.h>
Int njCollisionCheckSS( *sphere1, *sphere2 )
NJS_SPHERE *sphere1
NJS_SPHERE *sphere2
```

PARAMETERS

***sphere1**

Collision checked object, sphere #1

***sphere2**

Collision checked object, sphere #2

RETURN VALUE

1: Hit

0: Not hit

ERROR VALUE

None

FUNCTION

Checks collision for two spheres.

EXAMPLE

Checks collision for two spheres, sphere1 and sphere2.

```

NJS_SPHERE sphere1,sphere2;

sphere1.c.x = -80.f;
sphere1.c.y = 0.f;
sphere1.c.z = 0.f;
sphere1.r = 100.f;
sphere2.c.x = 80.f;
sphere2.c.y = 0.f;
sphere2.c.z = 0.f;
sphere2.r = 100.f;

njCollisionCheckSS(&sphere1, &sphere2);

```

Result

Return value: 1

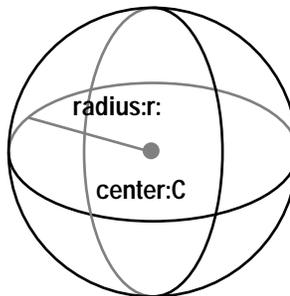
NOTES

NJS_SPHEREstructure (sphere)

```

typedef struct{
    NJS_POINT3          c;/* center of sphere */
    Float               r;/* radius of sphere */
} NJS_SPHERE;

```



A sphere consists of center coordinate c and radius r.

RELATED TOPICS

njDistanceL2L

Returns the distance between two lines.

FORMAT

```
#include <Ninja.h>

Float njDisatnceL2L(*l1, *l2, *p1, *p2)
NJS_LINE *l1
NJS_LINE *l2
NJS_POINT3 *p1
NJS_POINT3 *p2
```

PARAMETERS

NJS_LINE *l1

line data 1

NJS_LINE *l2

line data 2

NJS_POINT3 *p1

coordinates of closest point on line 1

NJS_POINT3 *p2

coordinates of closest point on line 2

RETURN VALUE

Minimum distance between the two lines.

FUNCTION

- Returns the minimum distance between two lines.
- When parameters p1 and 2 are not NULL, the coordinates of the two closest points on the two lines are determined and stored in p1 (for the point on l1) and p2 (for the point on l2).

EXAMPLE

NOTES

RELATED TOPICS

NJS_POINT3

NJS_LINE

njDistanceL2PL Returns the distance between a line and a plane.

FORMAT

```
#include <Ninja.h>

Float njDisatnceL2L(*l, *pl, *cp)
NJS_LINE    *l
NJS_PLANE   *pl
NJS_POINT3  *cp
```

PARAMETERS

NJS_LINE *l

line data

NJS_PLANE *pl

plane data

NJS_POINT3 *cp

intersection of a line and a plane (if not parallel)

RETURN VALUE

Distance between a line and a plane.

FUNCTION

- Returns the distance between a line and a plane.
- When parameter cp is not NULL, the coordinates of the point of intersection between the line and the plane are calculated and stored in cp (when the line and plane are not parallel).
- When the line and plane are parallel, the coordinates of the point of intersection between a projection from the start of the line, to the plane, is stored.

EXAMPLE

```
NJS_LINE   l;  
NJS_PLANE  pl;  
NJS_POINT3 cp;  
  
l.px = 2.f;  
l.py = -1.f;  
l.pz = 3.f;  
l.vx = 4.f;  
l.vy = -1.f;  
l.vz = 1.f;  
pl.px = 0.f;  
pl.py = 0.f;  
pl.pz = 0.f;  
pl.vx = 1.f;  
pl.vy = -4.f;  
pl.vz = 1.f;  
  
njDistanceL2PL(&l, &pl, &cp);  
  
% Result %  
Return value 0.000000  
cp (-2, 0, 2)
```

NOTES

RELATED TOPICS

NJS_POINT3

NJS_LINE

NJS_PLANE

njDistanceP2L Returns the distance between a point and a line.

FORMAT

```
#include <Ninja.h>

Float njDistanceP2L(*p, *l, *cp)
NJS_POINT3 *p
NJS_LINE *l
NJS_POINT3 *cp
```

PARAMETERS

NJS_POINT3 *p

point data

NJS_LINE *l

line data

NJS_POINT3 *cp

coordinates of the base of the projection from the point p to the line l

RETURN VALUE

Distance between a point and a line.

FUNCTION

- Returns the distance between a point and a line.
- When parameter cp is not NULL, the coordinates of the base of the projection from the point p to the line l are returned in cp.

EXAMPLE

```
NJS_POINT3 p, cp;
NJS_LINE l;

p.x = 6.f;
p.y = 6.f;
p.z = 4.f;
l.px = 4.f;
l.py = 3.f;
l.pz = 2.f;
l.vx = 3.f;

l.vy = 2.f;
l.vz = 1.f;

njDistanceP2L(&p, &l, &cp);

% Result %
Return value  1.732051
cp (7, 5, 3)
```

NOTES

RELATED TOPICS

NJS_POINT3 NJS_LINE

njDistanceP2P

Returns the distance between two points.

FORMAT

```
#include <Ninja.h>

Float njDistanceP2P(*p1, *p2)
NJS_POINT3 *p1
NJS_POINT3 *p2
```

PARAMETERS

NJS_POINT3 *p1

point data 1

NJS_POINT3 *p2

point data 2

RETURN VALUE

Distance between the two points.

FUNCTION

- Returns the distance between two points.

EXAMPLE

```
NJS_POINT3 p1, p2;

p1.x = 100.f;
p1.y = 100.f;
p1.z = 100.f;
p2.x = -100.f;
p2.y = -100.f;
p2.z = -100.f;

njDistanceP2P(&p1, &p2);

% Result %
346.410156
```

NOTES

RELATED TOPICS

NJS_POINT3

njDistanceP2PL Returns the distance between a point and a line.

FORMAT

```
#include <Ninja.h>

Float njDistanceP2PL(*p, *pl, *cp)
NJS_POINT3 *p
NJS_PLANE *pl
NJS_POINT3 *cp
```

PARAMETERS

NJS_POINT3 *p

point data

NJS_PLANE *pl

line data

NJS_POINT3 *cp

coordinates of the base of the projection from the point p to the line l

RETURN VALUE

Distance between a point and a line

FUNCTION

- Returns the distance between a point and a line.
- When parameter cp is not NULL, the coordinates of the base of the projection from the point p to the line l are returned in cp.

EXAMPLE

```
NJS_POINT3 p, cp;
NJS_PLANE pl;

p.x = 100.f;
p.y = 100.f;
p.z = 100.f;
pl.px = 0.f;
pl.py = 0.f;
pl.pz = 0.f;
pl.vx = 0.f;
pl.vy = 0.f;
pl.vz = 1.f;

njDistanceP2PL(&p, &pl, &cp);

% Result %
Return value 100.000000
cp (100, 100, 0)
```

NOTES

RELATED TOPICS

NJS_POINT3

NJS_LINE

njDistancePL2PL

Returns the distance between two planes.

FORMAT

```
#include <Ninja.h>

Float njDisatnceL2L(*p11, *p12, *l)
NJS_PLANE *p11
NJS_PLANE *p12
NJS_LINE *l
```

PARAMETERS

NJS_PLANE *p11

plane data 1

NJS_PLANE *p12

plane data 2

NJS_LINE *l

line of intersection between the two planes

RETURN VALUE

Distance between the two planes

FUNCTION

- Returns the distance between two planes.
- When parameter l is not NULL, the line of intersection between the two planes is determined and stored in l (if the two planes are not parallel).
- If the two planes are parallel, the value of the members of l is 0.

EXAMPLE

NOTES

RELATED TOPICS

NJS_LINE

NJS_PLANE

njGetPnaneNormal

Finds the vector that is normal to a plane.

FORMAT

```
#include <Ninja.h>
void njGetPlaneNormal(*p, *v)
NJS_POINT3 *p
NJS_VECTOR *v
```

PARAMETERS

NJS_POINT3 *p

data array describing three points in the plane

NJS_VECTOR *v

normal vector to the plane

RETURN VALUE

None

FUNCTION

- Finds the vector that is normal to a plane.

EXAMPLE

The following finds the vector that is normal to the plane passing through points (1, 2, 3), (1, -1, 2), and (2, 3, 1).

```
NJS_POINT3 p[3];
NJS_VECTOR v;

p[0].x = 1.f;
p[0].y = 2.f;
p[0].z = 3.f;
p[1].x = 1.f;
p[1].y = -1.f;
p[1].z = 2.f;
p[2].x = 2.f;
p[2].y = 3.f;
p[2].z = 1.f;

njGetPlaneNormal(p, &v);

% Result %
v (7, -1, 3)
```

NOTES

RELATED TOPICS

NJS_POINT3
NJS_VECTOR

njGetPnaneNormal2

Finds the vector that is normal to a plane.

FORMAT

```
#include <Ninja.h>
void njGetPlaneNormal(*p0, *p1, *p2 *v)
NJS_POINT3 *p0
NJS_POINT3 *p1
NJS_POINT3 *p2
NJS_VECTOR *v
```

PARAMETERS

NJS_POINT3 *p0

data of point 1 on plane

NJS_POINT3 *p1

data of point 2 on plane

NJS_POINT3 *p2

data of point 3 on plane

NJS_VECTOR *v

normal vector to plane

RETURN VALUE

None

FUNCTION

- Finds the normal vector from three points on a plane.

EXAMPLE

The following finds the normal vector to the plane passing through points (1, 2, 3), (1, -1, 2), and (2, 3, 1).

```
NJS_POINT3 p0, p1, p2;
NJS_VECTOR v;

p0.x = 1.f;
p0.y = 2.f;
p0.z = 3.f;
p1.x = 1.f;
p1.y = -1.f;
p1.z = 2.f;
p2.x = 2.f;
p2.y = 3.f;
p2.z = 1.f;

njGetPlaneNormal(&p0, &p1, &p2, &v);

% Result %
v (7, -1, 3)
```

NOTES

RELATED TOPICS

NJS_POINT3
NJS_VECTOR

njIsParalellL2L

Returns whether two lines are parallel.

FORMAT

```
#include <Ninja.h>

Bool njIsParalellL2L(*l1, *l2)
NJS_LINE *l1
NJS_LINE *l2
```

PARAMETERS

NJS_LINE *l1

line 1 data

NJS_LINE *l2

line 2 data

RETURN VALUE

TRUE

parallel

FALSE

not parallel

FUNCTION

- Determines whether or not two lines are parallel.

EXAMPLE

```
NJS_LINE 11, 12;

11.px = 100.f;
11.py = 100.f;
11.pz = 100.f;
11.vx = 3.f;
11.vy = 4.f;
11.vz = 5.f;

12.px = 100.f;
12.py = 100.f;
12.pz = -100.f;
12.vx = -3.f;
12.vy = -4.f;
12.vz = -5.f;

njIsParalellL2L(&l1, &l2);

% Result %
TRUE
```

NOTES

RELATED TOPICS

NJS_LINE

njIsParalellL2PL

Returns whether a line and a plane are parallel.

FORMAT

```
#include <Ninja.h>

Bool njIsParalellL2L(*l, *pl)
NJS_LINE *l
NJS_PLANE *pl
```

PARAMETERS

NJS_LINE *l

line data

NJS_PLANE *pl

plane data

RETURN VALUE

TRUE

parallel

FALSE

not parallel

FUNCTION

- Determines whether or not a line and a plane are parallel.

EXAMPLE

```
NJS_LINE l;  
NJS_PLANE pl;  
  
l.px = 100.f;  
l.py = 100.f;  
l.pz = 100.f;  
l.vx = 1.f;  
l.vy = 0.f;  
l.vz = 0.f;  
  
pl.px = -100.f;  
pl.py = -100.f;  
pl.pz = -100.f;  
pl.vx = -0.f;  
pl.vy = -0.f;  
pl.vz = -1.f;  
  
njIsParalellL2PL(&l, &pl);  
  
% Result %  
TRUE
```

NOTES

RELATED TOPICS

NJS_LINE
NJS_PLANE

njIsParalellPL2PL

Returns whether two planes are parallel.

FORMAT

```
#include <Ninja.h>

Bool njIsParalellPL2L(*p11, *p12)
NJS_PLANE *p11
NJS_PLANE *p12
```

PARAMETERS

NJS_PLANE *p11

plane 1 data

NJS_PLANE *p12

plane 2 data

RETURN VALUE

TRUE

parallel

FALSE

not parallel

FUNCTION

Determines whether or not two planes are parallel.

EXAMPLE

```
NJS_PLANE pl1, pl2;

pl1.px = 100.f;
pl1.py = 100.f;
pl1.pz = 100.f;
pl1.vx = 0.f;
pl1.vy = 0.f;
pl1.vz = 1.f;

pl2.px = -100.f;
pl2.py = -100.f;
pl2.pz = -100.f;
pl2.vx = 0.f;
pl2.vy = 0.f;
pl2.vz = -1.f;

njIsParalellPL2PL(&pl1, &pl2);

% Result %
TRUE
```

NOTES

RELATED TOPICS

NJS_PLANE



4. *Mathematical Functions*

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njAbs

Returns an absolute value.

FORMAT

```
#include <Ninja.h>
Float njAbs( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Absolute value of real number n

FUNCTION

- Determines the absolute value of arbitrary real number n and returns that value as the result.

EXAMPLE

```
int ix = -4, iy;
double dx = -3.141593, dy;
iy = njAbs( ix );
dy = njAbs( dx );
% Result %
The absolute value of -4 is 4.
The absolute value of -3.141593 is 3.141593.
```

NOTES

RELATED TOPICS

njArcCos

Returns an arc cosine (ArcCos).

FORMAT

```
#include <Ninja.h>
Angle njArcCos( n )
Float n
```

PARAMETERS

n

value of cosine

RETURN VALUE

value of arc cosine

FUNCTION

- Obtains the arc cosine of arbitrary cosine n and returns the result.

EXAMPLE

```
ans = njArcCos( 0.5f );
% Result %
ans = 2aaa
```

NOTES

RELATED TOPICS

[njArcCosec](#)

[njArcCot](#)

[njArcSec](#)

[njArcSin](#)

[njArcTan](#)

njArcCosec

Returns an arc cosecant.

FORMAT

```
#include <Ninja.h>
Angle njArcCosec( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Value of arc cosecant

FUNCTION

- Determines the arc cosecant of arbitrary real number *n* and returns the value found as the result.

EXAMPLE

```
ans = njArcCosec( 2.f );
% Result %
ans = 1555
```

NOTES

RELATED TOPICS

[njArcCos](#)

[njArcCot](#)

[njArcSec](#)

[njArcSin](#)

[njArcTan](#)

njArcCot

Returns an arc cotangent.

FORMAT

```
#include <Ninja.h>
Angle njArcCot( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Value of arc cotangent

FUNCTION

- Determines the arc cotangent of arbitrary real number *n* and returns the value found as the result.

EXAMPLE

```
ans = njArcCot( 2.f );
% Result %
ans = 12e4
```

NOTES

RELATED TOPICS

[njArcCos](#)

[njArcCosec](#)

[njArcSec](#)

[njArcSin](#)

[njArcTan](#)

njArcSec

Returns an arc secant.

FORMAT

```
#include <Ninja.h>
Angle njArcSec( n )
Float n
```

PARAMETERS

n
an arbitrary real number

RETURN VALUE

Value of arc secant

FUNCTION

- Determines the arc secant of arbitrary real number n and returns the value found as the result.

EXAMPLE

```
ans = njArcSec( 2.f );
% Result %
ans = 2aaa
```

NOTES

RELATED TOPICS

[njArcCos](#)
[njArcCosec](#)
[njArcCot](#)
[njArcSin](#)
[njArcTan](#)

njArcSin

Returns an arc sine.

FORMAT

```
#include <Ninja.h>
Angle njArcSin( n )
Float n
```

PARAMETERS

n

value of sine

RETURN VALUE

Value of arc sine

FUNCTION

- Determines the arc sine of an arbitrary given sine and returns the value found as the result.

EXAMPLE

```
ans = njArcSin( 0.5f );
% Result %
ans = 1555
```

NOTES

RELATED TOPICS

[njArcCos](#)

[njArcCosec](#)

[njArcCot](#)

[njArcSec](#)

[njArcTan](#)

njArcTan

Returns an arc tangent.

FORMAT

```
#include <Ninja.h>
Angle njArcTan( n )
Float n
```

PARAMETERS

n

value of tangent

RETURN VALUE

Value of arc tangent

FUNCTION

- Determines the arc tangent of a given arbitrary tangent value n and returns the value found as the result.

EXAMPLE

```
ans = njArcTan( 2.f );
% Result %
ans = 2dlb
```

NOTES

RELATED TOPICS

[njArcCos](#)

[njArcCosec](#)

[njArcCot](#)

[njArcSec](#)

[njArcSin](#)

njArcTan2

Returns an arc tangent (ArcTan2).

FORMAT

```
#include <Ninja.h>
Angle njArcTan2( y, x )
Float x
Float y
```

PARAMETERS

x

length of base

y

altitude

RETURN VALUE

Value of arc tangent

FUNCTION

- Determines the arc tangent from a given base x and altitude y and returns the value of the result.

EXAMPLE

```
ans = njArcTan2( 4.f , 2.f );
% Result %
ans = 2d1b
```

NOTES

RELATED TOPICS

[njArcCos](#)

[njArcCosec](#)

[njArcCot](#)

[njArcSec](#)

[njArcSin](#)

njCeil Returns the smallest integer not less than n (Ceiling Function).

FORMAT

```
#include <Ninja.h>
Float njCeil( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Smallest integer not less than n

FUNCTION

Determines the smallest integer that is not less than real number n and returns the value found as the result.

EXAMPLE

```
y1 = njCeil( 2.8f );
y2 = njCeil( -2.8f );
% Result %
y1 = 3.000000
y2 = -2.000000
```

NOTES

RELATED TOPICS

[njFloor](#)

[njRoundOff](#)

njCos

Returns a cosine.

FORMAT

```
#include <Ninja.h>
Float njCos( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

value of cosine

FUNCTION

- Finds the cosine of arbitrary angle `ang` and returns the value found as the result.

EXAMPLE

```
ans = njCos( 0x1555 );
% Result %
ans = 0.866041
```

NOTES

RELATED TOPICS

`njSin`

njCosec

Returns the cosecant.

FORMAT

```
#include <Ninja.h>
Float njCosec( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

Value of cosecant

FUNCTION

- Determines the cosecant of arbitrary angle `ang` and returns the value found as the result.

EXAMPLE

```
ans = njCosec( 0x1555 );
% Result %
ans = 2.000112
```

NOTES

RELATED TOPICS

`njCot`

njCosech

Returns the hyperbolic cosecant.

FORMAT

```
#include <Ninja.h>
Float njCosech( n )
Angle n
```

PARAMETERS

n

angle

RETURN VALUE

Value of hyperbolic cosecant

FUNCTION

- Determines the hyperbolic cosecant of arbitrary angle **n** and returns the value found as the result.

EXAMPLE

```
ans = njCosch( NJM_RAD_ANG(1) );
% Result %
ans = 0.850959
```

NOTES

RELATED TOPICS

[njCosh](#)

[njCoth](#)

[njSech](#)

[njSinh](#)

njCosh

Returns the hyperbolic cosine.

FORMAT

```
#include <Ninja.h>
Float njCosh( n )
Angle n
```

PARAMETERS

n

angle

RETURN VALUE

Value of hyperbolic cosine

FUNCTION

- Determines the hyperbolic cosine of given angle **n** and returns the value found as the result.

EXAMPLE

```
ans = njCosh( NJM_RAD_ANG(1) );
% Result %
ans = 1.543038
```

NOTES

RELATED TOPICS

[njCosech](#)

[njCoth](#)

[njSech](#)

[njSinh](#)

njCot

Returns the cotangent.

FORMAT

```
#include <Ninja.h>
Float njCot( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

Value of cotangent

FUNCTION

- Determines the cotangent of arbitrary angle ang and returns the value found as the result.

EXAMPLE

```
ans = njCot( NJM_RAD_ANG(1) );
% Result %
ans = 0.642144
```

NOTES

RELATED TOPICS

njCosec

njCoth

Returns the hyperbolic cotangent.

FORMAT

```
#include <Ninja.h>
Float njCoth( n )
Angle n
```

PARAMETERS

n

angle

RETURN VALUE

Value of the hyperbolic cotangent

FUNCTION

- Determines the hyperbolic cotangent of arbitrary angle **n** and returns the value found as the result.

EXAMPLE

```
ans = njCoth( NJM_RAD_ANG(1) );
% Result %
ans = 1.313062
```

NOTES

RELATED TOPICS

[njCosech](#)

[njCosh](#)

[njSech](#)

[njSinh](#)

njExp

Returns exponents.

FORMAT

```
#include <Ninja.h>
Float njExp( x )
Float x
```

PARAMETERS

x

an arbitrary real number

RETURN VALUE

Returns the exponent value of x

FUNCTION

- Determines the exponent value of the arbitrary real number x and returns the value found as the result.

EXAMPLE

```
ans = njExp( 2.302585093f );
Result
ans = 10.000000
```

NOTES

RELATED TOPICS

njFloor Returns the largest integer not greater than n (Floor Function).

FORMAT

```
#include <Ninja.h>
Float njFloor( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Largest integer that is not greater than n.

FUNCTION

- Determines the largest integer that is not larger than real number n and returns the value found as the result.

EXAMPLE

```
y1 = njFloor( 2.8f );
y2 = njFloor( -2.8f );
% Result %
y1 = 2.000000
y2 = -3.000000
```

NOTES

RELATED TOPICS

[njCeil](#)

[njRoundOff](#)

njFraction

Returns the decimal fraction.

FORMAT

```
#include <Ninja.h>
Float njFraction( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Value of decimal fraction

FUNCTION

- Returns the decimal fraction of arbitrary real number n.

EXAMPLE

```
ans1 = njFraction( 3.14159265f );
ans2 = njFraction( -3.14159265f );
% Result %
ans1 = 0.14159265
ans2 = -0.14159265
```

NOTES

RELATED TOPICS

njHypot

Returns length of a hypotenuse.

FORMAT

```
#include <Ninja.h>
Float njHypot( x , y )
Float x
Float y
```

PARAMETERS

x

an arbitrary real number

y

an arbitrary real number

RETURN VALUE

length of a hypotenuse

FUNCTION

- If the value of the length of x and y are given, determines the length of the hypotenus of the right angled triangle and returns the value found as the result.

EXAMPLE

```
ans = njHypot( 3.0f , 4.0f );
Result
ans = 5.0
```

NOTES

RELATED TOPICS

[njSqrt](#)

njInvertSqrt

Returns the inverse square root.

FORMAT

```
#include <Ninja.h>
Float njInvertSqrt( n )
Float n
```

PARAMETERS

n
arbitrary real number

RETURN VALUE

Inverse square root

FUNCTION

- Determines the inverse square root (1/square root) of arbitrary real number n and returns the value found as the result.

EXAMPLE

```
ans = njInvertSqrt( -3.14159265f );
% Result %
ans = -0.564190
```

NOTES

- If arbitrary real number n is negative, the negative value of the inverse square root of the absolute value of n is returned.

RELATED TOPICS

[njSqrt](#)

njLog

Returns the natural logarithm.

FORMAT

```
#include <Ninja.h>
Float njLog( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

natural logarithm of n

FUNCTION

- Determines the natural logarithm of arbitrary real number n and returns the value found as the result.

EXAMPLE

```
ans = njLog( 2.f );
% Result %
ans = 0.693147
```

NOTES

RELATED TOPICS

[njLog10](#)

njLog10

Returns the base 10 logarithm.

FORMAT

```
#include <Ninja.h>
Float njLog10( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Base 10 logarithm of n

FUNCTION

- Determines the base 10 logarithm of arbitrary real number n and returns the value found as the result.

EXAMPLE

```
ans = njLog10( 2.f );
% Result %
ans = 0.301030
```

NOTES

RELATED TOPICS

[njLog](#)

njLog2

Returns the base 2 logarithm.

FORMAT

```
#include <Ninja.h>
Float njLog2( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Base 2 logarithm of n

FUNCTION

- Determines the base 2 logarithm of arbitrary real number n and returns the value found as the result.

EXAMPLE

```
ans = njLog2( 2.f );
% Result %
ans = 1.000000
```

NOTES

RELATED TOPICS

njLog

njPow

Returns the power of a number.

FORMAT

```
#include <Ninja.h>
Float njPow( n1, n2 )
Float n1
Float n2
```

PARAMETERS

n1

arbitrary real number 1

n2

arbitrary real number 2

RETURN VALUE

value of n1 to the n2nd power

FUNCTION

- Calculates the value of arbitrary real number n1 raised to the power of arbitrary real number n2 and returns the value found as the result.

EXAMPLE

```
void main( void )
{
Float x = 2.f , y = 4.f
Float ans;

ans = njPow( x , y );
printf( "ans = %f\n", ans );
}
ans = 16.000000
```

NOTES

RELATED TOPICS

njRandom

Generates a random number.

FORMAT

```
#include <Ninja.h>
Float njRandom( )
```

PARAMETERS

random number

RETURN VALUE

Real number in the range $0 \leq X < 1$

FUNCTION

- Generates a random number in the range $0 \leq X < 1$ and returns the generated value as the result.

EXAMPLE

```
Float ret;
.....

njRandomSeed( (unsigned)time( NULL ) );
ret = njRandom();
```

NOTES

RELATED TOPICS

[njRandomSeed](#)

njRandomSeed

Sets the random number seed.

FORMAT

```
#include <Ninja.h>
void njRandomSeed( n )
    Uint32 n
```

PARAMETERS

n

random number seed

RETURN VALUE

None

FUNCTION

- Sets the specified arbitrary integer n as the random number seed.

EXAMPLE

```
Float ret;
.....

njRandomSeed( (unsigned)time( NULL ) );
ret = njRandom();
```

NOTES

RELATED TOPICS

njRoundOff

Rounds down the decimal fraction.

FORMAT

```
#include <Ninja.h>
Float njRoundOff( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Integer resulting from rounding down

FUNCTION

- Truncates the decimal portion of arbitrary real number **n** and returns the integer portion as the result.

EXAMPLE

```
y1 = njRoundOff( 2.8f );
y2 = njRoundOff( -2.8f );
% Result %
y1 = 2.000000
y2 = -2.000000
```

NOTES

RELATED TOPICS

[njCeil](#)

[njFloor](#)

[njRoundUp](#)

njRoundUp

Rounds up the decimal fraction.

FORMAT

```
#include <Ninja.h>
Float njRoundUp( n )
Float n
```

PARAMETERS

n

Arbitrary real number

RETURN VALUE

Integer resulting from rounding up

FUNCTION

- Rounds up the decimal fraction of arbitrary real number *n* and returns the resulting integer.

EXAMPLE

```
y1 = njRoundUp( 2.8f );
y2 = njRoundUp( -2.8f );
% Result %
y1 = 3.000000
y2 = -3.000000
```

NOTES

RELATED TOPICS

[njCeil](#)

[njFloor](#)

[njRoundOff](#)

njSec

Returns a secant.

FORMAT

```
#include <Ninja.h>
Float njSec( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

Value of secant

FUNCTION

- Determines the secant of arbitrary angle n and returns the value found as the result.

EXAMPLE

```
ans = njSec( NJM_RAD_ANG(1) );
% Result %
ans = 1.850710
```

NOTES

RELATED TOPICS

njCosec

njSech

Returns a hyperbolic secant.

FORMAT

```
#include <Ninja.h>
Float njSech( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

Value of hyperbolic secant

FUNCTION

- Determines the hyperbolic secant of arbitrary angle `ang` and returns the value found as the result.

EXAMPLE

```
ans = njSech( NJM_RAD_ANG(1) );
% Result %
ans = 0.648072
```

NOTES

RELATED TOPICS

`njCosech`

`njCosh`

`njCoth`

`njSinh`

`njTanh`

njSin

Returns a sine.

FORMAT

```
#include <Ninja.h>
Float njSin( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

Value of sine

FUNCTION

- Determines the sine of arbitrary angle **ang** and returns the value found as the result.

EXAMPLE

```
ans = njSin( 0x1555 );
% Result %
ans = 0.499972
```

NOTES

RELATED TOPICS

njCos

njTan

njSinh

Returns a hyperbolic sine.

FORMAT

```
#include <Ninja.h>
Float njSinh( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

Value of hyperbolic sine

FUNCTION

- Determines the hyperbolic sine of given angle **ang** and returns the value found as the result.

EXAMPLE

```
ans = njSinh( NJM_RAD_ANG(1) );
% Result %
ans = 1.175145
```

NOTES

RELATED TOPICS

[njCosech](#)

[njCosh](#)

[njCoth](#)

[njSech](#)

[njTanh](#)

njSqrt

Returns a square root.

FORMAT

```
#include <Ninja.h>
Float njSqrt( n )
Float n
```

PARAMETERS

n

arbitrary real number

RETURN VALUE

Value of square root

FUNCTION

- Determines the square root of a given real number and returns the value found as the result.

EXAMPLE

```
ans = njSqrt( -3.14159265f );
% Result %
ans = -1.772454
```

NOTES

- If the value of arbitrary real number *n* is negative, the negative of the square root of the absolute value of *n* is returned.

RELATED TOPICS

[njHypot](#)

njTan

Returns a tangent.

FORMAT

```
#include <Ninja.h>
Float njTan( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

Value of tangent

FUNCTION

- Determines the tangent of arbitrary angle **ang** and returns the value found as the result.

EXAMPLE

```
ans = njTan( 0x1555 );
% Result %
ans = 0.577307
```

NOTES

RELATED TOPICS

njCos

njSin

njTanh

Returns a hyperbolic tangent.

FORMAT

```
#include <Ninja.h>
Float njTanh( ang )
Angle ang
```

PARAMETERS

ang

angle

RETURN VALUE

Value of hyperbolic tangent

FUNCTION

- Determines the hyperbolic tangent of given angle **ang** and returns the value found as the result.

EXAMPLE

```
ans = njTanh( NJM_RAD_ANG(1) );
% Result %
ans = 0.761579
```

NOTES

RELATED TOPICS

[njCosech](#)

[njCosh](#)

[njCoth](#)

[njSech](#)

[njSinh](#)



5. 2D Graphics Functions

Contents

njDrawCircle2D.....	Draws circles on a 2D screen.	NLS-154
njDrawLine2D	Draws lines on a 2D screen.	NLS-157
njDrawPoint2D.....	Draws points on a 2D screen.	NLS-159
njDrawPolygon2D.....	Draws a polygon on a 2D screen.	NLS-161
njDrawTriangle2D.....	Draws triangles on a 2D screen.	NLS-163

njDrawCircle2D

Draws circles on a 2D screen.

FORMAT

```
#include <Ninja.h>
void njDrawCircle2D( *p, n, pri, attr )
NJS_POINT2COL *p
Int n
Float pri
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of circles to be drawn

n

number of circles to be drawn

pri

priority (used as the Z value)

attr

attributes (specifies drawing method)

RETURN VALUE

None

FUNCTION

- Draws circles.
- The following attributes can be used.

NJD_DRAW_NORMAL	An ellipse is drawn with center at x,y coordinates of the 1st point. The x of the 2nd point defines the distance from the center in the x direction, and the y defines the distance from the center in the y direction.
NJD_DRAW_INSCRIBED	The circle is inscribed in the rectangle whose diagonal is defined by two points.
NJD_DRAW_FAN	Allows drawing of concentric circles.
NJ_DRAW_CONNECTED	Draw continuously.
NJD_FILL	Drawing with fill.
NJD_TRANSPARENT	Transparent drawing.
NJD_USE_TEXTURE	Drawing with texture.

Example)

- NJD_DRAW_INSCRIBED | NJD_DRAW_FAN

Allows drawing of circles radially around a center defined by the 1st point.

- NJD_DRAW_INSCRIBED | NJD_DRAW_CONNECTED

Allows drawing of consecutive circles inscribed in rectangles.

EXAMPLE

The following draws four inscribed circles centered on a point.

```
Sint32 i;
NJS_POINT2COL  p2c[5];
NJS_POINT2     p[5];
NJS_COLOR     col[5];

p2c.p = p;
p2c.col = col;
p2c.tex = NULL;
p2c.num = 5;

p2c.p[0].x = 320;
p2c.p[0].y = 240;
p2c.col[0].color = 0xff000077;

p2c.p[1].x = 70;
p2c.p[1].y = 40;
p2c.col[1].color = 0xff000077;
```

```
p2c.p[2].x = 570;  
p2c.p[2].y = 40;  
p2c.col[2].color = 0x00ff0077;
```

```
p2c.p[3].x = 570;  
p2c.p[3].y = 440;  
p2c.col[3].color = 0x0000ff77;
```

```
p2c.p[4].x = 70;  
p2c.p[4].y = 440;  
p2c.col[4].color = 0xffffffff77;
```

```
njDrawCircle2D(p, 4, -10.f, NJD_DRAW_NORMAL | NJD_DRAW_INSCRIBED | NJD_DRAW_FAN);
```

NOTES

- The NJD_DRAW_NORMAL may be omitted when used in combination with other attributes.

RELATED TOPICS

NJS_POINT2COL

njDrawLine2D

Draws lines on a 2D screen.

FORMAT

```
#include <Ninja.h>
void njDrawLine2D( *p, n, pri, attr )
NJS_POINT2COL *p
Int n
Float pri
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of end points of lines to be drawn

n

number of lines to be drawn

pri

priority (used as Z value)

attr

attributes (specifies drawing method)

RETURN VALUE

None

FUNCTION

- Draws n lines.
- Valid attributes are used to draw n lines using point data given in the screen coordinate system.

NJD_DRAW_NORMAL	Drawing of independent lines.
NJD_DRAW_FAN	Drawing of radial lines.
NJD_DRAW_CONNECTED	Drawing of connected lines.
NJD_TRANSPARENT	Translucent drawing.
NJD_USE_TEXTURE	Drawing with texture.

The following five attributes can be specified. These attributes can be used in mutually consistent combinations by using the "|" character as a delimiter.

EXAMPLE

```
Sint32 i;
NJS_POINT2COL  p2c[100];
NJS_POINT2     p[100];
NJS_COLOR      col[100];

p2c.p = p;
p2c.col = col;
p2c.tex = NULL;
p2c.num = 100;

for(i=0;i<100;i++){
    p2c.p[i].x = (Sint16)(njRandom() * 640.f);
    p2c.p[i].y = (Sint16)(njRandom() * 480.f);
    p2c.p[i].col.color = (Sint32)(njRandom() * 0xFFFFFFFF);
}

njDrawLine2D(p,100,-2.f,NJD_DRAW_NORMAL|NJD_TRANSPARENT);
```

NOTES

- The NJD_DRAW_NORMAL attribute can be omitted when it is used in combination with other attributes.

RELATED TOPICS

NJS_POINT2COL

njDrawPoint2D

Draws points on a 2D screen.

FORMAT

```
#include <Ninja.h>
void njDrawPoint2D( *p, n, pri, attr)
NJS_POINT2COL *p
Int n
Float pri
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of points to be drawn

n

number of points to draw

pri

priority (used as Z value)

attr

attributes (specifies drawing method)

RETURN VALUE

None

FUNCTION

- Draws n points.
- An array of `NJS_POINT2COL` type is used when drawing multiple points.
- Valid attributes are used to draw n points of the specified color in the screen coordinate system at the coordinates specified by `p`.
- The following three attributes can be specified.

<code>NJD_DRAW_NORMAL</code>	Normal drawing.
<code>NJD_TRANSPARENT</code>	Transparent drawing.
<code>NJD_USE_TEXTURE</code>	Drawing with texture.

These attributes can be used in mutually consistent combinations by using the "|" character as a delimiter.

EXAMPLE

The following draws 100 points at random locations.

```
Sint32 i;
NJS_POINT2COL  p2c[100];
NJS_POINT2     p[100];
NJS_COLOR     col[100];

p2c.p = p;
p2c.col = col;
p2c.tex = NULL;
p2c.num = 100;

for(i=0;i<100;i++){
    p2c.p[i].x = (Sint16)(njRandom() * 640.f);
    p2c.p[i].y = (Sint16)(njRandom() * 480.f);
    p2c.col[i].color = (Sint32)(njRandom() * 0xFFFFFFFF);
}

njDrawPoint2D(p,100,-2.f,NJD_DRAW_NORMAL);
```

NOTES

- The `NJD_DRAW_NORMAL` attribute may be omitted when used in combination with other attributes.

RELATED TOPICS

njDrawPolygon2D

Draws a polygon on a 2D screen.

FORMAT

```
#include <Ninja.h>
void njDrawPolygon2D( *p, n, pri, attr )
NJS_POINT2COL *p
Int n
Float pri
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of vertices of polygons to be drawn

n

number of vertices of polygons

pri

priority (used as Z value)

attr

attributes (specifies the drawing method)

RETURN VALUE

None

FUNCTION

- Draws a polygon of n sides.
- The following four attributes can be used.

NJD_DRAW_NORMAL	Normal drawing.
NJD_FILL	Drawing with interior fill.
NJD_TRANSPARENT	Transparent drawing.
NJD_USE_TEXTURE	Drawing with texture.

These attributes can be used in mutually consistent combinations by using the "|" character as a delimiter.

EXAMPLE

The following draws a hexagon.

```
Sint32 i;
NJS_POINT2COL  p2c[6];
NJS_POINT2     p[6];
NJS_COLOR      col[6];

p2c.p = p;
p2c.col = col;
p2c.tex = NULL;
p2c.num = 6;

p2c.p[0].x = 427;
p2c.p[0].y = 116;
p2c.col[0].color = 0xFF000055;

p2c.p[1].x = 555;
p2c.p[1].y = 200;
p2c.col[1].color = 0xFFFF55;

p2c.p[2].x = 555;
p2c.p[2].y = 285;
p2c.col[2].color = 0x00FF0055;

p2c.p[3].x = 427;
p2c.p[3].y = 371;
p2c.col[3].color = 0xFFFF55;

p2c.p[4].x = 300;
p2c.p[4].y = 285;
p2c.col[4].color = 0x0000FF55;

p2c.p[5].x = 300;
p2c.p[5].y = 200;
p2c.col[5].color = 0xFFFF55;

njDrawPolygon2D(p, 6, -2.f, NJD_DRAW_NORMAL|NJD_FILL);
```

NOTES

The `NJD_DRAW_NORMAL` attribute may be omitted when it is used in combination with other attributes.

RELATED TOPICS

njDrawTriangle2D

Draws triangles on a 2D screen.

FORMAT

```
#include <Ninja.h>
void njDrawTriangle2D( *p, n, pri, attr )
NJS_POINT2COL *p
Int n
Float pri
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of points to be drawn

n

number of points to draw

pri

priority (used as Z value)

attr

attributes (specifies drawing method)

RETURN VALUE

None

FUNCTION

- Draws n triangles.
- The following six attributes can be used.

NJD_DRAW_NORMAL	Draws separate triangles.
NJD_DRAW_FAN	Draws triangles radially.
NJD_DRAW_CONNECTED	Draws connected triangles.
NJD_FILL	Drawing with filled interior.
NJD_TRANSPARENT	Translucent drawing.

NJD_USE_TEXTURE

Drawing with texture.

- These attributes can be used in mutually consistent combinations by using the "|" character as a delimiter.

EXAMPLE

The following draws four connected triangles.

```
Sint32 i;
NJS_POINT2COL  p2c[6];
NJS_POINT2     p[6];
NJS_COLOR      col[6];

p2c.p = p;
p2c.col = col;
p2c.tex = NULL;
p2c.num = 6;

p2c.p[0].x = 100;
p2c.p[0].y = 300;
p2c.col[0].color = 0xFFFF00AA;

p2c.p[1].x = 150;
p2c.p[1].y = 100;
p2c.col[1].color = 0x0FFFF000;

p2c.p[2].x = 200;
p2c.p[2].y = 300;
p2c.col[2].color = 0x00FFFF00;

p2c.p[3].x = 250;
p2c.p[3].y = 100;
p2c.col[3].color = 0xF00FF55;

p2c.p[4].x = 300;
p2c.p[4].y = 300;
p2c.col[4].color = 0xFF00FF00;

p2c.p[5].x = 350;
p2c.p[5].y = 100;
p2c.col[5].color = 0xFFFF00F00;

njDrawTriangle2D(p,4,-3.f,NJD_DRAW_NORMAL|NJD_DRAW_CONNECTED|NJD_FILL);
```

NOTES

RELATED TOPICS



6. 3D Graphics Functions

Contents

njDrawLine3D	Draws lines in 3D space.	NLS-166
njDrawPoint3D	Draws points in 3D space.	NLS-168
njDrawPlygon3D.....	Draws a polygon in 3D space.	NLS-170
njDrawTriangle3D.....	Draws triangles in 3D space.	NLS-172

njDrawLine3D

Draws lines in 3D space.

FORMAT

```
#include <Ninja.h>
void njDrawLine3D(*p, n, attr)
NJS_POINT3COL *p
Int n
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of endpoints of lines to be drawn

n

number of lines to be drawn

attr

attributes (specifies the drawing method)

RETURN VALUE

None

FUNCTION

- Draws n lines.
- The following 5 attributes can be used for drawing.

NJD_DRAW_NORMAL	Normal drawing.
NJD_DRAW_CONNECTED	Drawing of connected lines.
NJD_DRAW_WHEEL	Radial drawing.
NJD_TRANSPARENT	Translucent drawing.
NJD_USE_TEXTURE	Drawing with texture.

These attributes can be used in mutually consistent combinations by using the "|" character as a delimiter.

EXAMPLE

The following draws 50 lines at random.

```
int i;
NJS_POINT3COL p;
NJS_POINT3 point[100];
NIS_COLOR color[100];

p->p = point;
p->col = color;
p->tex = NULL;
p.num = 100;

for(i = 0; i < 100; i++){
    p->p[i].x = njRandom()*1000.f-500.f;
    p->p[i].y = njRandom()*1000.f-500.f;
    p->p[i].z = -njRandom()*1000.f;
    p->col[i].argb.a = (Uint8)(0x80*njRandom());
    p->col[i].argb.r = (Uint8)(0x80*njRandom());
    p->col[i].argb.g = (Uint8)(0x80*njRandom());
    p->col[i].argb.b = (Uint8)(0x80*njRandom());
}

njDrawLine3D(&p, 100, NJD_DRAW_NORMAL|NJD_TRANSPARENT);
```

 **NOTE:** Since this function draws in 3D, the view, screen, and matrix stack settings must be made before using it.

NOTES

The `NJD_DRAW_NORMAL` attribute can be omitted when used in combination with other attributes.

RELATED TOPICS

njDrawPoint3D

Draws points in 3D space.

FORMAT

```
#include <Ninja.h>
void njDrawPoint3D(*p, n, attr)
NJS_POINT3COL *p
Int n
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of points to be drawn.

n

number of points to be drawn

attr

attributes (specifies the drawing method)

RETURN VALUE

None

FUNCTION

- Draws n points.
- An array of NJS_POINT2COL type is used when drawing multiple points. n points of the specified color are drawn at the points specified by p in the global coordinate system.

NJD_DRAW_NORMAL	Normal drawing.
NJD_TRANSPARENT	Transparent drawing.
NJD_USE_TEXTURE	Drawing with texture.

The following 3 attributes can be used for drawing. These attributes can be used in mutually consistent combinations by using the "|" character as a delimiter.

EXAMPLE

The following draws 100 points at random.

```
int i;
NJS_POINT3COL p;
NJS_POINT3 point[100];
NIS_COLOR color[100];

p->p = point;
p->col = color;
p->tex = NULL;
p.num = 100;

for(i = 0; i < 100; i++){
    p -> p[i].x = njRandom()*1000.f-500.f;
    p -> p[i].y = njRandom()*1000.f-500.f;
    p -> p[i].z = -njRandom()*1000.f;
    p -> col[i].argb.a = (Uint8)(0x80*njRandom());
    p -> col[i].argb.r = (Uint8)(0x80*njRandom());
    p -> col[i].argb.g = (Uint8)(0x80*njRandom());
    p -> col[i].argb.b = (Uint8)(0x80*njRandom());
}

njDrawPoint3D(&p, 100, NJD_DRAW_NORMAL|NJD_TRANSPARENT);
```

 **NOTE:** Since this function draws in 3D, the view, screen, and matrix stack settings must be made before using it.

NOTES

The `NJD_DRAW_NORMAL` may be omitted when it is used in combination with other attributes.

RELATED TOPICS

njDrawPolygon3D

Draws a polygon in 3D space.

FORMAT

```
#include <Ninja.h>
void njDrawPolygon3D(*p, n, attr)
NJS_POINT3COL *p
Int n
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of vertices of a polygon to be drawn

n

number of vertices of a polygon

attr

attributes (specifies the drawing method)

RETURN VALUE

None

FUNCTION

- Draws a polygon of n sides.
- The following four attributes can be used.

NJD_DRAW_NORMAL	Normal drawing.
NJD_FILL	Drawing with interior fill.
NJD_TRANSPARENT	Transparent drawing.
NJD_USE_TEXTURE	Drawing with texture.

These attributes can be used in mutually consistent combinations by using the "|" character as a delimiter.

EXAMPLE

The following draws 100 squares at random.

```
int i;

NJS_POINT3COL p;
NJS_POINT3 point[4];
NJS_COLOR color[4];

p->p = point;
p->col = color;
p->tex = NULL;
p.num = 4;

for(i = 0; i < 100; i++){
    int j;
    p->p[0].x = njRandom()*1000.f-500.f;
    p->p[0].y = njRandom()*1000.f-500.f;
    p->p[0].z = -3000.f+(float)i;
    p->p[1].x = p->p[0].x-polysize;
    p->p[1].y = p->p[0].y;
    p->p[1].z = p->p[0].z;
    p->p[2].x = p->p[0].x-polysize;
    p->p[2].y = p->p[0].y-polysize;
    p->p[2].z = p->p[0].z;
    p->p[3].x = p->p[0].x;
    p->p[3].y = p->p[0].y-polysize;
    p->p[3].z = p->p[0].z;

    for(j = 0; j < 4; j++){
        p->col[j].argb.a =
        (UInt8)(0x80*njRandom());
        p->col[j].argb.r =
        (UInt8)(0x80*njRandom());
        p->col[j].argb.g =
        (UInt8)(0x80*njRandom());
        p->col[j].argb.b =
        (UInt8)(0x80*njRandom());
    }
    njDrawPolygon3D(&p, 4, NJD_DRAW_NORMAL|NJD_FILL);
}
```

NOTE: Since this function draws in 3D, the view, screen, and matrix stack settings must be made before using it.

NOTES

The `NJD_DRAW_NORMAL` may be omitted when it is used in combination with other attributes.

RELATED TOPICS

njDrawTriangle3D

Draws triangles in 3D space.

FORMAT

```
#include <Ninja.h>
void njDrawTriangle3D(*p, n, attr)
NJS_POINT3COL *p
Int n
Uint32 attr
```

PARAMETERS

***p**

list of coordinates of vertices of a polygon to be drawn

n

number of triangles to be drawn

attr

attributes (specifies the drawing method)

RETURN VALUE

None

FUNCTION

- Draws a polygon of n sides.
- The following six attributes can be used.

NJD_DRAW_NORMAL	Normal drawing.
NJD_DRAW_CONNECTED	Draws connected triangles.
NJD_DRAW_FAN	Draws triangles radially.
NJD_FILL	Drawing with filled interior.
NJD_TRANSPARENT	Transparent drawing.
NJD_USE_TEXTURE	Drawing with texture.

These attributes can be used in mutually consistent combinations by using the "|" character as a delimiter.

EXAMPLE

The following draws 100 triangles at random.

```
#define TRI_NUM 100
#define trisize 50.f

int i;
NJS_POINT3COL p;
NJS_POINT3 point[TRI_NUM*3];
NJS_COLOR color[TRI_NUM*3];
float trisize_half = trisize/2.f;
float triheight;

p->p = point;
p->col = color;
p->tex = NULL;
p.num = TRI_NUM*3;

triheight = trisize_half*njSqrt(3.f);
i = 0;
do{
    p->p[i].x = njRandom()*1000.f-500.f;
    p->p[i].y = njRandom()*1000.f-500.f;
    p->p[i].z = -3000.f+(float)i;
    p->col[i].argb.a = (Uint8)(0x80*njRandom());
    p->col[i].argb.r = (Uint8)(0x80*njRandom());
    p->col[i].argb.g = (Uint8)(0x80*njRandom());
    p->col[i+1].argb.b = (Uint8)(0x80*njRandom());
    p->p[i].x = p[i-1].p.x+trisize_half;
    p->p[i].y = p[i-1].p.y+triheight;
    p->p[i].z = p[i-1].p.z;
    p->col[i].argb.a = (Uint8)(0x80*njRandom());
    p->col[i].argb.r = (Uint8)(0x80*njRandom());
    p->col[i].argb.g = (Uint8)(0x80*njRandom());
    p->col[i+1].argb.b = (Uint8)(0x80*njRandom());
    p->p[i].x = p[i-2].p.x-trisize_half;
    p->p[i].y = p[i-2].p.y+triheight;
    p->p[i].z = p[i-2].p.z;
    p->col[i].argb.a = (Uint8)(0x80*njRandom());
    p->col[i].argb.r = (Uint8)(0x80*njRandom());
    p->col[i].argb.g = (Uint8)(0x80*njRandom());
    p->col[i+1].argb.b = (Uint8)(0x80*njRandom());
} while(i < TRI_NUM*3);
njDrawTriangle3D(&p,TRI_NUM, NJD_DRAW_NORMAL|NJD_FILL);
```



Note: Since this function draws in 3D, the view, screen, and matrix stack settings must be made before using it.

NOTEMS

The `NJD_DRAW_NORMAL` may be omitted when it is used in combination with other attributes.

RELATED TOPICS



7. *Light Functions*

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njSetLightAlpha

Sets the changes of alpha against material, whose light is set by njCreateLight.

FORMAT

```
#include <Ninja.h>
void njSetLightAlpha( *ptr, rate )
NJS_LIGHT *ptr
Float rate
```

PARAMETERS

***ptr**

light pointer

rate

magnification

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets the changes of transparency (alpha) produced by specular.
- Shows the change that as the light specular luminance increases, the material alpha value decreases (more opaque).
- Argument default value, which is set by CreateLight, is 0 (no reflection). The argument should be set with magnification against the specular luminance (specular luminance x magnification).
- The result will be added to the material alpha value.

EXAMPLE

```
#include
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_DIR_LIGHT);
.....
/* Decreases the alpha by 0.5 of specular luminance. */
njSetLightAlpha(&light, 0.5f);
```

NOTES

- Light must be specified by njCreateLight.
- If it is specified by either njFastDrawModel, njFastDrawObject, njFastDrawMotion, or njFastAction, this function has no effect.

RELATED TOPICS

[njCreateLight\(\)](#)

njCreateLight Defines a light source type and registers a new light.

FORMAT

```
#include <NINJA.H>
void njCreateLight( *ptr, lsrc )
NJS_LIGHT *ptr
Int lsrc
```

PARAMETERS

***ptr**

light pointer

lsrc

light type

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- The principle factors involved in light calculation are the directions of rays and lines normal to polygons (or to vertices), and the distance between the light and the vertices (or representative point in the model). In principle, the angle between the incident rays and the lines normal to an illuminated polygon will be 90 to 180 degrees. The closer the angle is to 180 degrees, the brighter the lighting, and illumination completely vanishes if the angle becomes less than 90 degrees. Further illumination is attenuated with distance (except with parallel light sources).



NOTE: The angular calculation range for NJD_DIR_LIGHT|NJD_SIMPLE_LIGHT only is 0 to 180 degrees.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();

/* Define parallel light source */
njCreateLight(&light, NJD_DIR_LIGHT);
.....

/* A parallel light source remains effective
 * for all model functions until njDeleteLight
 * or AnjCreateLightOff is called.
 */
njDrawObject(...);
.....
```

NOTES

Currently, `njDrawObject` and `njDrawModel` are required in order for lighting to be effective. The light types (lsrc) are as follows.

1. Single light model

NJD_AMBIENT

Ambient light: All surfaces are equally illuminated.

NJD_DIR_LIGHT

Parallel light: Illumination is unaffected by distance in the direction specified by `njSetLightDirection` or in the direction resulting from matrix rotation by functions such as `njRotateLightX`.

The light flag `NJD_SIMPLE_LIGHT` can be added to this type of light source.

NJD_POINT_LIGHT

Point light source: Radial illumination from the point source specified by `njSetLightLocation` or from the translated point location resulting from matrix transformations such as `njTranslateLight`.

The light flags `NJD_SIMPLE_LIGHT` and `NJD_BLOCK_LIGHT` can be added to this type of light source.

NJD_SPOT_LIGHT

Spotlight: With this light source type, the direction and position of lighting are determined in the same manner as with parallel lighting and point lighting.

This type of light source illuminates a circular area whose angular size is determined by the `njSetLightAngle` function. The light flags `NJD_SIMPLE_LIGHT` and `NJD_BLOCK_LIGHT` can be added to this type of light source.

2. Compound light models

NJD_SPEC_DIR(NJD_SPEC_POINT)

Parallel light source with highlighting (point light source): The angle of specular highlighting is determined by `njSetLightAngle`.

Otherwise, behavior is the same as with parallel lighting (point light source).

The light flag `NJD_SIMPLE_LIGHT` can be added to this type of light source.

(`NJD_BLOCK_LIGHT` can also be specified, but only with point lighting.)

NJD_LAMBERT_DIR(NJD_LAMBERT_POINT)

Lambert model: This illumination uses a parallel light source (point light source) that is governed by a standard lighting model including ambient light.

The light flag `NJD_SIMPLE_LIGHT` can be added to this type of light source.

(`NJD_BLOCK_LIGHT` can also be specified, but only with point lighting.)

NJD_PHONG_DIR(NJD_PHONG_POINT)

Phong model: This illumination uses a parallel light source (point light source) that is governed by a standard lighting model including ambient light and specular light.

The light flag `NJD_SIMPLE_LIGHT` can be added to this type of light source.

(`NJD_BLOCK_LIGHT` can also be specified, but only with point lighting.)

3. Other flags

NJD_SIMPLE_LIGHT

This flag generally makes calculation simpler and faster, but may have an effect on quality.

This flag is specified using an OR operator; for example,

`NJD_SPEC_POINT | NJD_SIMPLE_LIGHT` can be used.

NJD_BLOCK_LIGHT

This flag makes light calculation faster limiting distance calculation to a single representative point, rather than to all vertices.

However, it can greatly affect quality, and the expected benefit is not achieved with some models.

This flag is used in the same manner as NJD_SIMPLE_LIGHT.

4. User-defined (callback) light

NJD_USER_LIGHT

Calls a user-defined light function.

RELATED TOPICS

`njDrawObject`

`njDrawModel()`

njDeleteLight

Deletes a light created by njCreateLight.

FORMAT

```
#include <NINJA.H>
void njDeleteLight( *ptr )
NJS_LIGHT *ptr
```

PARAMETERS

***ptr**

light pointer

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Deletes a light defined in the light system.
- However, after deletion, the light source can be restored by recalling njCreateLight.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;
njInitSystem();

/* Define parallel light source */
njCreateLight(&light, NJD_DIR_LIGHT);
.....

/* Delete parallel light source */
njDeleteLight(&light);
.....
```

NOTES

RELATED TOPICS

njCreateLight()

njLightOff

Deactivates a light created by njCreateLight (turns the light off).

FORMAT

```
#include <NINJA.H>
void njLightOff( *ptr )
NJS_LIGHT *ptr
```

PARAMETERS

***ptr**

light pointer

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Extinguish a set light.
- Afterwards, the light can be turned back on by making another call to njLightOn.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_DIR_LIGHT);
.....
/* Extinguish parallel light source */
njLightOff(&light);
.....
```

NOTES

Metaphorically, njCreateLight and njDeleteLight have the same function as installing or removing a light bulb, while njLightOn and njLightOff have the function of turning on or off the light switch.

RELATED TOPICS

njCreateLight()

njLightOn()

njLightOn Activates a light created by njCreateLight (turns the light on).

FORMAT

```
#include <NINJA.H>
void njLightOn( *ptr )
NJS_LIGHT *ptr
```

PARAMETERS

***ptr**

light pointer

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Turns on an extinguished light. (Lights are on by default, so this function does not need to be called unless a light is extinguished.)

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_DIR_LIGHT);
.....
/* Extinguish parallel light source */
njLightOff(&light);
.....
/* Turn on parallel light source */
njLightOn(&light);
```

NOTES

- Metaphorically, `njCreateLight` and `njDeleteLight` have the same function as installing or removing a light bulb, while `njLightOn` and `njLightOff` have the function of turning on or off the light switch.

RELATED TOPICS

`njCreateLight`

`njLightOff`

njMultiLightMatrix

Multiplies a matrix with a light matrix.

FORMAT

```
#include <NINJA.H>
void njMultiLightMatrix( *ptr, *m )
NJS_LIGHT *ptr
NJS_MATRIX *m
```

PARAMETERS

***ptr**

light pointer

***m**

matrix pointer

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Multiplies a light matrix defined with njCreateLight by another matrix specified by the user. This results in calculation of the light source position and direction.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;
NJS_MATRIX m;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);

.....
njClearMatrix();
```

```
/* Multiply by matrix m */  
njMultiLightMatrix(&light, &m);
```

NOTES

- Before calling this function, the light to be modified must be specified by `njCreateLight` and `njClearMatrix` must be called.
- Also, do not apply any scaling factor to the matrix.
- The order of multiplication is as follows.

```
njMultiMatrix( light matrix , user-specified matrix );
```

RELATED TOPICS

`njMultiMatrix()`

`njCreateLight()`

njRotateLightX

Rotates a light matrix around the X axis.

FORMAT

```
#include <NINJA.H>
void njRotateLightX( *ptr, angx )
NJS_LIGHT *ptr
Angle angx
```

PARAMETERS

***ptr**

light pointer

angx

angle of rotation around X axis

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Rotates a light matrix defined with njCreateLight around the X axis.
- This results in calculation of the light source position and direction.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);

.....
njClearMatrix();

/* Rotate 90 degrees around X axis */
```

```
njRotateLightX(&light, NJM_RAD_ANG(NJD_PI/2.f));
```

NOTES

- Before calling this function, the light to be modified must be specified by `njCreateLight` and `njClearMatrix` must be called.

RELATED TOPICS

`njCreateLight`

njRotateLightXYZ

Rotates a light matrix around the X, Y, and Z axes.

FORMAT

```
#include <NINJA.H>
void njRotateLightXYZ( *ptr, angx, angy, angz )
NJS_LIGHT *ptr
Angle angx
Angle angy
Angle angz
```

PARAMETERS

***ptr**

light pointer

angx

angle of rotation around X axis

angy

angle of rotation around Y axis

angz

angle of rotation around Z axis

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Rotates a light matrix defined with njCreateLight around the X, Y, and Z axes, in that sequence.
- This results in calculation of the light source position and direction.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);

.....
njClearMatrix();

/* Rotate 90 degrees around X axis,
        60 degrees around Y axis,
        and 30 degrees around Z axis */
njRotateLightXYZ(&light,
                                     NJM_RAD_ANG(NJD_PI/2.f),
                                     NJM_RAD_ANG(NJD_PI/3.f),
                                     NJM_RAD_ANG(NJD_PI/6.f) );
```

NOTES

- Before calling this function, the light to be modified must be specified by `njCreateLight` and `njClearMatrix` must be called.

RELATED TOPICS

`njCreateLight`

njRotateLightY

Rotates a light matrix around the Y axis.

FORMAT

```
#include <NINJA.H>
void njRotateLightY( *ptr, angy )
NJS_LIGHT *ptr
Angle angy
```

PARAMETERS

***ptr**

light pointer

angy

angle of rotation around Y axis

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Rotates a light matrix defined with njCreateLight around the Y axis.
- This results in calculation of the light source position and direction.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);

.....
njClearMatrix();

/* Rotate 60 degrees around Yaxis */
```

```
njRotateLightY(&light, NJM_RAD_ANG(NJD_PI/3.f));
```

NOTES

Before calling this function, the light to be modified must be specified by `njCreateLight` and `njClearMatrix` must be called.

RELATED TOPICS

`njCreateLight`

njRotateLightZ

Rotates a light matrix around the Z axis.

FORMAT

```
#include <NINJA.H>
void njRotateLightZ( *ptr, angz )
NJS_LIGHT *ptr
Angle angz
```

PARAMETERS

***ptr**

light pointer

angz

angle of rotation around z axis

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Rotates a light matrix defined with njCreateLight around the Z axis.
- This results in calculation of the light source position and direction.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);

.....
njClearMatrix();

/* Rotate 30 degrees around Z axis */
njRotateLightZ(&light, NJM_RAD_ANG(NJD_PI/6.f));
```

NOTES

- Before calling this function, the light to be modified must be specified by `njCreateLight` and `njClearMatrix` must be called.

RELATED TOPICS

`njCreateLight()`

njSetLightAngle Sets the limit angle of a light created with njCreateLight.

FORMAT

```
#include <NINJA.H>
void njSetLightAngle( *ptr, iang, oang )
NJS_LIGHT *ptr
NJS_Angle iang
NJS_Angle oang
```

PARAMETERS

***ptr**

light pointer

iang

limiting inside cone angle (circular angle)

oang

limiting outside cone angle (circular angle)

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets the limit angle of spotlight and specular light sources defined with njCreateLight.
- An example would be a spotlight used to illuminate a stage.
- The light displayed on the stage is circular, but the light is attenuated gradually outside the light cone, rather than becoming dark abruptly.
- The iang parameter of this function sets the angle of the edge of the cone, or the angle at which attenuation of light begins.
- The angle through which attenuation takes place can never exceed 90 degrees, but calculation of attenuation close to 90 degrees becomes unmeaningful as the beam of the spotlight is tightened.
- The angle at which calculation of attenuation is stopped (cut off)--i.e., the angle at which light disappears – is set by the oang parameter.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_SPEC_POINT);
.....
/*
 * Set inner limit angle of specular point light source to 30 degrees
 * and output limit angle to 60 degrees
 */
njSetLightAngle(&light, NJM_RAD_ANG(NJD_PI/6.f), NJM_RAD_ANG(NJD_PI/3.f));
```

NOTES

Before using this function, the light source must first be defined using `njCreateLight`.

RELATED TOPICS

`njCreateLight()`

`njSetLightRange()`

njSetLightColor

Sets the color of light defined by njCreateLight.

FORMAT

```
#include <NINJA.H>
void njSetLightColor( *ptr red, green, blue )
NJS_LIGHT *ptr
Float red
Float green
Float blue
```

PARAMETERS

***ptr**

light pointer

red

red light source

green

green light source

blue

blue light source

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets the 3-color components of lighting.
- For each component, 100% is denoted by 1.f.
- This is the default for all components.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_DIR_LIGHT);
.....
/* Set the color of a parallel light source to 255,0,0 (red) */
njSetLightColor(&light, 1.f, 0.f, 0.f);
```

NOTES

- Before using this function, the light source must first be defined using `njCreateLight`.

RELATED TOPICS

`njCreateLight()`

njSetLightDirection

Sets the direction of light defined by njCreateLight.

FORMAT

```
#include <NINJA.H>
void njSetLightDirection( *ptr, dx, dy, dz )
NJS_LIGHT *ptr
Float dx
Float dy
Float dz
```

PARAMETERS

***ptr**

light pointer

dx

x coordinate of light source

dy

y coordinate of light source

dz

z coordinate of light source

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets the direction of the light beam as vector components. (The default direction is that of the z axis.)

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_DIR_LIGHT);
.....
/* Set direction vector of parallel light source beam to (1,0,0) */
njSetLightDirection(&light, 1.f, 0.f, 0.f);
```

NOTES

- Before using this function, the light source must first be defined using `njCreateLight`.
- The vector set is normalized.

RELATED TOPICS

`njCreateLight()`

njSetLightIntensity Sets the intensity of light defined using njCreateLight.

FORMAT

```
#include <NINJA.H>
void njSetLightIntensity( *ptr, spc, dif, amb )
NJS_LIGHT *ptr
Float spc
Float dif
Float amb
```

PARAMETERS

***ptr**

light pointer

spc

specular light intensity

dif

diffuse light intensity

amb

ambient light intensity

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- In the Ninja light model, light consists of three elements: specular light (highlighting), diffuse light (normal light), and ambient light (background light).
- This function sets the intensity (strength) of each of these elements.
- Ordinarily, settings are made in the range from 0.f to 1.f; however, values in excess of 1.f can be used according to conditions.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_SPEC_DIR);
.....
/* Set intensity of specular diffuse parallel light source to 0.5f */
njSetLightIntensity(&light, 0.5f, 0.5f, 0.f);
```

NOTES

Before using this function, the light source must first be defined using `njCreateLight`. It is not mandatory that intensity of each element of the specified light be set, in which case the intensity calculation is ignored. For instance, in the example above, setting 0.5f instead of 0.f as the 4th parameter of `njSetLightIntensity` will have no effect on this light source.

RELATED TOPICS

`njCreateLight()`

njSetLightLocation

Sets the location of light defined by njCreateLight.

FORMAT

```
#include <NINJA.H>
void njSetLightLocation( *ptr, px, py, pz )
NJS_LIGHT *ptr
Float px
Float py
Float pz
```

PARAMETERS

***ptr**

light pointer

px

x coordinate of light source location

py

y coordinate of light source location

pz

z coordinate of light source location

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

Sets the location of the light source. (The default location is the origin.)

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);
.....

/* Set point light source location to (10,0,-10) */
njSetLightLocation(&light, 10.f, 0.f, -10.f);
```

NOTES

- Before using this function, the light source must first be defined using `njCreateLight`.

RELATED TOPICS

`njCreateLight()`

njSetLightRange Sets the limit distance of a light created with njCreateLight.

FORMAT

```
#include <NINJA.H>
void njSetLightRange( *ptr, nrang, frang )
NJS_LIGHT *ptr
Float nrang
Float frang
```

PARAMETERS

***ptr**

light pointer

nrang

forward limit distance

frang

backward limit distance

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets the limiting distance of spotlighting or other lighting created by njCreateLight that requires distance calculation. Brightness increases as the light source approaches a point, but there is a limit to how far this can be expressed on the monitor screen. Accordingly, the Ninja light model continually calculates the maximum intensity of a light source when the distance to that source is reduced below a certain amount. This limit is set as the forward limit distance.
- Further, light is attenuated as distance from the light source increases, but it is not essential that calculations be performed for all distances. The point at which calculation of attenuation starts being abandoned (cut off; i.e, the distance at which light disappears) is set as the backward limit distance.

 **NOTE:** Although nrang is set to 1.f by default, this setting should take into account the size of the model itself, as well as the distance between models.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_SPEC_POINT);
.....
/*
 * Set the forward limit distance of a specular point light source to 20.f
 * and the backward limit distance to 80.f.
 */
njSetLightRange(&light, 20.f, 80.f);
```

NOTES

- Before using this function, the light source must first be defined using `njCreateLight`.

RELATED TOPICS

`njCreateLight()`

`njSetLightAngle()`

njSetUserLight

Assigns a user-defined light function to a light.

FORMAT

```
#include <NINJA.H>
void njSetUserLight( *ptr, func )
NJS_LIGHT *ptr
NJF_LIGHT_FUNC func
```

PARAMETERS

***ptr**

light pointer

func

name of callback function (pointer)

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

Sets a user-defined light function by assigning a light source created with njCreateLight to NJD_USER_LIGHT.

EXAMPLE

```

#include <NINJA.H>
.....

NJS_LIGHT light;

void
func(NJS_ARGB* argb, NJS_POINT3* pnt, NJS_VECTOR* nml, NJS_LIGHT* lt)
{
.....
                                /*
                                * Example of inner sum of polygon normal line
                                * and light beam direction
                                */

                                deg = - nml->x * NJM_LIGHT_VECTOR(lt).x
                                - nml->y * NJM_LIGHT_VECTOR(lt).y
                                - nml->z * NJM_LIGHT_VECTOR(lt).z;

.....
/* argb */

                                argb->a = deg * NJM_LIGHT_DIF(lt).a;
                                argb->r = deg * NJM_LIGHT_DIF(lt).r;
                                argb->g = deg * NJM_LIGHT_DIF(lt).g;
                                argb->b = deg * NJM_LIGHT_DIF(lt).b;

}

/* In main routine */
.....
njInitSystem();
njCreateLight(&light,  NJD_USER_LIGHT);

/* Set user function func to light lt */
njSetUserLight (&light, func);
.....

```

NOTES

The NJD_USER_LIGHT light must be selected with njCreateLight.

Light functions definable by the user and macros that are used thereby are as follows.

1. Callback functions

<FORMAT>

```
func(rgba, pnt, nml, ptr)
                                NJS_RGBA    *rgba
                                NJS_POINT3   *pnt
                                NJS_VECTOR   *nml
                                NJS_LIGHT    *ptr
```

<Parameters>

***rgba**

Pointer after calculation

***pnt**

Polygon position vector pointer

***nml**

Polygon normal line vector pointer

***ptr**

Light pointer set by njCreateLight

2. Macros (with NJS_LIGHT *ptr)

NJM_LIGHT_VECTOR(ptr)

Current light direction: NJS_VECTOR. This is referenced as

NJM_LIGHT_VECTOR(ptr).x.

NJM_LIGHT_POINT(ptr)

Current light position: NJS_POINT3. This is referenced as

NJM_LIGHT_POINT(ptr).x.

NJM_LIGHT_AMB(ptr)

Ambient light intensity: NJS_RGBA. This normally has a value in the range 0 to 1.f; however, values greater than 1.f are possible. This is referenced as

NJM_LIGHT_AMB(ptr).r.

NJM_LIGHT_DIF(ptr)

Diffuse light intensity: NJS_ARGB. This normally has a value in the range 0 to 1.f; however, values greater than 1.f are possible. This is referenced as

NJM_LIGHT_DIF(ptr).r.

NJM_LIGHT_SPC(ptr)

Specular light intensity: NJS_ARGB. This normally has a value in the range 0 to 1.f; however, values greater than 1.f are possible. This is referenced as

NJM_LIGHT_SPC(ptr).r.

NJM_LIGHT_EXP(ptr)

Index: Part of the information contained in the object data; an integer. This provides the specular diffusion. The relationship to SOFTIMAGE is listed below.

NINJA	:	SOFTIMAGE
0	:	0
1	:	1
2	:	2
3	:	3
4	:	4
5	:	6
6	:	8
7	:	12
8	:	16
9	:	24
10	:	32
11	:	48
12	:	64
13	:	96
14	:	128
15	:	192
16	:	256

NJM_LIGHT_COLOR(ptr)

Light color: NJS_ARGB. This provides the light color.

NJM_LIGHT_INIT_VECTOR(ptr)

Light direction before matrix calculation: NJS_VECTOR. This is the initial direction before matrix calculation.

NJM_LIGHT_INIT_POINT(ptr)

Light position before matrix calculation: NJS_POINT3. This is the initial position before matrix calculation.

NJM_LIGHT_MATRIX(ptr)

Light position before matrix calculation. This is the light matrix.

RELATED TOPICS

`njCreateLight()`

njTranslateLight

Applies a matrix that gives parallel translation along each axis.

FORMAT

```
#include <NINJA.H>
void njTranslateLight( *ptr, tx, ty, tz )
NJS_LIGHT *ptr
Float tx
Float ty
Float tz
```

PARAMETERS

***ptr**

Light pointer

tx

Move in X-axis direction

ty

Move in Y-axis direction

tz

Move in Z-axis direction

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Translates light matrix registered by njCreateLight with elements x, y, and z.
- Location and direction of light source will be calculated.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);

.....
njClearMatrix();

/* Translate with elements of (10,0,-10) */
njTranslateLight(&light, 10.f, 0.f, -10.f);
```

NOTES

Light must be specified by `njCreateLight`, and `njClearMatrix` must be called beforehand.

RELATED TOPICS

`njCreateLight()`

njTranslateLightV

Moves a light matrix laterally according to a directional vector.

FORMAT

```
#include <NINJA.H>
void njTranslateLightV( *ptr, *vctr )
NJS_LIGHT *ptr
NJS_VECTOR *vctr
```

PARAMETERS

***ptr**

light pointer

***vctr**

pointer to directional vector

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Uses a directional vector to move a light matrix created with `njCreateLight`. This results in calculation of the position and direction of the light source.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;
NJS_VECTOR vector;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);

.....
njClearMatrix();

/* Move by vector */
njTranslateLightV(&light, &vector);
```

NOTES

- Before calling this function, the light source must be specified by `njCreateLight` and `njClearMatrix` must be called.

RELATED TOPICS

`njCreateLight()`

njUnitLightMatrix

Unitizes a light matrix.

FORMAT

```
#include <NINJA.H>
void njUnitLightMatrix( *ptr )
NJS_LIGHT *ptr
```

PARAMETERS

***ptr**

light pointer

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Unitizes a light matrix created with njCreateLight.
- This results in calculation of the position and direction of the light source.

EXAMPLE

```
#include <NINJA.H>
.....

NJS_LIGHT light;

njInitSystem();
njCreateLight(&light, NJD_POINT_LIGHT);

.....
njClearMatrix();

/* Unitizes the light matrix */
njUnitLightMatrix(&light);
```

NOTES

- Before using this function, the light must be specified with `njCreateLight` and `njClearMatrix` must be called.

RELATED TOPICS

`njCreateLight()`



8. Scroll Functions

Contents

njDrawScroll	Draws a 2D scroll surface.	NLS-220
--------------------	---------------------------------	---------

njDrawScroll

Draws a 2D scroll surface.

FORMAT

```
#include <Ninja.h>
void njDrawScroll( *scl )
NJS_SCROLL *scl
```

PARAMETERS

***scl**

pointer to scroll structure

RETURN VALUE

None

FUNCTION

- Draws a 2D scroll structure in the clip screen.

EXAMPLE

```

  Uint32 map[4][5];
  NJS_TEXLIST texlist;

  NJS_TEXMEMLIST *texmemlist;

  /* Cell definition */
  /* Prepare to load 5 textures */
  texmemlist = malloc(sizeof(NJS_TEXMEMLIST)*5);
  njInitTexture(texmemlist,5);
  njLoadTexture(&texlist);

  /* The scroll function does not require calling njSetTexture or njSetTextureNum */

  /* Set the scroll structure */
  scl.mapw = 5; /*
  Number of map cells horizontally */
  scl.maph = 4; /*
  Number of map cells vertically */
  scl.sx = 1.0f; /*
  Scale horizontally */
  scl.sy = 1.0f; /*
  Scale vertically */
  scl.spx = 320.f; /*
  Scale center x coordinate */
  scl.spy = 240.f; /*
  Scale center y coordinate */
  scl.list = &texlist; /*
  Texture list */
  scl.map = (Uint32*)map; /* Map
  array */
  scl.mflag = ON; /*
  Matrix flag */
  scl.sflag = ON; /*
  Scale flag */
  scl.pr = -100.f; /*
  Priority -1.f (front) to -65535.f (rear) */
  scl.px = 0.f; /*
  Movement x coordinate */
  scl.py = 0.f; /*
  Movement y coordinate */
  scl.bx = 0.f; /*
  Start of map write x coordinate */
  scl.by = 0.f; /*
  Start of map write y coordinate */
  scl.cx = 320.f; /*
  Rotation center x coordinate */
  scl.cy = 240.f; /*
  Rotation center y coordinate */
  scl.clip[0].x = 0.f; /*
  Upper left clip x coordinate */
  scl.clip[0].y = 0.f; /*
  Upper left clip y coordinate */

```

```
scl.clip[1].x = 640.f; /*
Lower right clip x coordinate */
scl.clip[1].y = 480.f; /*
Lower right clip y coordinate */
scl.sclc.argb.a = 255; /*
Globally applied A*/
scl.sclc.argb.r = 255; /*
Globally applied R*/
scl.sclc.argb.g = 255; /*
Globally applied g*/
scl.sclc.argb.b = 255; /*
Globally applied B */
scl.colmode = NJD_COLOR_MODE_TEXTURE; /* Set
color mode */
```

NOTES

Note that color mode has been changed.

Clipping function has been deleted.

For more detailed explanation on making map or texture list, see Scroll Guide.

With Scroll sample

RELATED TOPICS

[njInitTexture\(\)](#)

[njLoadTexture\(\)](#)



9. Modeling Functions

Contents

njControl3D.....	Controls the drawing surface for a 3D object.	NLS-224
njDrawModel.....	Draws a model.	NLS-227
njDrawObject.....	Draws an object.	NLS-229
njFastDrawModel.....	Draws Models.	NLS-231
njFastDrawObject.....	Draws objects.	NLS-233
njInit3D.....	Initializing 3D system.	NLS-235
njSetConstantAttr.....	Sets model attributes.	NLS-236
njSetConstantMaterial.....	Sets model material data.	NLS-238
njSetDepthQueue.....	Sets depth queue.	NLS-240
njSimpleDrawModel.....	Draws models.	NLS-242

`njSimpleDrawObject` Draws objects. NLS-243 **njControl3D** Controls the drawing surface for a 3D object.

FORMAT

```
#include <Ninja.h>
void    njControl3D( flag )
Uint32  flag
```

PARAMETERS

flag

control parameters

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Controls the drawing surface for models and objects.
- Parameters that can be set are as follows.

NJD_CONTROL_3D_DISP_AXIS

Draws axes (1 long) at the origin for each model.

X axis:blue, Y axis:green, Z axis:red

NJD_CONTROL_3D_NO_CLIP_CHECK

Specifies not to perform clipping check when drawing models.

With this parameter set, drawing efficiency will be up if model drawing is within a screen completely.

NJD_CONTROL_3D_CONSTANT_ATTR

Allows to change model attribute. Changing parameters should be specified with `njSetConstantAttr()`.

NJD_CONTROL_3D_CONSTANT_MATERIAL

Changes material data of models to fixed value. Changing parameters should be specified with `njSetConstantMaterial()`.

NJD_CONTROL_3D_OFFSET_MATERIAL

Supplements material data of models. Supplementing parameters should be specified with `njSetConstantMaterial()`.

NJD_CONTROL_3D_DEPTH_QUEUE

Validates depth queue. Depth queue here means to change degree of transparency accommodating with distance.

Depth queue parameters should be specified with `njSetDepthQueue()`.

NJD_CONTROL_3D_VERTEX_OFFSET

Moves vertex data in normal line direction.

The offset to move is specified by `_nj_vertex_offset_ variable`.

NJD_CONTROL_3D_MODEL_CLIP

Validates clipping by model.

NJD_CONTROL_3D_CONSTANT_TEXTURE_MATERIAL

Makes texture material color white.

In default, it uses material color.

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
njInitMatrix( matrix, 128 );
njInit3D( vbuf, 4096 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT );
njSetView( &view );

njControl3D( NJD_CONTROL_3D_NO_CLIP_CHECK | NJD_CONTROL_3D_DISP_AXIS );

while(1) {
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njDrawObject( object );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

`njInit3D()`

`njDrawModel()`

`njDrawObject()`

`njSetConstantAttr()`

`njSetConstantMaterial()`

`njSetTextureMode()`

`njDrawAlphaBuf()`

`njSetDepthQueue()`

njDrawModel

Draws a model.

FORMAT

```
#include <Ninja.h>
void      njDrawModel( model )
NJS_MODEL *model
```

PARAMETERS

model

pointer to model structure

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Draws the model data after converting coordinates for the current matrix.
- The drawing method can be controlled with njControl3D().

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
njInitMatrix( matrix, 128 );
njInit3D( vbuf, 4096 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT );
njSetView( &view );

while(1) {
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njDrawModel( model );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

`njInit3D()`

`njDrawObject()`

`njControl3D()`

`njSetConstantAttr()`

`njSetConstantMaterial()`

`njSetTextureMode()`

`njDrawAlphaBuf()`

`njSetDepthQueue()`

njDrawObject

Draws an object.

FORMAT

```
#include <Ninja.h>
void      njDrawObject( *object )
NJS_OBJECT *object
```

PARAMETERS

***object**

pointer to object structure

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

Draws the object (model data with parent-child hierarchy) after converting coordinates for the current matrix.

The drawing method can be controlled with njControl3D().

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
njInitMatrix( matrix, 128 );
njInit3D( vbuf, 4096 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT );
njSetView( &view );

while(1) {
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njDrawObject( object );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

- [njInit3D\(\)](#)
- [njDrawModel\(\)](#)
- [njControl3D\(\)](#)
- [njSetConstantAttr\(\)](#)
- [njSetConstantMaterial\(\)](#)
- [njSetTextureMode\(\)](#)
- [njDrawAlphaBuf\(\)](#)
- [njSetDepthQueue\(\)](#)

njFastDrawModel

Draws Models.

FORMAT

```
#include <Ninja.h>
void      njFastDrawModel( model )
NJS_MODEL *model
```

PARAMETERS

model

model structure pointer

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Performs coordinate conversion for model data at the current matrix, and draws it.
- Drawing method can be controlled by njControl3D().
- Drawing ability is higher than njDrawModel().
- However, only white is allowed as a light color and depth queue cannot function.

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
njInitVertexBuffer( 500000, 0, 10000, 0 );
njInitMatrix( matrix, 128, 0 );
njInit3D( vbuf, 4096 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT );
njSetView( &view );

while(1) {
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njFastDrawModel( model );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

- [njInit3D\(\)](#)
- [njDrawObject\(\)](#)
- [njControl3D\(\)](#)
- [njSetConstantAttr\(\)](#)
- [njSetConstantMaterial\(\)](#)
- [njSetTextureMode\(\)](#)
- [njDrawAlphaBuf\(\)](#)
- [njSetDepthQueue\(\)](#)

njFastDrawObject

Draws objects.

FORMAT

```
#include <Ninja.h>
void njFastDrawObject( object1 )
NJS_OBJECT *object
```

PARAMETERS

object

pointer for the object structure

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Performs coordinate conversion for object (model data with parent / child hierarchy) at the current matrix, and draws it.
- Drawing method can be controlled by njControl3D().
- Drawing ability is higher than njDrawObject().
- However, only white is allowed as a light color and depth queue cannot function.

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
njInitVertexBuffer( 500000, 0, 10000, 0 );
njInitMatrix( matrix, 128, 0 );
njInit3D( vbuf, 4096 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT );
njSetView( &view );

while(1) {
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njFastDrawObject( object );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

[njInit3D\(\)](#)

[njDrawModel\(\)](#)

[njControl3D\(\)](#)

[njSetConstantAttr\(\)](#)

[njSetConstantMaterial\(\)](#)

njInit3D

Initializing 3D system.

FORMAT

```
#include <Ninja.h>
void njInit3D( vbuf, vn )
NJS_VERTEX_BUF *vbuf
Int vn
```

PARAMETERS

vbuf

pointer to vertex calculation working buffer

vn

size of vertex calculation working buffer

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Initializes the work buffer used for model drawing.
- The vertex computation work buffer is used for temporary storage of the model data vertex computation results.
If multiple models are drawn, the buffer size used can only be as large as the largest of the models.

EXAMPLE

```
#define VERTEX_MAX 1024
NJS_VERTEX_BUF vbuf[VERTEX_MAX];
njInit3D( vbuf, VERTEX_MAX );
```

NOTES

RELATED TOPICS

[njDrawModel\(\)](#)
[njDrawObject\(\)](#)
[njControl3D\(\)](#)
[njDrawAlphaBuf\(\)](#)

njSetConstantAttr

Sets model attributes.

FORMAT

```
#include <Ninja.h>
void      njSetConstantAttr( and_attr, or_attr )
Uint32    and_attr
Uint32    or_attr
```

PARAMETERS

and_attr

AND attribute pattern

or_attr

OR attribute pattern

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Specifies the model attributes.
- These are specified as an AND pattern or OR pattern which is applied to the original data. The attributes are enabled when NJD_CONTROL_3D_CONSTANT_ATTR is specified with njControl3D.

EXAMPLE

This changes a polygon with texture to a monocolored polygon and displays it flat.

```
njInitSystem( NJD_RESOLUTION_640x480, 1 );
njInitMatrix( matrix, 128 );
njInit3D( vbuf, 4096, abuf, zbuf, 32 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT );
njSetView( &view );

njControl3D( NJD_CONTROL_3D_CONSTANT_ATTR );
njSetConstantAttr( NJD_FLAG_USE_TEXTURE, NJD_FLAG_USE_FLAT );

while(1) {
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njDrawObject( object );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

[njDrawModel\(\)](#)

[njDrawObject\(\)](#)

[njControl3D\(\)](#)

njSetConstantMaterial

Sets model material data.

FORMAT

```
#include <Ninja.h>
void      njSetConstantMaterial( argb )
NJS_ARGB  *argb
```

PARAMETERS

argb

material data

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Specifies a model's material data.
- The material data becomes valid when `NJD_CONTROL_3D_CONSTANT_MATERIAL` or `NJD_CONTROL_3D_OFFSET_MATERIAL` is specified by `njControl3D`.
- When `NJD_CONTROL_3D_CONSTANT_MATERIAL` is specified, the model is drawn with the specified material data. When `NJD_CONTROL_3D_OFFSET_MATERIAL` is specified, the model is drawn after adding the specified material data to the material of the model data.
- This data is also used for color calculation when drawing sprites.

EXAMPLE

The model is drawn wholly transparent.

```
njInitSystem( NJD_RESOLUTION_640x480, 1 );
njInitMatrix( matrix, 128 );
njInit3D( vbuf, 4096, abuf, zbuf, 32 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT );
njSetView( &view );

njControl3D( NJD_CONTROL_3D_OFFSET_MATERIAL );
argb.a = -128.0f;
argb.r = 0.f;
argb.g = 0.f;
argb.b = 0.f;
njSetConstantMaterial( &argb );

while(1){
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njDrawObject( object );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

- [njDrawModel\(\)](#)
- [njDrawObject\(\)](#)
- [njControl3D\(\)](#)
- [njDrawSprite2D\(\)](#)
- [njDrawSprite3D\(\)](#)

njSetDepthQueue

Sets depth queue.

FORMAT

```
#include <Ninja.h>
void njSetDepthQueue( near, far )
Float near
Float far
```

PARAMETERS

near

Sets depth queue.

far

back Z value

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets depth queue of model drawing.
- Enables when specifies NJD_CONTROL_3D_DEPTH_QUEUE for njControl3D.
- Depth queue changes the degree of transparency from the front towards the back.
- The part which is front or “near” does not become transparent. The part which is back or “far” becomes transparent..

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_640x480, 1 );
njInitMatrix( matrix, 128 );
njInit3D( vbuf, 4096, abuf, zbuf, 32 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT );
njSetView( &view );

njControl3D( NJD_CONTROL_3D_DEPTH_QUEUE );
njSetDepthQueue( -9000.f, -10000.f );
njClipZ( -10.f, -10000.f );

while(1) {
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njDrawObject( object );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

The degree of transparency is changed when Z value is -9000 thru -10000.

If the far values for both Z clip and depth queue are set the same, clipping will be done when it becomes completely transparent.

NOTES

RELATED TOPICS

[njDrawModel\(\)](#)

[njDrawObject\(\)](#)

[njControl3D\(\)](#)

njSimpleDrawModel

Draws models.

FORMAT

```
#include <Ninja.h>
void njSimpleDrawModel( model )
NJS_MODEL *model
```

PARAMETERS

model

Pointer to model structure

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function converts the coordinates for model data according to the current matrix and then draws the model.
- The drawing method can be controlled via `njControl3D()`.
- The drawing performance of this routine is better than that of `njFastDrawModel()`.
- However, the light that is registered first is regarded as a parallel light source, so that only the direction of the light source has any effect; the color and intensity of the light source are not reflected in the drawing.
- Furthermore, this function does not support depth cues.

EXAMPLE

NOTES

RELATED TOPICS

njSimpleDrawObject

Draws objects.

FORMAT

```
#include <Ninja.h>

void njSimpleDrawObject( objectl )

NJS_OBJECT *object
```

PARAMETERS

objectPointer to object structure

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function converts the coordinates for an object (model data with a parent-child hierarchy) according to the current matrix and then draws the object.
- The drawing method can be controlled via njControl3D().
- The drawing performance of this routine is better than that of njFastDrawObject().
- However, the light that is registered first is regarded as a parallel light source, so that only the direction of the light source has any effect; the color and intensity of the light source are not reflected in the drawing.
- Furthermore, this function does not support depth cues.

EXAMPLE

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB565, 1 );
njInitVertexBuffer( 500000, 0, 10000, 0 );
njInitMatrix( matrix, 128, 0 );
njInit3D( vbuf, 4096 );
njInitView( &view );
njCreateLight( &light, NJD_DIR_LIGHT ); njSetView( &view );

while(1) {
    njClearMatrix();
    njTranslate( NULL, 0.f, 0.f, -10.f );
    njRotateXYZ( NULL, xx,yy,zz );
    njSimpleDrawObject( object );
    xx += 257;
    yy += 179;
    zz += 193;
    njWaitVSync();
}
```

NOTES

RELATED TOPICS

- [njInit3D\(\)](#)
- [njDrawModel\(\)](#)
- [njControl3D\(\)](#)
- [njSetConstantAttr\(\)](#)
- [njSetConstantMaterial\(\)](#)



10. View Functions

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njCalcScreen

Projects points in 3D space onto the screen, then finds the screen coordinates to which the points are projected.

FORMAT

```
#include <Ninja.h>

int njCalcScreen(*p, *sx, *sy)
NJS_POINT3 *p
Float *sx
Float *sy
```

PARAMETERS

p

point coordinates in 3D space

sx

x coordinate after projection

sy

y coordinate after projection

RETURN VALUE

OK

The coordinates after projection lie within the screen's drawing area.

NG

The coordinates after projection fall outside of the screen's drawing area.

FUNCTION

- Projects points in 3D space onto the screen, then finds the screen coordinates to which the points are projected.

EXAMPLE

The following projects the point at (1000, 1000, 1000) in 3D space onto the screen, then finds the screen coordinates.

```
NJS_POINT3 p;  
Float sx, sy;  
  
p.x = 1000.f;  
p.y = 1000.f;  
p.z = 1000.f;  
  
njInitSystem(NJD_RESOLUTION_640x480, 1);  
njCalcScreen(&p, &sx, &sy);  
  
% Result %  
  
NG  
sx = 820.000000, sy = 740.000000
```

NOTES

- The results calculated by this function reflect the screen, aspect, near clipping, far clipping, and drawing area settings.

RELATED TOPICS

[njInitSystem\(\)](#)
[njSetScreen\(\)](#)
[njSetAspect\(\)](#)
[njClip2D\(\)](#)
[njClipZ\(\)](#)

njClip2D

Specifies the drawing area on the screen.

FORMAT

```
#include <Ninja.h>

void njClip2D(*v)
NJS_POINT2 *v
```

PARAMETERS

v

upper right and lower left coordinates of drawing area

RETURN VALUE

None

FUNCTION

- Specifies the drawing area on the screen.

EXAMPLE

The following specifies a drawing area with an upper right corner at (160, 240) and a lower left corner at (480, 300).

```
NJS_POINT2 p[2];

P[0].x = 160.f;
P[0].y = 240.f;
P[1].x = 480.f;
P[1].y = 300.f;

njClip2D(P);
```

NOTES

Since `njInitSystem()` initializes the drawing area to the entire screen, this function is not needed unless the user requires a drawing area of different size.

RELATED TOPICS

`njInitSystem()`

njClipZ Specifies the limit values of near clipping and far clipping.

FORMAT

```
#include <Ninja.h>

void njClipZ(n, f)
Float n
Float f
```

PARAMETERS

n
near clipping limit value

f
far clipping limit value

RETURN VALUE

None

FUNCTION

- Specifies the limit values of near clipping and far clipping.
- Since the area behind the screen is represented by a negative Z axis in the Ninja coordinate system, n and f are specified as negative values.
(-1.0 => n > f => -65535.0)
Specified values of greater than -1.0 or less than -65535.0 are automatically changed to -1.0 or -65535.0, respectively.

EXAMPLE

```
#define N_CLIP      -500.f
#define F_CLIP      -50000.f

njClipZ(N_CLIP, F_CLIP);
```

NOTES

RELATED TOPICS

njForwardViewAbsolute

Moves the view location in the direction of the view. (Absolute Move).

FORMAT

```
#include <Ninja.h>

njForwardViewAbsolute( *v, x)
NJS_VIEW *v
Float x
```

PARAMETERS

v

view structure pointer

x

movement distance (absolute)

RETURN VALUE

None

FUNCTION

- Moves the view location in the direction of the view by an absolute amount.

EXAMPLE

This example moves the view located at (0, 0, 0) and directed toward (1, 1, -1) (toward the inside of the upper right of the screen) by 10 in the direction of the view.

```
#define VIEW_APX 0.f
#define VIEW_APY 0.f
#define VIEW_APZ 0.f
#define VIEW_AVX 1.f
#define VIEW_AVY 1.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);

njUnitCurrentViewVector(&v);
njForwardViewAbsolute(&v, 10.f);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter `v` is NULL, this function acts on the current view.

RELATED TOPICS

`njUnitCurrentViewVector()`

`njSetView()`

`njClearMatrix()`

njForwardViewRelative

Moves the view location along the viewline.
(Relative Move).

FORMAT

```
#include <Ninja.h>

njForwardViewRelative( *v, x)
NJS_VIEW *v
Float x
```

PARAMETERS

v

view structure pointer

x

movement distance (relative value)

RETURN VALUE

None

FUNCTION

- Moves the view location along the viewline by a relative amount.

EXAMPLE

This example moves the view located at (0, 0, 0) and directed toward (1, 1, -1) (toward the inside of the upper right of the screen) by 10 in the direction of the view.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 0.f
#define VIEW_VX 1.f
#define VIEW_VY 1.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njUnitCurrentViewVector(&v);
njForwardViewRelative(&v, 10.f);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter `v` is `NULL`, this function acts on the current view.

RELATED TOPICS

`njUnitCurrentViewVector()`

`njSetView()`

`njClearMatrix()`

njInitView

Initializes the view.

FORMAT

```
#include <Ninja.h>

void njInitView(*v)
NJS_VIEW *v
```

PARAMETERS

v
view structure pointer

RETURN VALUE

None

FUNCTION

- Initializes the user-defined view as follows:

```
Position    (PX,PY,PZ) = (0,0, 0)           //
origin
Orientation (VX,XY,XZ) = (0,0,-1)          //
toward back of screen
Tilt (roll, or tilt along the Z axis of line of sight) //0 degrees
View matrix = Unit matrix
```

EXAMPLE

```
NJS_VIEW v;
njInitView(&v);
```

NOTES

- This function may be omitted when settings are made directly in the view structure.
- Structure members which must be set are:

```
px, py, pz    (view point)
vx, vy, vz    (view direction)
roll          (view tilt)
```

It is not necessary to set the view matrix.

RELATED TOPICS

```
njSetView()
njClearMatrix()
```

njLookAtView Changes the view direction towards point (x, y, z).

FORMAT

```
#include <Ninja.h>

void njLookAtView( *v, x, y, z)
NJS_VIEW *v
Float x
Float y
Float z
```

PARAMETERS

v

view structure pointer

x

X coordinate of point toward which view is being directed

y

Y coordinate of point toward which view is being directed

z

Z coordinate of point toward which view is being directed

RETURN VALUE

None

FUNCTION

- Changes the view direction towards a point (x, y, z).

EXAMPLE

The following changes the direction of the view located at (500, 500, 500) and directed toward (0, 0, -1) (to rear of screen) toward the origin (0, 0, 0).

```
#define VIEW_PX 500.f
#define VIEW_PY 500.f
#define VIEW_PZ 500.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njLookAtView(&v, 0.f, 0.f, 0.f);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter `v` is `NULL`, the current view is changed.

RELATED TOPICS

`njInitView()`

`njSetView()`

`njClearMatrix()`

njLookAtViewV Changes the view direction towards point (x, y, z).

FORMAT

```
#include <Ninja.h>

void njLookAtViewV( *v, *p)
NJS_VIEW *v
NJS_POINT3 *p
```

PARAMETERS

v

view structure pointer

p

coordinates of point to which view is to be directed

RETURN VALUE

None

FUNCTION

- Changes the view direction towards a point (x, y, z).

EXAMPLE

The following changes the direction of the view located at (500, 500, 500) and directed toward (0, 0, -1) (to rear of screen) toward the origin (0, 0, 0).

```
#define VIEW_PX 500.f
#define VIEW_PY 500.f
#define VIEW_PZ 500.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;
NJS_POINT3 p;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

p.x = 0.f;
p.y = 0.f;
p.z = 0.f;

njLookAtViewRelative(&v, &p);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter `v` is NULL, the current view is changed.

RELATED TOPICS

`InitView()`

`njSetView()`

`njClearMatrix()`

njMultiViewMatrix

Multiplies a view by a matrix.

FORMAT

```
#include <Ninja.h>

void njMultiViewMatrix(*v, *m)
NJS_VIEW *v
NJS_MATRIX *m
```

PARAMETERS

v

view structure pointer

m

matrix structure pointer

RETURN VALUE

None

FUNCTION

Multiplies a user-specified view by a matrix.

```
% Result %
[VM]: view matrix
[M]: matrix

[VM] = [M][VM]
(px, py, pz) = (px, py, pz)[M]
(vx, vy, vz) = (vx, vy, vz)[M]
```

EXAMPLE

NOTES

- When parameter v is NULL, the current matrix is used.

RELATED TOPICS

njReturn2BaseView

Returns the current view to the base view.

FORMAT

```
#include <Ninja.h>

void njReturn2BaseView(*v);
NJS_VIEW *v
```

PARAMETERS

v

view structure pointer

RETURN VALUE

None

FUNCTION

- Restores the location and viewline orientation of the current view to the location and orientation of the base view.

EXAMPLE

This example manipulates the view in various ways, then restores the view to the base view location and viewline.

```
NJS_VIEW v;

njInitView(&v);
njTranslateViewRelative(50.f, 50.f, 50.f);
njjLookAtView(&v, 0.f, 0.f, 0.f);
njReturn2BaseView(&v);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, this function acts on the current view.

RELATED TOPICS

InitView()

njSetView()

njClearMatrix()

njRotateViewPosXAbsolute

Rotates the view location around the X axis. (Absolute Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewPosXAbsolute(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute)

RETURN VALUE

None

FUNCTION

- Rotates the view location around the X axis by an absolute angle.

EXAMPLE

This example rotates the location of the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) around the X axis by 90 degrees, without changing the view direction.

```
#define VIEW_APX 0.f
#define VIEW_APY 0.f
#define VIEW_APZ 3000.f
#define VIEW_AVX 0.f
#define VIEW_AYV 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AYV;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);

njRotateViewPosXAbsolute(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, this function acts on the current view.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njRotateViewPosXRelative

Rotates the view around the X axis
(Relative Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewPosXRelative(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (relative amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view by a relative amount around the X axis.

EXAMPLE

Rotates the view located at (0, 0, 3000) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the X axis.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njRotateViewPosXRelative(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, the current matrix is rotated.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njRotateViewPosYAbsolute

Rotates the view location around the Y axis. (Absolute Rotation).

FORMAT

```
#include <Ninja.h>
void njRotateViewPosYAbsolute(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute)

RETURN VALUE

None

FUNCTION

- Rotates the view location around the Y axis by an absolute angle.

EXAMPLE

This example rotates the location of the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) around the Y axis by 90 degrees, without changing the view direction.

```
#define VIEW_APX 0.f
#define VIEW_APY 0.f
#define VIEW_APZ 3000.f
#define VIEW_AVX 0.f
#define VIEW_AVY 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);

njRotateViewPosYAbsolute(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, this function acts on the current view.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njRotateViewPosYRelative

Rotates the view around the Y axis
(Relative Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewPosYRelative(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (relative amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view by a relative amount around the Y axis.

EXAMPLE

- Rotates the view located at (0, 0, 3000) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the Y axis.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njRotateViewPosYRelative(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, the current matrix is rotated.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njRotateViewPosZAbsolute

Rotates the view location around the Z axis. (Absolute Rotation).

FORMAT

```
#include <Ninja.h>
void njRotateViewPosZAbsolute(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute)

RETURN VALUE

None

FUNCTION

- Rotates the view location around the Z axis by an absolute angle.

EXAMPLE

This example rotates the location of the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) around the Z axis by 90 degrees, without changing the view direction.

```
#define VIEW_APX 3000.f
#define VIEW_APY 0.f
#define VIEW_APZ 0.f
#define VIEW_AVX 0.f
#define VIEW_AVY 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);

njRotateViewPosZAbsolute(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, this function acts on the current view.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njRotateViewPosZRelative

Rotates the view around the Z axis
(Relative Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewPosZRelative(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (relative amount of rotation)

RETURN VALUE

None

FUNCTION

Rotates the view by a relative amount around the Z axis.

EXAMPLE

Rotates the view located at (3000, 0, 0) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the Z axis.

```
#define VIEW_PX 3000.f
#define VIEW_PY 0.f
#define VIEW_PZ 0.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njRotateViewPosZRelative(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, the current matrix is rotated.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njRotateViewX

Rotates the view around the X axis (Absolute Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewX(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute amount of the rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view around the X axis.

EXAMPLE

Rotates the view located at (0, 0, 3000) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the X axis.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njSetView(&v);
njRotateViewX(&v, NJM_DEG_ANG(90));
njClearMatrix();
```

NOTES

- When parameter `v` is `NULL`, the current matrix is rotated.
- Views (viewpoints) can be moved and rotated by manipulating the view structure in either of two ways: by specifying transformation of view structure matrix in absolute terms, or by manipulating the position (`px`, `py`, `pz`), view direction (`vx`, `vy`, `vz`), and tilt (view roll) of each member in relative terms. This function is of the absolute type.

RELATED TOPICS

`njSetView()`

`njClearMatrix()`

njRotateViewXAbsolute

Rotates the view location around the X axis. (Absolute Rotation).

FORMAT

```
#include <Ninja.h>
void njRotateViewXAbsolute(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute)

RETURN VALUE

None

FUNCTION

- Rotates the view location around the X axis by an absolute angle.

EXAMPLE

This example rotates the location of the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) around the X axis by 90 degrees, without changing the view direction.

```
#define VIEW_APX 0.f
#define VIEW_APY 0.f
#define VIEW_APZ 3000.f
#define VIEW_AVX 0.f
#define VIEW_AVY 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);

njRotateViewXAbsolute(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, this function acts on the current view.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njRotateViewXRelative

Rotates the view around the X axis
(Relative Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewXRelative(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (relative amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view by a relative amount around the X axis.

EXAMPLE

Rotates the view located at (0, 0, 3000) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the X axis.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njRotateViewXRelative(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, the current matrix is rotated.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njRotateViewXYZ

Rotates the view around the X, Y, and Z axes
(Absolute Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewXYZ(*v, angx, angy, angz)
NJS_VIEW *v
Angle angx
Angle angy
Angle angz
```

PARAMETERS

v

view structure pointer

angx

rotation angle with respect to X axis (absolute amount of rotation)

angy

rotation angle with respect to Y axis (absolute amount of rotation)

angz

rotation angle with respect to Z axis (absolute amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view around the X, Y, and Z axes.
- Rotation is applied around the X, Y, and Z axes, in that order.

EXAMPLE

The following rotates the view located at (0, 0, 3000) with orientation (0, 0, -1) (screen rear) by 30 degrees around the X axis, 60 degrees around the Y axis, and 90 degrees around the Z axis.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njSetView(&v);
njRotateViewXYZ(&v, NJM_DEG_ANG(30), NJM_DEG_ANG(60), NJM_DEG_ANG(90));
njClearMatrix();
```

NOTES

- When parameter `v` is `NULL`, the current view is rotated.
- Views (viewpoints) can be moved and rotated by manipulating the view structure in either of two ways: by specifying transformation of view structure matrix in absolute terms, or by manipulating the position (`px`, `py`, `pz`), view direction (`vx`, `vy`, `vz`), and tilt (view roll) of each member in relative terms. This function is of the absolute type.

RELATED TOPICS

`njSetView()`

`njClearMatrix()`

`NJM_DEG_ANG()`

njRotateViewXYZAbsolute

Rotates the line of view around the X, Y, and Z axes. (Absolute Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewXYZAbsolutee(*v, angx, angy, angz)
NJS_VIEW *v
Angle angx
Angle angy
Angle angz
```

PARAMETERS

v

view structure pointer

angx

Rotation angle around X axis (absolute value)

angy

Rotation angle around Y axis (absolute value)

angz

Rotation angle around Z axis (absolute value)

RETURN VALUE

None

FUNCTION

- Rotates the line of view around the X, Y, and Z axes.
- Rotation takes place around the X, Y, and Z axes, in that order.

EXAMPLE

This example rotates the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) around the X, Y, and Z axes by 30, 60, and 90 degrees, respectively, without changing the view location or direction.

```
#define VIEW_APX 0.f
#define VIEW_APY 0.f
#define VIEW_APZ 3000.f
#define VIEW_AVX 0.f
#define VIEW_AVY 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(AVIEW_ROLL);

njRotateViewXYZAbsolute(&v, NJM_DEG_ANG(30), NJM_DEG_ANG(60), NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, this function acts on the current view.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

[NJM_DEG_ANG\(\)](#)

njRotateViewXYZRelative

Rotates the view around the X, Y, and Z axes (Relative Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewXYZRelative(*v, angx, angy, angz)
NJS_VIEW *v
Angle angx
Angle angy
Angle angz
```

PARAMETERS

v

view structure pointer

angx

rotation angle around the X axis (relative amount of rotation)

angy

rotation angle around the Y axis (relative amount of rotation)

angz

rotation angle around the Z axis (relative amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view by a relative amount around the X, Y, and Z axes.
- Rotation is applied around the X, Y, and Z axes, in that order.

EXAMPLE

The following rotates the view located at (0, 0, 3000) with view orientation (0, 0, -1) (screen rear) by 30 degrees around the X axis, 60 degrees around the Y axis, and 90 degrees around the Z axis.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njRotateViewXYZRelative(&v, NJM_DEG_ANG(30), NJM_DEG_ANG(60), NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, the current matrix is rotated.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

[NJM_DEG_ANG\(\)](#)

njRotateViewY

Rotates the view around the Y axis (Absolute Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewY(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view around the Y axis.

EXAMPLE

Rotates the view located at (0, 0, 3000) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the Y axis.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njSetView(&v);
njRotateViewY(&v, NJM_DEG_ANG(90));
njClearMatrix();
```

NOTES

- When parameter `v` is `NULL`, the current view is rotated.
- Views (viewpoints) can be moved and rotated by manipulating the view structure in either of two ways: by specifying transformation of view structure matrix in absolute terms, or by manipulating the position (`px`, `py`, `pz`), view direction (`vx`, `vy`, `vz`), and tilt (view roll) of each member in relative terms. This function is of the absolute type.

RELATED TOPICS

`njSetView()`

`njClearMatrix()`

`NJM_DEG_ANG()`

njRotateViewYAbsolute

Rotates the view line around the Y axis.
(Absolute Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewYAbsolute(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute value)

RETURN VALUE

None

FUNCTION

- Rotates the line of view around the Y axis by an absolute amount.

EXAMPLE

This example rotates the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) around the Y axis by 90 degrees without changing the view location or direction.

```
#define VIEW_APX 0.f
#define VIEW_APY 0.f
#define VIEW_APZ 3000.f
#define VIEW_AVX 0.f
#define VIEW_AVY 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);

njRotateViewYAbsolute(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter `v` is `NULL`, this function acts on the current view.

RELATED TOPICS

`njSetView()`
`njClearMatrix()`

njRotateViewYRelative

Rotates the view around the Y axis
(Relative Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewYRelative(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (relative amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view by a relative amount around the Y axis.

EXAMPLE

Rotates the view located at (0, 0, 3000) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the Y axis.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njRotateViewYRelative(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, the current matrix is rotated.

RELATED TOPICS

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

[NJM_DEG_ANG\(\)](#)

njRotateViewZ

Rotates the view around the Z axis (Absolute Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewZ(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view around the Z axis.

EXAMPLE

Rotates the view located at (0, 0, 3000) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the Z axis.

```
#define VIEW_PX 3000.f
#define VIEW_PY 0.f
#define VIEW_PZ 0.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njSetView(&v);
njRotateViewZ(&v, NJM_DEG_ANG(90));
njClearMatrix();
```

NOTES

- When parameter `v` is `NULL`, the current view is rotated.
- Views (viewpoints) can be moved and rotated by manipulating the view structure in either of two ways: by specifying transformation of view structure matrix in absolute terms, or by manipulating the position (`px`, `py`, `pz`), view direction (`vx`, `vy`, `vz`), and tilt (view roll) of each member in relative terms. This function is of the absolute type.
- For details, see the View function `View.txt`.

RELATED TOPICS

`njSetView()`

`njClearMatrix()`

`NJM_DEG_ANG()`

njRotateViewZAbsolute

Rotates the view around the Z axis.
(Absolute Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewZAbsolute(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (absolute value)

RETURN VALUE

None

FUNCTION

- Rotates the view around the Z axis by an absolute amount.

EXAMPLE

This example rotates the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) around the Z axis by 90 degrees without changing the view location or direction.

```
#define VIEW_APX 3000.f
#define VIEW_APY 0.f
#define VIEW_APZ 0.f
#define VIEW_AVX 0.f
#define VIEW_AVY 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);

njRotateViewZAbsolute(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter `v` is NULL, this function acts on the current view.

RELATED TOPICS

`njSetView()`

`njClearMatrix()`

`NJM_DEG_ANG()`

njRotateViewZRelative

Rotates the view around the Z axis
(Relative Rotation).

FORMAT

```
#include <Ninja.h>

void njRotateViewZRelative(*v, ang)
NJS_VIEW *v
Angle ang
```

PARAMETERS

v

view structure pointer

ang

rotation angle (relative amount of rotation)

RETURN VALUE

None

FUNCTION

- Rotates the view by a relative amount around the Z axis.

EXAMPLE

Rotates the view located at (3000, 0, 0) with orientation (0, 0, -1) (behind the screen) by 90 degrees around the Z axis.

```
#define VIEW_PX 3000.f
#define VIEW_PY 0.f
#define VIEW_PZ 0.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njRotateViewZRelative(&v, NJM_DEG_ANG(90));
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, the current matrix is rotated.

RELATED TOPICS

`njSetView()` `njClearMatrix()` `NJM_DEG_ANG()`

njSetAspect

Sets the screen aspect ratio.

FORMAT

```
#include <Ninja.h>

void njSetAspect(ax, ay)
Float ax
Float ay
```

PARAMETERS

ax

horizontal screen ratio

ay

vertical screen ratio

RETURN VALUE

None

FUNCTION

- Sets the screen aspect ratio.

EXAMPLE

The following sets the vertical:horizontal screen aspect to 2:3.

```
njSetAspect(3.f, 2.f);
```

NOTES

Since the screen aspect is initialized to 1:1 by `njInitSystem()`, use of this function is optional unless required by the user.

RELATED TOPICS

`njInitSystem()`

njSetBaseView

Sets the current view as the base view.

FORMAT

```
#include <Ninja.h>
void njSetBaseView(NJS_VIEW *v)
NJS_VIEW *v
```

PARAMETERS

v

view structure pointer

RETURN VALUE

None

FUNCTION

- Sets the current view location and viewline orientation as the base view location and view direction.

EXAMPLE

Moves the view located at (0, 0, 0) and directed toward (0, 0, -1) (toward the inside of the screen) to (50, 50, 50), then sets that view as the base view after reorienting the viewline toward (0, 0, 0).

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 0.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njTranslateViewRelative(50.f, 50.f, 50.f);
njinjLookAtView(&v, 0.f, 0.f, 0.f);
njSetBaseView(&v);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter `v` is `NULL`, this function acts on the current view.

RELATED TOPICS

`njInitView()`

`njSetView()`

`njClearMatrix()`

njSetPerspective

Sets the perspective in horizontal direction.

FORMAT

```
#include <Ninja.h>
void njSetPerspective(ang)
Int ang
```

PARAMETERS

ang

perspective in horizontal direction

RETURN VALUE

None

FUNCTION

- Calculates the distance from the specified perspective in horizontal direction to the screen and sets the distance.

EXAMPLE

Sets the perspective in horizontal direction to 120 degrees.

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB555, 1 );
njSePerspective(120);
```

NOTES

RELATED TOPICS

njSetScreen

Sets the screen.

FORMAT

```
#include <Ninja.h>
void njSetScreen(*s)
NJS_SCREEN *s
```

PARAMETERS

***s**

screen structure pointer

RETURN VALUE

None

FUNCTION

- Initializes the screen according to screen structure values set by the user.

EXAMPLE

```
#define SCR_DIST 500.f //distance from view point (view)
#define SCR_WIDTH 640.f //screen width
#define SCR_HEIGHT 480.f //screen height
#define SCR_CX SCR_WIDTH/2 //center of screen (X axis)
#define SCR_CY SCR_HEIGHT/2 //center of screen (Y axis)

NJS_SCREEN scr;

scr.dist = SCR_DIST;
scr.w = SCR_WIDTH;
scr.h = SCR_HEIGHT;
scr.cx = SCR_CX;
scr.cy = SCR_CY;

njSetScreen(&scr);
```

NOTES

- Since the screen is initialized as indicated above by njInitSystem(), use of this function is optional unless required by the user.

RELATED TOPICS

njInitSystem()

njSetScreenDist

Sets the distance from the perspective to the screen.

FORMAT

```
#include <Ninja.h>
void njSetScreenDist(dist)
Float dist
```

PARAMETERS

dist

distance from the perspective to the screen

RETURN VALUE

None

FUNCTION

- Sets the distance from the perspective to the screen.

EXAMPLE

Sets the distance between the perspective and the screen to 2000.f.

```
njInitSystem( NJD_RESOLUTION_VGA, NJD_FRAMEBUFFER_MODE_RGB555, 1 );
njSetScreenDist(2000.f);
```

NOTES

RELATED TOPICS

njSetView

Specifies a user-defined view as the current view.

FORMAT

```
#include <Ninja.h>

void njSetView(*v)
NJS_VIEW *v
```

PARAMETERS

v

view structure pointer

RETURN VALUE

None

FUNCTION

- Specifies a user-defined view as the current view.
- The view matrix is prepared according to position (px, py, pz), view direction (vx, vy, vz), and view tilt (roll) included in the view structure.
- Clears the matrix stack. (njSetView() includes the function of njClearMatrix())

EXAMPLE

```
NJS_VIEW v;

njInitView(&v);
njSetView(&v);
```

NOTES

- The view must be initialized before execution of njSetView().
- For details, see the View function Readme.txt.
- In order to keep the compatibility of programs, njClearMatrix() function still exists. But if njClearMatrix() function is executed, you need to do the same process twice.

RELATED TOPICS

njInitView()

njClearMatrix()

njTranslateView

Translates the view along the X, Y, and Z axes
(Absolute Translation).

FORMAT

```
#include <Ninja.h>

void njTranslateView(*v, x, y, z)
NJS_VIEW *v
Float x
Float y
Float z
```

PARAMETERS

v

view structure pointer

x

amount of translation along the X axis (absolute amount of translation)

y

amount of translation along the Y axis (absolute amount of translation)

z

amount of translation along the Z axis (absolute amount of translation)

RETURN VALUE

None

FUNCTION

- Translates the view along the X, Y, and Z axes.

EXAMPLE

The following translates the view located at (0, 0, 0) with orientation (0, 0, -1) (screen rear) by 100 along the X axis, 200 along the Y axis, and 300 along the Z axis.

```
NJS_VIEW v;  
  
njInitView(&v);  
njSetView(&v);  
njTranslateView(&v, 100.f, 200.f, 300.f);  
njClearMatrix();
```

NOTES

- The following translates the view located at (0, 0, 0) with orientation (0, 0, -1) (screen rear) by 100 along the X axis, 200 along the Y axis, and 300 along the Z axis.
- Views (viewpoints) can be moved and rotated by manipulating the view structure in either of two ways: by specifying transformation of view structure matrix in absolute terms, or by manipulating the position (px, py, pz), view direction (vx, vy, vz), and tilt (view roll) of each member in relative terms. This function is of the absolute type.

RELATED TOPICS

`njInitView()`

`njSetView()`

`njClearMatrix()`

njTranslateViewAbsolute

Moves the view location along the X, Y, and Z axes. (Absolute Move).

FORMAT

```
#include <Ninja.h>

void njTranslateViewAbsolute(*v, x, y, z)
NJS_VIEW *v
Float x
Float y
Float z
```

PARAMETERS

v

view structure pointer

x

amount of movement along the X axis (absolute value)

y

amount of movement along the Y axis (absolute value)

z

amount of movement along the Z axis (absolute value)

RETURN VALUE

None

FUNCTION

Moves the view location along the X, Y, and Z axes by absolute amount. The current view location is taken as the origin.

EXAMPLE

This example moves the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) along the X, Y, and Z axes by 100, 200, and 300, respectively, without changing the view direction.

```
#define VIEW_APX 0.f
#define VIEW_APY 0.f
#define VIEW_APZ 3000.f
#define VIEW_AVX 0.f
#define VIEW_AVY 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

NJS_VIEW v;

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_APZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_AVZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);

njTranslateViewAbsolute(&v, 100.f, 200.f, 300.f);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, this function acts on the current view.

RELATED TOPICS

[njInitView\(\)](#)

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njTranslateViewRelative

Translates the view along the X, Y, and Z axes (Relative Translation).

FORMAT

```
#include <Ninja.h>

void njTranslateViewRelative(*v, x, y, z)
NJS_VIEW *v
Float x
Float y
Float z
```

PARAMETERS

v

view structure pointer

x

amount of translation along X axis (relative amount of translation)

y

amount of translation along Y axis (relative amount of translation)

z

amount of translation along Z axis (relative amount of translation)

RETURN VALUE

None

FUNCTION

- Translates the view relatively along the X, Y, and Z axes.
- The view's current location will be the origin of this translation.

EXAMPLE

The following translates the view located at (0, 0, 3000) and directed toward (0, 0, -1) (to rear of screen) by 100 in the X direction, 200 in the Y direction, and 300 in the Z direction.

```
#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

NJS_VIEW v;

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);

njTranslateViewRelative(&v, 100.f, 200.f, 300.f);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, the current view is moved.

RELATED TOPICS

[njInitView\(\)](#)

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njTranslateViewV

Translates the view along the X, Y, and Z axes
(Absolute Translation).

FORMAT

```
#include <Ninja.h>

void njTranslateViewV( *v, *p)
NJS_VIEW *v
NJS_POINT3 *p
```

PARAMETERS

v

view structure pointer

p

amount of translation along the X, Y, and Z axes (absolute amount of translation)

RETURN VALUE

None

FUNCTION

- Translates the view along the X, Y, and Z axes.

EXAMPLE

The following translates the view located at (0, 0, 0) with orientation (0, 0, -1) (screen rear) by 100 along the X axis, 200 along the Y axis, and 300 along the Z axis.

```
NJS_VIEW v;
NJS_POINT3 p;

p.x = 100.f;
p.y = 200.f;
p.z = 300.f;

njInitView(&v);
njSetView(&v);
njTranslateView(&v, &p);
njClearMatrix();
```

NOTES

- When parameter *v* is NULL, the current view is moved.
- Views (viewpoints) can be moved and rotated by manipulating the view structure in either of two ways: by specifying transformation of view structure matrix in absolute terms, or by manipulating the position (*px*, *py*, *pz*), view direction (*vx*, *vy*, *vz*), and tilt (view roll) of each member in relative terms. This function is of the absolute type.

RELATED TOPICS

`njInitView()`

`njSetView()`

`njClearMatrix()`

njTranslateViewVAbsolute

Moves the view location along the X, Y, and Z axes. (Absolute Move).

FORMAT

```
#include <Ninja.h>

void njTranslateViewVAbsolute(*v, *p)
NJS_VIEW *v
NJS_POINT3 *p
```

PARAMETERS

NJS_VIEW *v

view structure pointer

NJS_POINT3 *p

amount of movement along each of the X, Y, and Z axes (absolute values)

RETURN VALUE

None

FUNCTION

- Moves the view location along the X, Y, and Z axes by absolute amounts.

EXAMPLE

This example moves the view located at (0, 0, 3000) and directed toward (0, 0, -1) (into the screen) along the X, Y, and Z axes by 100, 200, and 300, respectively, without changing the view direction.

```
NJS_VIEW v;
NJS_POINT3 p;

#define VIEW_APX 0.f
#define VIEW_APY 0.f
#define VIEW_APZ 3000.f
#define VIEW_AVX 0.f
#define VIEW_AVY 0.f
#define VIEW_AVZ -1.f
#define VIEW_AROLL 0

v.apx = VIEW_APX;
v.apy = VIEW_APY;
v.apz = VIEW_PZ;
v.avx = VIEW_AVX;
v.avy = VIEW_AVY;
v.avz = VIEW_VZ;
v.aroll = NJM_DEG_ANG(VIEW_AROLL);
p.x = 100.f;
p.y = 200.f;
p.z = 300.f;

njTranslateViewVAbsolute(&v, &p);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter v is NULL, this function acts on the current view.

RELATED TOPICS

[njInitView\(\)](#)

[njSetView\(\)](#)

[njClearMatrix\(\)](#)

njTranslateViewVRelative

Translates the view along the X, Y, and Z axes (Relative Translation).

FORMAT

```
#include <Ninja.h>

void njTranslateViewVRelative(*v, *p)
NJS_VIEW *v
NJS_POINT3 *p
```

PARAMETERS

v

view structure pointer

p

amount of translation along the X, Y, and Z axes (relative amount of translation)

RETURN VALUE

None

FUNCTION

- Translates the view relatively along the X, Y, and Z axes.
- The view's current location will be the origin of this translation.

EXAMPLE

The following translates the view located at (0, 0, 3000) and directed toward (0, 0, -1) (to rear of screen) by 100 in the X direction, 200 in the Y direction, and 300 in the Z direction.

```
NJS_VIEW v;
NJS_POINT3 p;

#define VIEW_PX 0.f
#define VIEW_PY 0.f
#define VIEW_PZ 3000.f
#define VIEW_VX 0.f
#define VIEW_VY 0.f
#define VIEW_VZ -1.f
#define VIEW_ROLL 0

v.px = VIEW_PX;
v.py = VIEW_PY;
v.pz = VIEW_PZ;
v.vx = VIEW_VX;
v.vy = VIEW_VY;
v.vz = VIEW_VZ;
v.roll = NJM_DEG_ANG(VIEW_ROLL);
p.x = 100.f;
p.y = 200.f;
p.z = 300.f;

njTranslateViewRelative(&v, &p);
njSetView(&v);
njClearMatrix();
```

NOTES

- When parameter `v` is NULL, the current view is moved.

RELATED TOPICS

`njInitView()`

`njSetView()`

`njClearMatrix()`

njUnitBaseViewVector

Converts the original view vector to a unit vector.

FORMAT

```
#include <Ninja.h>

void njUnitCurrentViewVector(*v)
NJS_VIEW *v
```

PARAMETERS

v

view structure pointer

RETURN VALUE

None

FUNCTION

- Converts the original view vector specified by the user to a unit vector.

EXAMPLE

```
NJS_VIEW v;

v.apx = v.apy = v.apz = 0.f;
v.avx = v.avy = v.avz = 1.f;
njUnitBaseViewVector(&v);
```

NOTES

- When parameter *v* is NULL, this function acts on the view matrix of the current view.

```
njUnitBaseViewMatrix(NULL);
```

RELATED TOPICS

njUnitCurrentViewVector

Converts the view vector of the current view to a unit vector.

FORMAT

```
#include <Ninja.h>

void njUnitCurrentViewVector(*v)
NJS_VIEW *v
```

PARAMETERS

v

view structure pointer

RETURN VALUE

None

FUNCTION

- Converts the current view vector of the view specified by the user to a unit vector.

EXAMPLE

```
NJS_VIEW v;

v.px = v.py = v.pz = 0.f;
v.vx = v.vy = v.vz = 1.f;
njUnitCurrentViewVector(&v);
```

NOTES

- When parameter v is NULL, this function acts on the current view matrix.

```
njUnitCurrentViewVector(NULL);
```

RELATED TOPICS

njUnitViewMatrix

Sets a unit matrix to the view matrix.

FORMAT

```
#include <Ninja.h>

void njUnitViewMatrix(*v)
NJS_VIEW *v
```

PARAMETERS

v

view structure pointer

RETURN VALUE

None

FUNCTION

- Sets a unit matrix to the view matrix of the view specified by the user.

EXAMPLE

```
NJS_VIEW v;
njUnitViewMatrix(&v);
```

NOTES

- When parameter v is NULL, the unit matrix is set to the view matrix of the current view.

```
njUnitViewMatrix(NULL);
```

RELATED TOPICS

njUnitViewVector

Converts the view vector to a unit vector.

FORMAT

```
#include <Ninja.h>

void njUnitViewVector(*v)
NJS_VIEW *v
```

PARAMETERS

v

pointer to the view structure

RETURN VALUE

None

FUNCTION

- Converts both the view vector of the current user-specified view and the base view vector to unit vectors.

EXAMPLE

```
NJS_VIEW v;

v.px = v.py = v.pz = 0.f;
v.apx = v.apy = v.apz = 0.f;
v.vx = v.vy = v.vz = 1.f;
v.avx = v.avy = v.avz = 1.f;
njUnitViewVector(&v);
```

NOTES

- When parameter v is NULL, the operation is performed on the view matrix of the current view.

```
njUnitViewMatrix(NULL);
```

RELATED TOPICS



11. Texture Functions

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njCalcTexture

Calculates the remaining texture memory size.

FORMAT

```
#include <Ninja.h>
Uint32 njCalcTexture(flag);
Uint32 flag
```

PARAMETERS

NJD_TEXMEM_FREESIZE

free size in total

NJD_TEXMEM_MAXBLOCK

max free size in block

NJD_TEXMEM_MAXSIZE

max size in texture memory

RETURN VALUE

Amount of remaining texture memory

FUNCTION

- Calculates total free size or max free size in block of texture memory.

EXAMPLE

```
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};
Uint32 calc;

/* Prepare to read two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);
njSetTextureName(&texname[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1], "file2.pvr", 1, NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX);

/* Load textures */
njLoadTexture(&texlist);

/* Calculates the free size in total */
calc = njCalcTexture(NJD_TEXMEM_FREESIZE);

/* Output on screen */
njPrintD(NJM_LOCATION(10, 10), calc, 10);
```

NOTES

- `njInitTexture()` must be executed before calling this function.

RELATED TOPICS

njGetTextureNumG Obtains the global index number of the current texture.

FORMAT

```
#include <Ninja.h>
Uint32 njGetTextureNumG(void);
```

PARAMETERS

None

RETURN VALUE

Successful

Global index number in the range 0 to 0xFFFFFFFF0

Failed

0xFFFFFFFF

FUNCTION

- Obtains the global index number of the current texture.

EXAMPLE

```
Uint32 globalIndex;

/* Get the global index number for the current texture previously set */
globalIndex = njGetTextureNumG();

/* Set the global index #0 to the current texture. */
njSetTextureNumG(0);

                                                                    :
Drawing textures...                                                                    :

/* Put the current texture back */
njSetTextureNumG(globalIndex);
```

NOTES

- Current texture must be set previously by `njSetTextureNum`, `njSetTextureNumG`.

RELATED TOPICS

`njSetTextureNum` `njSetTextureNumG`

njInitTexture Sets the area used for storing texture information.

FORMAT

```
#include <Ninja.h>
void njInitTexture(*addr, n);
NJS_TEXMEMLIST *addr
Uint32 n
```

PARAMETERS

***addr**

pointer to the area holding n NJS_TEXMEMLIST structures

n

number of textures to be used

RETURN VALUE

None

FUNCTION

- Establishes the area for storing textures by setting addr with the pointer to the NJS structure area for holding the n textures to be used.
- This function must be executed before loading textures.

EXAMPLE

```
/* Set two textures */
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist={texname,2};

/* Prepare to read two textures*/
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist,2);
/* Load the textures */
njSetTextureName(&texname[0],"file1.pvr",0,NJD_TEXATTR_TYPE_FILE|
NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1],"file2.pvr",1,NJD_TEXATTR_TYPE_FILE|
NJD_TEXATTR_GLOBALINDEX);

njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);
/* Set current texture to the texlist #0 */
njSetTextureNum(0);
```

NOTES

- The area set by this function is used internally by texture-related functions.
- For details, see the texture document.

RELATED TOPICS

[njLoadTexture](#)

[njLoadTextureNum](#)

[njLoadTextureNumG](#)

njLoadCacheTexture

Sets the cache information area.

FORMAT

```
#include <Ninja.h>
Sint32      njLoadCacheTexture(*texlist);
NJS_TEXLIST *texlist
```

PARAMETERS

***texlist**

pointer to the NJS_TEXLIST structure

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Load textures set to the texlist structure from cache memory to texture memory.

EXAMPLE

```
NJS_TEXNAME texname[2];
NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read two textures in */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

/* Specify to read file into cache */
njSetTextureName(&texname[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);
/* Specify to read file into cache */
njSetTextureName(&texname[1], "file2.pvr", 1, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);

/* Load texture into cache */
njLoadTexture(&texlist);

/* Set texlist as the current texture */
njSetTexture(&texlist);

/* Read texture from cache into texture memory*/
njLoadCacheTexture(&texlist);

/* Set current texture as texlist #0 file1.pvr*/
njSetTextureNum(0);

Drawing textures                                     :
```

NOTES

- The current texture list must be set by njSetTexture.
- The specified texture must be loaded into cache memory.
- See also Texture guide for more reference.

RELATED TOPICS

[njLoadCacheTextureNumG](#)

njLoadCacheTextureNum

Loads a texture by texture number.

FORMAT

```
#include <Ninja.h>
Sint32 njLoadCacheTextureNum(n);
Uint32 n
```

PARAMETERS

n

texture number in current texture list

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Loads a texture by texture number

EXAMPLE

```
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX )
njSetTextureName(&texname[1], "file2.pvr", 1, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);

/* Load texture and read into cache */
njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);

/* Read textures from cache into texture memory*/
njLoadCacheTextureNum(0);
njLoadCacheTextureNum(1);

/* Set current texture as texture #0 in texlist file1.pvr*/
njSetTextureNum(0);

:
Drawing texture with texture in file1.pvr
:

/* Release texture #0 in cache */
njReleaseCacheTextureNum(0);
```

NOTES

- Current texture list must be specified by `njSetTexture`.
- The specified texture must be loaded into cache memory.
- Even if texture in cache memory is released, the one in texture memory will not be released. Refer to Texture Guide for more details.

RELATED TOPICS

`njLoadCacheTexture` `njLoadCacheTextureNumG`

njLoadCacheTextureNumG

Loads texture number `globalIndex` from cache memory into texture memory.

FORMAT

```
#include <Ninja.h>

Sint32 njLoadCacheTextureNumG( globalIndex );

Uint32 globalIndex
```

PARAMETERS

globalIndex

Global index number

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Loads texture number `globalIndex` from from cache memory into texture memory.

EXAMPLE

```
NJS_TEXNAME texname[2];
NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 100, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1], "file2.pvr", 200, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);

/* Load texture and read into cache */
njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);

/* Read textures from cache into texture memory*/
njLoadCacheTextureNumG(100); /* file1.pvr */
njLoadCacheTextureNumG(200); /* file2.pvr */

/* Set current texture as texture #0 in texlist file1.pvr*/

njSetTextureNumG(100);

Drawing texture with texture in file1.pvr
```

NOTES

- The specified texture must be loaded into cache memory.
- Even if texture in cache memory is released, the one in texture memory will not be released. Refer to Texture Guide for more details.

RELATED TOPICS

[njLoadCacheTexture](#)

[njLoadCacheTextureNum](#)

njLoadTexture

Loads a texture.

FORMAT

```
#include <Ninja.h>
 Sint32 njLoadTexture(*texlist);
 NJS_TEXLIST *texlist
```

PARAMETERS

***texlist**

pointer to the NJS_TEXLIST structure

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Loads the texture set into the texlist structure into texture memory or cache memory.

Notes on texture creation

1. Set texture name structure for textures.

NJS_TEXNAME

```
void          *filename
 Uint16       attr
 Uint32       texaddr
```

***filename**

Filename when it is a PVR format texture file.

The NJS_TEXINFO structure pointer when loaded from memory.

globalIndex

The texture global number defined within the application.

It will be treated as the same texture if the global index number is the same, even if the texture list is different.

Valid value: 0 thru 0xFFFFFFFF. 0xFFFFFFFF is prohibited to use.

attr

Specifies the origin and the destination of loading textures, and performs OR for each tag.

[the origin of load]

NJD_TEXATTR_TYPE_FILE

Loads the PVR format files. Specifies filename with *filename.

NJD_TEXATTR_TYPE_MEMORY

Loads from memory. Sets NJS_TEXINFO structure pointer with *filename.

Refer to following for setting NJS_TEXINFO.

[the destination](loads into texture memory if not specified)

NJD_TEXATTR_CACHE

Loads into cache memory only.

NJD_TEXATTR_BOTH

Loads into both texture memory and cache memory.

[global index specification]

NJD_TEXATTR_GLOBALINDEX

This is used if global index within the file is not used.

texaddr

Specifies global index at initialization if NJD_TEXATTR_GLOBALINDEX is specified with attr.

After loading textures, it holds the address of NJS_TEXMEMLIST.

2.If textures are loaded from memory, it is necessary to set NJS_TEXINFO structure.

NJS_TEXINFO structure

```
void*          texaddr;  
NJS_TEXSURFACE texsurface;
```

texaddr

Stores address when cache texture is specified.

texsurface

Sets data after loading textures.

NJS_TEXLIST structure

```
NJS_TEXNAME    *textures;
Uint32         nbTexture;
```

textures

Sets the pointer for NJS_TEXNAME structure that has texture information

nbTexture

number of textures

EXAMPLE

```
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

/* Set the two textures */
njSetTextureName(&texname[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1], "file2.pvr", 1, NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX);

/* load texture */
njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);

/* Set current texture to texlist #0 */
njSetTextureNum(0);
```

NOTES

- njInitTexture must be executed prior to executing this function.
- Refer to Texture Guide for more details.

RELATED TOPICS

[njInitTexture](#)

[njLoadTextureNum](#)

njLoadTextureNum

Loads textures.

FORMAT

```
#include <Ninja.h>
 Sint32 njLoadTextureNum(n);
 Uint32 n
```

PARAMETERS

n

texture number in the current texture list

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Load the number n texture in the current texture list into either texture memory or cache memory.

EXAMPLE

```
/* Set two textures */
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read textures for two */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

/* Set the two textures */
njSetTextureName(&texname[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
                                                         NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1], "file2.pvr", 1, NJD_TEXATTR_TYPE_FILE |
                                                         NJD_TEXATTR_GLOBALINDEX);

/* Set texlist as the current texture list */
/* It must be done first */
njSetTexture(&texlist);

/* Load texture #0 file1.pvr */
njLoadTextureNum(0);

/* Load texture #1 file2.pvr */
njLoadTextureNum(1);

/* Set current texture as texture #0 in the texlist */
njSetTextureNum(0);
```

NOTES

- njInitTexture and njSetTexture must be executed prior to executing this function. Refer to Texture Guide for more details.

RELATED TOPICS

[njInitTexture](#) [njLoadTexture](#)

njReleaseCacheTextureNum

Release cache memory.

FORMAT

```
#include <Ninja.h>
 Sint32 njReleaseCacheTextureNum(n);
 Uint32 n
```

PARAMETERS

n

Texture number in the current texture list

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Release the cache memory for texture n

EXAMPLE

```

NJS_TEXNAME texname[2];
NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1], "file2.pvr", 1, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);
/* Load texture and read into cache */
njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);

/* Read texture from cache into texture memory*/
njLoadCacheTextureNum(0);
njLoadCacheTextureNum(1);

/* Set current texture to texlist #0 file1.pvr*/
njSetTextureNum(0);

Drawing texture with texture in file1.pvr

/* Release texture #0 in cache */
njReleaseCacheTextureNum(0);

```

NOTES

- Current texture list must be specified by `njSetTexture`.
- The specified texture must be loaded into cache memory.
- Even if texture in cache memory is released, the one in texture memory will not be released. Refer to Texture Guide for more details.

RELATED TOPICS

`njReleaseCacheTextureAll`

`njReleaseCacheTextureNumG`

njReleaseCacheTextureAll

Release all cache memory.

FORMAT

```
#include <Ninja.h>
void njReleaseCacheTextureAll(void);
```

PARAMETERS

None

RETURN VALUE

None

FUNCTION

- Release all cache memory

EXAMPLE

```

NJS_TEXNAME texname[2];
NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1], "file2.pvr", 1, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);
/* Load texture and read into cache */
njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);

/* Read texture from cache into texture memory*/
njLoadCacheTextureNum(0);
njLoadCacheTextureNum(1);

/* Set current texture to texlist #0 file1.pvr*/
njSetTextureNum(0);

Drawing texture with texture in file1.pvr

/* Release all textures in cache */
njReleaseCacheTextureAll();

```

NOTES

Even if texture in cache memory is released, the one in texture memory will not be released. Refer to Texture Guide for more details.

RELATED TOPICS

njReleaseCacheTextureNumG

Releases cache memory.

FORMAT

```
#include <Ninja.h>
Sint32 njReleaseCacheTextureNumG(globalIndex);
Uint32 globalIndex
```

PARAMETERS

globalIndex

global index number

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Releases cache memory for globalIndex

EXAMPLE

```

NJS_TEXNAME texname[2];
NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 100, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1], "file2.pvr", 200, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_TYPE_CACHE | NJD_TEXATTR_GLOBALINDEX);

/* Load texture and read into cache */
njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);

/* Read textures from cache into texture memory*/
njLoadCacheTextureNum(0);
njLoadCacheTextureNum(1);

/* Set current texture as texture #0 in texlist file1.pvr*/
njSetTextureNum(0);

:
Drawing texture with texture in file1.pvr
:

/* Release the global index #100 texture stored in cache */
njReleaseCacheTextureNumG(100);

```

NOTES

- The specified texture must be loaded into cache memory.
- Even if texture in cache memory is released, the one in texture memory will not be released. Refer to Texture Guide for more details.

RELATED TOPICS

njReleaseTexture

Releases texture memory.

FORMAT

```
#include <Ninja.h>
Sint32 njReleaseTexture(*texlist);
NJS_TEXLIST *texlist
```

PARAMETERS

***texlist**

NJS_TEXLIST structure pointer

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Releases texture memory of texlist.

EXAMPLE

```
NJS_TEXNAME texname[2];

NJS_TEXNAME texname2[2];

NJS_TEXLIST texlist = {texname, 2};
NJS_TEXLIST texlist2 = {texname2, 2};

/* Prepare to read four textures */
NJS_TEXMEMLIST texmemlist[4];

njInitTexture(texmemlist, 4);

njSetTextureName(&texname[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname[1], "file2.pvr", 1, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname2[0], "file1.pvr", 0, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX);
njSetTextureName(&texname2[1], "file3.pvr", 2, NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX);

/* load texture */
njLoadTexture(&texlist);
njLoadTexture(&texlist2);

/* Release the texture in texlist */
njReleaseTexture(&texlist);

/*
also,
loaded
*/
Even if texlist is released, since file1.pvr is in texlist2
file.pvr will not be released from texture memory.
** However file1.pvr cannot be read with texlist unless it is
again.
```

NOTES

- As noted above, if the texture is loaded in another texture list, the texture will not be released from texture memory unless all other occupying lists release the texture.
- Refer to Texture Guide for more details.

RELATED TOPICS

njReleaseTextureNum

Releases texture memory.

FORMAT

```
#include <Ninja.h>
Sint32 njReleaseTextureNum(n);
Uint32 n
```

PARAMETERS

n

number of texture

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Releases n texture in the current texture list from texture memory.

EXAMPLE

```
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 100,
                 NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname[1], "file2.pvr", 200,
                 NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX );

/* load texture */
njLoadTexture(&texlist);

/* set current texture list*/
njSetTexture(&texlist);

/* Release texture #0 in texlist  file.pvr*/
njReleaseTextureNum(0);
```

NOTES

- If the texture is registered in another texture list, the texture will not be released from texture memory unless all other occupying lists release the texture.
- Refer to Texture Guide for more details.

RELATED TOPICS

[njReleaseTextureAll](#)
[njReleaseTexture](#)
[njReleaseTextureNumG](#)

njReleaseTextureNumG

Releases texture memory.

FORMAT

```
#include <Ninja.h>
Sint32 njReleaseTextureNumG(globalIndex);
Uint32 globalIndex
```

PARAMETERS

globalIndex

Global index number

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Releases texture specified by globalIndex in the current texture list from texture memory.

EXAMPLE

```
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 100,
                 NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname[1], "file2.pvr", 200,
                 NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX );

/* load texture */
njLoadTexture(&texlist);

/* set current texture list*/
njSetTexture(&texlist);

/* Release the global index number 100 texture
 * in the texlist file1.pvr
 */
njReleaseTextureNumG(100);
```

NOTES

- If the texture is registered in another texture list, the texture will not be released from texture memory unless all other occupying lists release the texture.
- Refer to Texture Guide for more details.

RELATED TOPICS

[njReleaseTextureAll](#)

[njReleaseTexture](#)

[njReleaseTextureNum](#)

njReleaseTextureAll

Release all texture memory.

FORMAT

```
#include <Ninja.h>
void njReleaseTextureAll(void);
```

PARAMETERS

None

RETURN VALUE

None

FUNCTION

- Release all texture memory.

EXAMPLE

```

NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read in two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 0,
                NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname[1], "file2.pvr", 1,
                NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX );

/* Load texture */
njLoadTexture(&texlist);

/* Set the current texture list */
njSetTexture(&texlist);

/* set current texture to texture #0 in texlist file1.pvr */
njSetTextureNum(0);

:
Drawing textures
:

/* release all textures */
njReleaseTextureAll();

```

NOTES

- It must be loaded again if the texture is needed.
- See also Texture Guide for more details.

RELATED TOPICS

[njReleaseTexture](#)
[njReleaseTextureNum](#)
[njReleaseTextureNumG](#)

njSetTexture

Set current texture list.

FORMAT

```
#include <Ninja.h>
 Sint32 njSetTexture(*texlist);
 NJS_TEXLIST *texlist
```

PARAMETERS

***texlist**

NJS_TEXLIST structure pointer

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Set texlist as the curent texture list

EXAMPLE

```
NJS_TEXNAME texname[2];
NJS_TEXNAME texname2[2];

NJS_TEXLIST texlist = {texname, 2};
NJS_TEXLIST texlist = {texname2, 2};

/* Prepare to read three textures */
NJS_TEXMEMLIST texmemlist[3];

njInitTexture(texmemlist, 3);

njSetTextureName(&texname[0], "file1.pvr", 0,
                 NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname[1], "file2.pvr", 1,
```

```

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname2[0], "file1.pvr", 0,

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname2[1], "file3.pvr", 1,

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX );

/* Load texture */
njLoadTexture(&texlist);

/* Load texture */
njLoadTexture(&texlist2);

/* Set current texture list to texlist */
/* no problem if it's done prior to executing njLoadTexture */
njSetTexture(&texlist);

/* Set current texture as #0 texture in texlist file1.pvr*/
njSetTextureNum(0);

:
Drawing textures using file1.pvr
:

/* Set texlist2 as the current texture list */
njSetTexture(&texlist2);

/* Set current texture to texlist2 #1 texture file3.pvr */
njSetTextureNum(1);

:
Drawing textures using file3.pvr
:

```

NOTES

- Current texture list won't be changed until next time `njSetTexture` is executed.
- All texture related functions such as `njXXXXNum` and `njXXXXNumG` will work with current texture list.
- Refer to Texture guide for more information.

RELATED TOPICS

`njSetTextureNum`

`njSetTextureNumG`

njSetTextureInfo

Set data into texture name structure.

FORMAT

```
#include <Ninja.h>
njSetTextureInfo(*info, *tex, Type, nWidth, nHeight)
NJS_TEXINFO *info
Uint16      *tex
Sint32      Type
Sint32      nWidth
Sint32      nHeight
```

PARAMETERS

***info**

texture information (output)

***tex**

memory texture pointer

Type

texture type

nWidth

texture width size

nHeight

texture height size

RETURN VALUE

None

FUNCTION

- Sets texture data into texture information structure.
- For Type, color format and category code are set. Set all the information into addr of njSetTextureName.

Color format

NJD_TEXFMT_ARGB_1555	
NJD_TEXFMT_RGB_565	
NJD_TEXFMT_ARGB_4444	
NJD_TEXFMT_YUV_422	currently not used
NJD_TEXFMT_BUMP	currently not used

Category code

NJD_TEXFMT_TWIDDLED	
NJD_TEXFMT_TWIDDLED_MM	
NJD_TEXFMT_VQ	currently not used
NJD_TEXFMT_VQ_MM	currently not used
NJD_TEXFMT_PALETTIZE4	currently not used
NJD_TEXFMT_PALETTIZE4_MM	currently not used
NJD_TEXFMT_PALETTIZE8	currently not used
NJD_TEXFMT_PALETTIZE8_MM	currently not used
NJD_TEXFMT_RECTANGLE	
NJD_TEXFMT_STRIDE	

EXAMPLE

```
NJS_TEXINFO Info;
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureInfo(&Info, Image,
                 NJD_TEXFMT_RECTANGLE |
                 NJD_TEXFMT_ARGB_1555
                 , 256, 256);

njSetTextureName(&texname[0], "file0.pvr", 0,
                 NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname[1], &Info, 1,
                 NJD_TEXATTR_TYPE_MEMORY |
                 NJD_TEXATTR_GLOBALINDEX );

/* Load texture */
njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);

/* Set the texlist #1 texture as the current texture Image */
njSetTextureNum(1);

:
Drawing textures using memorytexture Image.
:
```

NOTES

- See Texture Guide for more information

RELATED TOPICS

[njSetTextureName](#)

njSetTextureName

Set data into texture name structure.

FORMAT

```
#include <Ninja.h>
void njSetTextureName(*texname, *addr, globalIndex, attr)
NJS_TEXNAME *texname
void *addr
Uint32 globalIndex
Uint32 attr
```

PARAMETERS

***texname**

NJS_TEXNAME structure pointer

***addr**

file name or NJS_TEXINFO structure pointer

globalIndex

global index

attr

texture attribute

RETURN VALUE

None

FUNCTION

Set filename to addr when loading textures from a file. NJD_TEXATTR_TYPE_FILE should be specified to attr.

With PVR format textures, if global index is not used for the textures, set NJD_TEXATTR_GLOBALINDEX to attr and global index to globalIndex.

For memory texture, set NJS_TEXINFO structure pointer that is set by njSetTextureInfo to addr.

Also, set NJD_TEXATTR_TYPE_MEMORY to attr, and global index to globalIndex.

EXAMPLE

```
NJS_TEXNAME texname[2];

NJS_TEXLIST texlist = {texname, 2};

/* Prepare to read two textures */
NJS_TEXMEMLIST texmemlist[2];

njInitTexture(texmemlist, 2);

njSetTextureName(&texname[0], "file1.pvr", 0,
                NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname[1], "file2.pvr", 1,
                NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX );

/* Load texture */
njLoadTexture(&texlist);

/* Set texlist as the current texture list */
njSetTexture(&texlist);

/* Set texture 0 from texlist as current texture file1.pvr */
njSetTextureNum(0);

                :
/* Omitted texture drawing Drawing with texture file1.pvr */
                :
```

NOTES

- The global index set here is once stored to texaddr in NJS_TEXNAME structure and passed to NJS_MEMLIST structure globalIndex when loading textures.
- At that time texaddr is overwritten.
- So you'll need to set it again if you load textures, release them and reload them.
- Refer to Texture Guide for more information.

RELATED TOPICS

[njSetTextureInfo](#)

njSetTextureNum Sets a texture number as the current texture.

FORMAT

```
#include <Ninja.h>
 Sint32 njSetTextureNum(n);
 Uint32 n
```

PARAMETERS

n
texture number

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

Sets texture number *n* from the current texture list as the current texture.

Subsequently, this remains the current texture until execution of `njSetTextureNum` or `njSetTextureNumG`.

About the texture number of the current texture

As shown in the example below, when textures are created, texture numbers are sequentially allocated in the series 0, 1, 2, 3,... from the beginning of a `NJS_TEXNAME` structure which is set in the `NJS_TEXLIST` structure.

```
NJS_TEXNAME texname[5];
NJS_TEXLIST texlist={texname,5};

/* Texture number 0 */
njSetTextureName(&texname[0], "file1.pvr", 10,
                                                         NJD_TEXATTR_TYPE_FILE |
                                                         NJD_TEXATTR_GLOBALINDEX);

/* Texture number 1 */
njSetTextureName(&texname[1], "file2.pvr", 11,
```

```
/* Texture number 2 */
njSetTextureName(&texname[2], "file1.pvr", 12,

/* Texture number 3 */
njSetTextureName(&texname[3], "file2.pvr", 13,

/* Texture number 4 */
njSetTextureName(&texname[4], "file1.pvr", 14,
```

```
NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX);

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX);

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX);

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX);
```

EXAMPLE

```
NJS_TEXNAME texname[2];
NJS_TEXNAME texname2[2];

NJS_TEXLIST texlist = {texname, 2};
NJS_TEXLIST texlist = {texname2, 2};

/* Prepare to load a total of 4 textures */
NJS_TEXMEMLIST texmemlist[4];

njInitTexture(texmemlist, 4);

/* Load texture */
njLoadTexture(&texlist);

njSetTextureName(&texname[0], "file1.pvr", 0,

njSetTextureName(&texname[1], "file2.pvr", 1,

njSetTextureName(&texname2[0], "file3.pvr", 2,

njSetTextureName(&texname2[1], "file4.pvr", 3,
```

```
NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX );

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX );

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX );

NJD_TEXATTR_TYPE_FILE |
NJD_TEXATTR_GLOBALINDEX );
```

```
/* Load texture */
njLoadTexture(&texlist2);

/* Set current texture list as texlist */
njSetTexture(&texlist);

/* Set texture 0 from texlist as current texture file1.pvr */
njSetTextureNum(0);

                                     :
/* Omitted texture drawing Drawing with texture file1.pvr */
                                     :

/* Set texlist2 as current texture list */
njSetTexture(&texlist2);

/* Set texture 1 from texlist2 as current texture file4.pvr */
njSetTextureNum(1);

                                     :
/* Omitted texture drawing Drawing with texture file1.pvr */
                                     :
```

NOTES

- The specified texture must be present in texture memory.
- For details, see the texture document.

RELATED TOPICS

[njSetTexture](#)

[njSetTextureNumG](#)

njSetTextureNumG

Sets the current texture to a global index number.

FORMAT

```
#include <Ninja.h>
 Sint32 njSetTextureNumG(globalIndex);
 Uint32 globalIndex
```

PARAMETERS

globalIndex

global index number

RETURN VALUE

Successful

1

Failed

-1

FUNCTION

- Sets the texture identified by global index number `globalIndex` as the current texture. Subsequently, this remains the current texture until execution of `njSetTextureNum` or `njSetTextureNumG`.

EXAMPLE

```
NJS_TEXNAME texname[2];
NJS_TEXNAME texname2[2];

NJS_TEXLIST texlist = {texname, 2};
NJS_TEXLIST texlist = {texname2, 2};

/* Prepare to read in textures for four */
NJS_TEXMEMLIST texmemlist[4];

njInitTexture(texmemlist, 4);

njSetTextureName(&texname[0],
                 "file1.pvr", 100,
                 NJD_TEXATTR_TYPE_FILE |
                 NJD_TEXATTR_GLOBALINDEX );
```

```

njSetTextureName(&texname[1],
                "file2.pvr",200,
                NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname2[0],
                "file3.pvr",300,
                NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX );

njSetTextureName(&texname2[1],
                "file4.pvr",400,
                NJD_TEXATTR_TYPE_FILE |
                NJD_TEXATTR_GLOBALINDEX );

/* Load texture */
njLoadTexture(&texlist);

/* Load texture */
njLoadTexture(&texlist2);

/* Set global index #100 texture
 * as the current texture file1.pvr
 */
njSetTextureNumG(100);

:

Drawing textures (using file1.pvr textures.)

:

/* Set the 3rd texture in global index
 * as the current texture file4.pvr
 */
njSetTextureNumG(400);

:

Drawing textures (using file4.pvr textures.)

:

```

NOTES

- Specified texture must be located in texture memory.
- Refer to Texture Guide for more details.

RELATED TOPICS

[njSetTexture](#)

[njSetTextureNum](#)

njReloadTextureNum

Reloads Textures.

FORMAT

```
#include <Ninja.h>
Sint32 njReloadTextureNum(n, *texaddr, attr, lod);
Uint32 n
void *texaddr
Uint32 attr
Uint32 lod
```

PARAMETERS

n

texture number of the current texture list

***texaddr**

address for either a filename or a texture memory

attr

texture attribute

lod

mipmap level

RETURN VALUE

Success

1

Failure

-1

ERROR VALUE

None

FUNCTION

- Reloads texture to the texture number *n* of the current texture list.
- Textures that can be reloaded must be the same format and size as previously loaded.
- The reloading texture overwrites the previous texture.
- When loading textures from a file, specify `NJD_TEXATTR_TYPE_FILE` for `attr`. When loading textures from a memory, specify `NJD_TEXATTR_TYPE_MEMORY` for `attr`.
- Also, for mipmap textures, specifying `lod` allows reloading corresponding mipmap level. For example, setting 128 to `lod` will reload only 128x128 level mipmap textures.
- Specifying 0 to `lod` will reload all levels of mipmap textures.
- When loading from memory, it reloads from the address specified by `texaddr` to the level specified by `lod`.

EXAMPLE

Suppose

- 256x256 mipmap is loaded as texture #0 in the current texture list,
- 128x128 mipmap is loaded as texture #1 in the current texture list,
- 256x128 rectangle texture is loaded as texture #2 in the current texture list.

```

/*
                                Change texture #0 texture, mipmap level 128x128 to file1.pvr.
                                (Here, file1.pvr is 256x256 mipmap texture.)
*/
njReloadTextureNum(0, "file1.pvr", NJD_TEXATTR_TYPE_FILE, 128);

/*
                                Reloads all the textures of texture #1.
                                (Here, file2.pvr is 128x128 mipmap texture.)
*/
njReloadTextureNum(1, "file2.pvr", NJD_TEXATTR_TYPE_FILE, 0);

/*
                                Reloads all the textures of texture #2.
                                (Here file3.pvr is 256x128 rectangle texture.)
*/
njReloadTextureNum(2, "file3.pvr", NJD_TEXATTR_TYPE_FILE, 0);

```

NOTES

- For memory textures, it specifies the beginning of texture specified by `lod`.
- Please refer to texture documentation for more details.

RELATED TOPICS

`njLoadTextureNum`

`njLoadTextureNumG`

`njReloadTextureNumG`

njReloadTextureNumG

Reloads Textures.

FORMAT

```
#include <Ninja.h>
Sint32 njReloadTextureNumG(globalIndex, *texaddr, attr, lod);
Uint32 globalIndex
void *texaddr
Uint32 attr
Uint32 lod
```

PARAMETERS

globalIndex

global index number

***texaddr**

address of either a file name or a texture memory

attr

texture attribute

lod

mipmap level

RETURN VALUE

Successful

1

Failed

-1

ERROR VALUE

None

FUNCTION

- Reloads the texture specified by globalIndex.

EXAMPLE

NOTES

RELATED TOPICS

`njLoadTextureNum`

`njLoadTextureNumG`

`njReloadTextureNum`

njRenderTextureNum

Renders Texture Area.

FORMAT

```
#include <Ninja.h>
void njRenderTextureNum(n);
Uint32 n
```

PARAMETERS

n

texture number in the current texture list

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Renders to the number n texture of the current texture list.
- Textures that can render are either NJD_TEXFMT_RECTANGLE or NJD_TEXFMT_STRIDE.
- If texture area is smaller than the screen, it adjusts the upper left and performs rendering.
- Stride value must be set by njSetRenderWidth if NJD_TEXFMT_STRIDE
- Normally, the stride value is the same as rendering area width.

EXAMPLE

```
void njUserInit(void)
{
    color mode
    /* When render texture is used, set njInitSystem frame buffer
    with the texture color mode used for render texture.
    */
    njInitSystem( NJD_RESOLUTION_VGA,
    NJD_FRAMEBUFFER_MODE_RGB565, 1 );
    :
    /* Reserve texture memory area with dummy */
    buff = njMalloc(512*512*2);
```

```
512x512 */
                                /* Set color the same as the frame buffer color, and size to
njSetTextureInfo(&info,buff,NJD_TEXFMT_RECTANGLE|NJD_TEXFMT_RGB_565,512,512);
                                njSetTextureName(&texname[0],&info,0,NJD_TEXATTR_TYPE_MEMORY|
                                NJD_TEXATTR_GLOBALINDEX);

                                njInitTexture( tex, 100 );
                                njLoadTexture(&texlist);

function */                                /* Reserved dummy area can be released after the njLoadTexture
                                njFree(buff);
}

Sint32 njUserMain(void)
{
                                :

                                /* Draw models etc. */
                                njDrawObject( OBJECT );

                                :

                                njSetTexture(&texlist);
                                /* Renders to the texture number 0. */
                                njRenderTextureNum(0);

                                /* Draw using rendered textures. */
                                njDrawTexture( poly, 4, 0,TRUE);

                                :
}
}
```

NOTES

- Rendering to the texture area results in an additional rendering to the frame buffer.
- Refer to texture document for more details.

RELATED TOPICS

[njRenderTextureNumG](#)

njRenderTextureNumG

Renders at the Texture Area.

FORMAT

```
#include <Ninja.h>
void njRenderTextureNumG(globalIndex);
Uint32 globalIndex
```

PARAMETERS

globalIndex

global index number

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Renders at the texture specified by globalIndex.

EXAMPLE

NOTES

RELATED TOPICS

njRenderTextureNum

njSetRenderWidth

Sets Stride Value.

FORMAT

```
#include <Ninja.h>
void njSetRenderWidth(nWidth);
Uint32 nWidth
```

PARAMETERS

nWidth

stride value

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Sets stride value when the stride texture format is used.
- When stride texture is specified for rendering texture, it sets texture width size if it is smaller than rendering area . And, it sets the rendering area width size if it is smaller than the texture size. Values set are multiples of 32 (up to 992).

EXAMPLE

NOTES

RELATED TOPICS

[njRenderTextureNum](#)

[njRenderTextureNumG](#)



12. Sprite Functions

Contents

njDrawSprite2D.....	Draws 2D sprite.	NLS-374
njDrawSprite3D.....	Draws 3D sprite.	NLS-378

njDrawSprite2D

Draws 2D sprite.

FORMAT

```
#include <Ninja.h>
void njDrawSprite2D( *sp, n, pri, attr )
NJS_SPRITE *sp
Int n
Float pri
Uint32 attr
```

PARAMETERS

***sp**

Pointer for Sprite structure

n

Sprite number

pri

Priority

attr

Attribute

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Draws 2D sprite.
- Sprite can draw textures and its animations simply.
- Priority sets the Z value.
- Back is minus direction and its range is -1.0 thru -65535.0.
- The followings can be set as attribute:

NJD_SPRITE_ANGLE	Validate texture rotation.
NJD_SPRITE_COLOR	The value set to <code>njSetConstantMaterial()</code> is used as color data.
NJD_SPRITE_HFLIP	Reverse texture horizontally (L<->R).
NJD_SPRITE_VFLIP	Reverse texture vertically (Up<->Down).
NJD_SPRITE_HVFLIP	Reverse texture horizontally and vertically.
NJD_SPRITE_ALPHA	Set if translucent is used.

Sprite structure

```
typedef struct {
    NJS_POINT3  p;          /* point          */
    NJS_VECTOR  v;          /* normal         */
    Float       sx,sy;     /* scale         */
    Angle       ang;       /* angle         */
    NJS_TEXLIST *tlist;    /* texture list  */
    NJS_TEXANIM *tanim;    /* animation list */
} NJS_SPRITE;
```

p

sets drawing point.

`p.x` and `p.y` : set screen coordinate (upper left origin).

v

*is not valid in the current version.

sx,sy

specify the magnifying rate in H and V.

ang

sets the rotate angle.

It is valid only when `NJD_SPRITE_ANGLE` is set.

tlist

sets texture list of all textures used for Sprite.

The texture list must be loaded by njLoadTexture() beforehand.

tanim

sets texture animation patterns.

The order of this structure accommodates texture numbers.

Texture animation structure

```
typedef struct {  
    Sint16    sx, sy;           /* size      */  
    Sint16    cx, cy;           /* center    */  
    Sint16    u1, v1;           /* tex1      */  
    Sint16    u2, v2;           /* tex2      */  
    Sint16    texid;            /* texture id */  
    Sint16    attr;             /* attribute  */  
} NJS_TEXANIM;
```

sy, sy

specify sprite size (irrelevant to texture size)

cx, cy

set the center coordinate for the texture.

specify by relative point from upper left.

This point corresponds to drawing point and the center of rotation.

u1, v1

set texture upper-left UV coordinate.

0 - 255 must be specified irrelevant with texture size.

u2, v2

set texture bottom-right UV coordinate.

0 - 255 must be specified irrelevant with texture size.

texid

specify which texture within the list is used.

attr

*invalid at the current version.

EXAMPLE

- Use two 256x256 textures.
- Divide each texture into four patterns and make 8 texture animation patterns.

```

NJS_TEXANIM anim[] = {
    { 128,128, 64, 64, 0, 0,127,127, 0, 0 },
    { 128,128, 64, 64,128, 0,255,127, 0, 0 },
    { 128,128, 64, 64, 0,128,127,255, 0, 0 },
    { 128,128, 64, 64,128,128,255,255, 0, 0 },
    { 128,128, 64, 64, 0, 0,127,127, 1, 0 },
    { 128,128, 64, 64,128, 0,255,127, 1, 0 },
    { 128,128, 64, 64, 0,128,127,255, 1, 0 },
    { 128,128, 64, 64,128,128,255,255, 1, 0 },
};

main() {
    NJS_SPRITE sprite;

    Initial settings
    :
    :

    sprite.tlist = &texlist;
    sprite.tanim = anim;
    sprite.ang = 0x4000;
    sprite.sx = 1.0f;
    sprite.sy = 1.0f;
    sprite.p.x = 320.0f;
    sprite.p.y = 240.0f;

    njLoadTexture( &texlist );
    njDrawSprite2D( &sprite, 2, -150.f, NJD_SPRITE_ANGLE );

    .....
}

```

NOTES**RELATED TOPICS**

```

njDrawSprite3D()
njSetConstantMaterial()
njLoadTexture()

```

njDrawSprite3D

Draws 3D sprite.

FORMAT

```
#include <Ninja.h>
void njDrawSprite3D( *sp, n, attr )
NJS_SPRITE *sp
Int n
Uint32 attr
```

PARAMETERS

***sp**

Pointer for sprite structure

n

Sprite number

attr

Attribute

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Draws 3D sprite.
- It can draw texture and its animation.
- Draws 3D sprite across the XY plane.
It is almost the same as 2D drawing except it draws in 3D.
- Attribute valid only for 3D:

NJD_SPRITE_SCALE	Magnification/Reduction only. Always front to the screen.
-------------------------	--

EXAMPLE

- Use two 256x256 textures and divide each into 4 patterns, making 8 texture animation patterns.

```

NJS_TEXANIM anim[] = {
    { 128,128, 64, 64, 0, 0,127,127, 0, 0 },
    { 128,128, 64, 64,128, 0,255,127, 0, 0 },
    { 128,128, 64, 64, 0,128,127,255, 0, 0 },
    { 128,128, 64, 64,128,128,255,255, 0, 0 },
    { 128,128, 64, 64, 0, 0,127,127, 1, 0 },
    { 128,128, 64, 64,128, 0,255,127, 1, 0 },
    { 128,128, 64, 64, 0,128,127,255, 1, 0 },
    { 128,128, 64, 64,128,128,255,255, 1, 0 },
};

main() {
    NJS_SPRITE sprite;

    Initial settings
    :
    :

    sprite.tlist = &texlist;
    sprite.tanim = anim;
    sprite.ang = 0;
    sprite.sx = 1.0f;
    sprite.sy = 1.0f;
    sprite.p.x = 0.0f;
    sprite.p.y = 0.0f;
    sprite.p.z = 0.0f;

    njInitSystem( NJD_RESOLUTION_640x480, 1 );
    njInitMatrix( matrix, 128 );
    njInit3D( vbuf, 1024, abuf, fbuf, 32 );
    njInitView( &view );
    njCreateLight( &light, NJD_DIR_LIGHT );
    njSetView( &view );
    njInitTexture( tex, 100 );

    njLoadTexture( &texlist );

    while(1) {
        njClearMatrix();

        njTranslate( NULL, 0.f, 0.f, -400.f );
        njDrawSprite3D( &sprite, 2,
            NJD_SPRITE_ANGLE );

        sprite.angle += 100;

        .....
    }
}

```




13. *Debugging Functions*

Contents

njPrintB	Displays a value in binary notation.	NLS-382
njPrintC.....	Displays a character string.	NLS-384
njPrintColor.....	Specifies the character color.	NLS-385
njPrintD.....	Displays a value in decimal notation.	NLS-386
njPrintF	Displays a floating point decimal value.	NLS-388
njPrintH	Displays a value in decimal notation.	NLS-390
njFrameBufferBmp.....	Converts Frame Buffer To Bit Map Image.	NLS-392
njPrintSize	Specifies Character Size.	NLS-393

njPrintB

Displays a value in binary notation.

FORMAT

```
#include <Ninja.h>
void njPrintB(loc, val, digit);
Int loc
Uint32 val
Int digit
```

PARAMETERS

loc

display position

val

value

digit

number of output digits

RETURN VALUE

None

FUNCTION

- Displays the specified value on screen as a binary number.

EXAMPLE

The following outputs the value of 100 as a binary number at location 10,10.

```
njPrintB(NJM_LOCATION(10,10),100,10);
```

NOTES

- The display position is specified by NJM_LOCATION(x,y).
- x,y specify a character position in a row.
- If the value is greater than the number of output digits, the value following the number of output digits is output.

RELATED TOPICS

`njPrintColor`

`njPrintC`

`njPrintD`

`njPrintH`

`njPrintF`

njPrintC

Displays a character string.

FORMAT

```
#include <Ninja.h>
void njPrintC(loc,*s);
Int loc
Uint8 *s
```

PARAMETERS

loc
display position

***s**
character string to be output

RETURN VALUE

None

FUNCTION

- Displays a character string at the specified screen location.

EXAMPLE

```
njPrintC(NJM_LOCATION(10,10) , "NINJA TEST" );
```

NOTES

- The display position is specified by NJM_LOCATION(x,y).
- x,y specify a character position in a row.

RELATED TOPICS

njPrintColor
njPrintD
njPrintB
njPrintH
njPrintF

njPrintColor

Specifies the character color.

FORMAT

```
#include <Ninja.h>
void njPrintColor(c);
Uint32 c
```

PARAMETERS

c

color value

RETURN VALUE

None

FUNCTION

- Specifies the color of debug printing. The color is entered as an RGB value.
- The first 8 bits of the A value are invalid.

EXAMPLE

Set the character to red, 255.

```
njPrintColor(0x00FF0000);
```

NOTES

- When `njPrintColor` is not executed, the default debug print color is white (0x00FFFFFF).
- After executing `njPrintColor`, the specified color is used for all debug printing.

RELATED TOPICS

[njPrintC](#)

[njPrintD](#)

[njPrintB](#)

[njPrintH](#)

[njPrintF](#)

njPrintD

Displays a value in decimal notation.

FORMAT

```
#include <Ninja.h>

void njPrintD(loc,val,digit);

Int loc

Int val

Int digit
```

PARAMETERS

loc
display position

val
value

digit
number of output digits

RETURN VALUE

None

FUNCTION

- Displays the specified value on screen as a decimal number

EXAMPLE

The following outputs the value of 100 as 3 digits at location 10,10.

```
njPrintD(NJM_LOCATION(10,10),100,3);
```

NOTES

- The display position is specified by NJM_LOCATION(x,y).
- x,y specify a character position in a row.
- If the value is greater than the number of output digits, the value following the number of output digits is output.

RELATED TOPICS

`njPrintColor`

`njPrintC`

`njPrintD`

`njPrintH`

`njPrintF`

njPrintF

Displays a floating point decimal value.

FORMAT

```
#include <Ninja.h>
void njPrintD(loc, val, digit);
Int loc
Float val
Int digit
```

PARAMETERS

loc

display position

val

value

digit

number of output digits

RETURN VALUE

None

FUNCTION

- Displays the specified value on screen as a floating point decimal number.

EXAMPLE

The following outputs the value 3.14 as 10 digits at location 10,10.

```
njPrintF(NJM_LOCATION(10,10), 3.14, 10);
```

NOTES

- The display position is specified by NJM_LOCATION(x,y).
- x,y specify a character position in a row.
- If the value is greater than the number of output digits, the value following the number of output digits is output.

RELATED TOPICS

`njPrintColor`

`njPrintC`

`njPrintD`

`njPrintB`

`njPrintH`

njPrintH

Displays a value in decimal notation.

FORMAT

```
#include <Ninja.h>
void njPrintH(loc, val, digit);
Int loc
Uint32 val
Int digit
```

PARAMETERS

loc

display position

val

value

digit

number of output digits

RETURN VALUE

None

FUNCTION

- Displays the specified value on screen as a hexadecimal number.

EXAMPLE

The following outputs the value of 100 as a 3 hexadecimal digits at location 10,10.

```
njPrintH(NJM_LOCATION(10,10), 100, 3);
```

NOTES

- The display position is specified by NJM_LOCATION(x,y).
- x,y specify a character position in a row.
- If the value is greater than the number of output digits, the value following the number of output digits is output.

RELATED TOPICS

`njPrintColor`

`njPrintC`

`njPrintD`

`njPrintB`

`njPrintF`

njFramebufferBmp

Converts Frame Buffer To Bit Map Image.

FORMAT

```
#include <Ninja.h>
void njFramebufferBmp(filename);
Uint8 *filename
```

PARAMETERS

filename

file name

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Changes the context of frame buffer into 24bit texture image.
- Currently, it applies only for flame#0. So using this function while frame#0 is drawn creates an image in the middle of rendering. (will be modified in future)

EXAMPLE

```
/* Converts the frame buffer context to a bitmap image as frame.bmp. */
njFramebufferBmp("frame.bmp");
```

NOTES

- Specification will be modified so that the current frame will be converted to a bitmap texture. It can be used for debugging purpose.

RELATED TOPICS

njPrintSize

Specifies Character Size.

FORMAT

```
#include <Ninja.h>
void njPrintSize(size);
Uint16 size
```

PARAMETERS

size

character size

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

Specifies the character size.

EXAMPLE

Sets the character size 16x16 and output.

```
njPrintSize(16);
```

NOTES

- If specified sizes are varied in a screen, the character positions will not be aligned.

RELATED TOPICS

njPrintB
njPrintColor
njPrintC
njPrintD
njPrintH
njPrintF



14. *Special Effects Functions*

Contents

njExcuteFade	Excutes the fade effect.	NLS-396
njFadeDisable.....	Disables the fade effect.	NLS-398
njFadeEnable.....	Enables the fade effect.	NLS-400
njFogDisable.....	Disables the fog effect.	NLS-402
njFogEnable.....	Enables the fog effect.	NLS-404
njGenerateFogTable	Creates Fog Table.	NLS-406
njGenerateFogTable2	Creates Fog Table and Sets Density.	NLS-408
njGenerateFogTable3	Creates Fog Table and Sets Density.	NLS-410
njSetFadeColor.....	Specifies the fade color.	NLS-412
njSetFogColor.....	Specifies the fog color.	NLS-414
njSetFogDensity.....	Specifies the fog density.	NLS-416
njSetFogTable.....	Sets a user-defined fog table.	NLS-418

NOTES

- It can't be used with Fog feature against the same object.

RELATED TOPICS

`njSetFadeColor()`

`njFadeExecute()`

`njFadeEnable()`

`njFadeDisable()`

njFadeDisable

Disables the fade effect.

FORMAT

```
#include <Ninja.h>
void njFadeDisable()
```

PARAMETERS

None

RETURN VALUE

None

FUNCTION

- Disables the fade effect.

EXAMPLE

Fading out to Green.

```
Float fade_val
```

```
njSetFadeColor(0xff00ff00);
njExcuteFade(fade_val);
njFadeEnable();
```

```
                                :
Drawing models etc. (fade valid.)
                                :
                                :
njFadeDisable();
                                :
Drawing models etc. (fade valid.)
                                :
```



NOTE: The example above only explains the flow of the fog feature, and therefore, it is not for actual use.

NOTES

- It can't be used with Fog feature against the same object.

RELATED TOPICS

`njSetFadeColor()`

`njFadeExecute()`

`njFadeEnable()`

`njFadeDisable()`

njFadeEnable

Enables the fade effect.

FORMAT

```
#include <Ninja.h>
void njfadeEnable()
```

PARAMETERS

None

RETURN VALUE

None

FUNCTION

- Enables the fade effect.

EXAMPLE

Fading out to Green.

```
Float fade_val
```

```
njSetFadeColor(0xff00ff00);
njExcuteFade(fade_val);
njFadeEnable();
```

```
                                :
                                drawing models etc.
                                :
```

```
njFadeDisable();
```



NOTE: The example above only explains the flow of the fog feature, and therefore, it is not for actual use.

NOTES

- It can't be used with Fog feature against the same object.

RELATED TOPICS

`njSetFadeColor()`

`njFadeExecute()`

`njFadeEnable()`

`njFadeDisable()`

njFogDisable

Disables the fog effect.

FORMAT

```
#include <Ninja.h>
void njFogDisable()
```

PARAMETERS

None

RETURN VALUE

None

FUNCTION

- Disables the fog effect.

EXAMPLE

```
NJS_FOG_TABLE fog;

njSetFogColor(0xffffffff);
njSetFogDensity(0xff07);
njGenerateFogTable(fog);
njSetFogTable();
njFogEnable();

:
Drawing models etc. (Fade valid)
:

njFogDisable();

:
Drawing models etc. (Fade valid)
:
```



NOTE: The example above only explains the flow of the fog feature, and therefore, it is not for actual use.

NOTES

- It can't be used with Fade feature against the same object.

RELATED TOPICS

`njSetFogColor()`

`njSetFogDensity()`

`njSetFogTable()`

`njFogEnable()`

`njFogDisable()`

`njGenerateFogTable()`

`njGenerateFogTable2()`

`njGenerateFogTable3()`

NOTES

- It can't be used with Fade feature against the same object.

RELATED TOPICS

`njSetFogColor()`

`njSetFogDensity()`

`njSetFogTable()`

`njFogEnable()`

`njFogDisable()`

`njGenerateFogTable()`

`njGenerateFogTable2()`

`njGenerateFogTable3()`

njGenerateFogTable

Creates Fog Table.

FORMAT

```
#include <Ninja.h>

void njGenerateFogTable(fog)
NJS_FOG_TABLE fog
```

PARAMETERS

NJS_FOG_TABLE fog

Fog table to be made

RETURN VALUE

None

FUNCTION

- Sets each value of the fog table from 0.f to 1.f in linear.

EXAMPLE

Creates white fog from front -1 to back -255.

```
NJS_FOG_TABLE fog;

njSetFogColor(0xffffffff);
njSetFogDensity(0xff07);
njGenerateFogTable(fog);
njSetFogTable();
njFogEnable();
```

Drawing models etc.

```
njFogDisable();
```



NOTE: The example above only explains the flow of the fog feature, and therefore, it is not for actual use.

NOTES

- It can't be used with Fade feature against the same object.

RELATED TOPICS

`njSetFogColor()`

`njSetFogDensity()`

`njSetFogTable()`

`njFogEnable()`

`njFogDisable()`

`njGenerateFogTable()`

`njGenerateFogTable2()`

`njGenerateFogTable3()`

njGenerateFogTable2

Creates Fog Table and Sets Density.

FORMAT

```
#include <Ninja.h>

void njGenerateFogTable2(fog, f)
NJS_FOG_TABLE fog
Float          f
```

PARAMETERS

NJS_FOG_TABLE fog

Fog tabel to be created

Float f

Fog back boundary

RETURN VALUE

None

FUNCTION

- Makes fog occur from front 255/f to back f.

EXAMPLE

Makes white fog from front -255/4000 to back -4000.

```
NJS_FOG_TABLE fog;

njSetFogColor(0xffffffff);
njGenerateFogTable2(fog, -4000,f);
njSetFogTable();
njFogEnable();
```

Drawing models etc.

```
njFogDisable();
```



NOTE: The example above only explains the flow of the fog feature, and therefore, it is not for actual use.

NOTES

- Fog density is set automatically.
- It can't be used with Fade feature against the same object.

RELATED TOPICS

`njSetFogColor()`

`njSetFogDensity()`

`njSetFogTable()`

`njFogEnable()`

`njFogDisable()`

`njGenerateFogTable()`

`njGenerateFogTable2()`

`njGenerateFogTable3()`

njGenerateFogTable3

Creates Fog Table and Sets Density.

FORMAT

```
#include <Ninja.h>

void njGenerateFogTable3(fog, n, f)
NJS_FOG_TABLE    fog
Float            n
Float            f
```

PARAMETERS

NJS_FOG_TABLE fog

Fog table to be created

Float n

Fog front boundary

Float f

Fog back boundary

RETURN VALUE

None

FUNCTION

- Creates fog from front n to back f.

NOTES

- It can't be used with Fade feature against the same object.

RELATED TOPICS

`njSetFadeColor()`

`njExcuteFade()`

`njFadeEnable()`

`njFadeDisable()`

NOTES

- It can't be used with Fade feature against the same object.

RELATED TOPICS

`njSetFogColor()`

`njFogDensity()`

`njSetFogTable()`

`njFogEnable()`

`njFogDisable()`

`njGenerateFogTable()`

`njGenerateFogTable2()`

`njGenerateFogTable3()`

NOTES

- It cannot be used with the fade feature against the same object.
- The example above explains only the flow of the fog feature. It cannot be executed as is.
- The fog density value is specified as 16 bit: upper 8bit = mantissa; lower 8bit= exponent.
- Range for the fog is $1/w = 1/\text{density} \dots 256/\text{density}$. For example, when the fog reaches the value of w , 65536: $\text{density} = 65536 = 0x8010$, and the range for the fog is $w=65536$ to $w=256$.
- Fog color that is out of range is clumped.

RELATED TOPICS

`njSetFogColor()`

`njFogDensity()`

`njSetFogTable()`

`njFogEnable()`

`njFogDisable()`

`njGenerateFogTable()`

`njGenerateFogTable2()`

`njGenerateFogTable3()`

NOTES

- It can't be used with Fade feature against the same object.

RELATED TOPICS

`njSetFogColor()`

`njFogDensity()`

`njSetFogTable()`

`njFogEnable()`

`njFogDisable()`

`njGenerateFogTable()`

`njGenerateFogTable2()`

`njGenerateFogTable3()`



15. Motion Functions

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njAction

Drawing motion.

FORMAT

```
#include <Ninja.h>
void  njAction( *action, frame )
NJS_ACTION *action
Float  frame
```

PARAMETERS

action

Pointer to the action structure

frame

Frame number

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Draws object structure with motion - action structure.
- Floating point can be used for frame number, so it can supplement motion data.
- The range for frame number is 0 thru less than 10 (9.9999) when the frame number of a motion is 10.
- For example, suppose the frame number is 0.5. It will supplement the values between 0th frame and 1st frame and draw.
- Supplements for 9 thru 10(9.9999) would be performed between the last frame and the first frame.

EXAMPLE

```
#define ACTION    action_man
extern NJS_ACTION ACTION[];

void main() {
    Float ff=0.0f;

    njInitSystem( NJD_RESOLUTION_640x480, 1 );
    njInitMatrix( matrix, 128 );
    njInit3D( vbuf, 1024, abuf, fbuf, 32 );
    njInitView( &view );
    njCreateLight( &light, NJD_DIR_LIGHT );
    njSetView( &view );

    while(1) {
        njClearMatrix();
        njAction( ACTION,ff );

        ff+=0.2f;
        if( ff >= (ACTION->motion->nbFrame) )
            ff--=ACTION->motion->nbFrame;

        njWaitVSync();
    }
}
```

NOTES

- As for drawing, it is completely the same as model drawing, except that it has motion.
- Therefore, settings for njControl3D are the same.

RELATED TOPICS

[njInit3D\(\)](#)

[njDrawModel\(\)](#)

[njDrawObject\(\)](#)

[njControl3D\(\)](#)

[njDrawMotion\(\)](#)

njActionLink

Links motions.

FORMAT

```
#include <Ninja.h>

void njActionLink( actionlink, frame )

NJS_ACTION_LINK *actionlink

Float frame
```

PARAMETERS

actionlink

Pointer to action link structure

frame

Frame number (from 0 to 1)

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function links two motion structures.
- The frames in the motion link structure are the link source and link destination motion frames.
- When the frame parameter is 0, the frame is part of the motion of the link source frame; when the frame parameter is 1, the frame is part of the motion of the link destination frame.
- Other values ($0 < ff < 1$) interpolate the motion between the link destination frame and the link source frame.

EXAMPLE

```

#include <NINJA.H>

#define OBJECT          object_sample
#define MOTION1        motion_sample1 /* Described in nam */
#define MOTION2        motion_sample2 /* Described in nam */
#define STEPS          60

extern NJS_MOTION      MOTION1[];
extern NJS_MOTION      MOTION2[];

NJS_MOTION_LINK motionlink;
NJS_ACTION_LINK actionlink;

.....
actionlink.motionlink = &motionlink;
actionlink.object = OBJECT;
motionlink.motion[0] = MOTION1; /* link source */
motionlink.motion[1] = MOTION2; /* link destination */
/* interpolate 1.5 frames of MOTION2 from the final frame of MOTION1 */
motionlink.frame[0] = MOTION1->nbFrame-1;
motionlink.frame[1] = 1.5;

.....
njActionLink( &actionlink, ff/STEPS ); /* Specify from 0 - 1 for frames */

ff+=0.2f;
if( ff >= STEPS - 1 ) ff=0.f;
.....

```

NOTES

The drawing performed by this function is identical to model drawing, except that motion has been added. In other words, all of the njControl3D settings are identical. This function corresponds to the model drawing function njDrawObject, so the light source is normal light.

RELATED TOPICS

Related Items

[njDrawMotionLink\(\)](#)

[njFastActionLink\(\)](#)

[njFastDrawMotionLink\(\)](#)

njDrawMotion

Drawing Motion.

FORMAT

```
#include <Ninja.h>
void njDrawMotion( *object, *motion, frame )
NJS_OBJECT *object
NJS_MOTION *motion
Float frame
```

PARAMETERS

object

Pointer for the object structure

motion

Pointer for the motion structure

frame

Frame number

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Draws motion following motion data.
- Floating point can be used for frame number, so it can supplement motion data.
- The range for frame number is 0 thru less than 10 (9.9999) when the frame number of a motion is 10.
- For example, suppose the frame number is 0.5. It will supplement the values between 0th frame and 1st frame and draw.
- Supplements for 9 thru 10(9.9999) would be performed between the last frame and the first frame.

EXAMPLE

```
#define OBJECT    object_man
#define MOTION    motion_man
extern NJS_OBJECT OBJECT[];
extern NJS_MOTION MOTION[];

void main() {
    Float ff=0.0f;

    njInitSystem( NJD_RESOLUTION_640x480, 1 );
    njInitMatrix( matrix, 128 );
    njInit3D( vbuf, 1024, abuf, fbuf, 32 );
    njInitView( &view );
    njCreateLight( &light, NJD_DIR_LIGHT );
    njSetView( &view );

    while(1) {
        njClearMatrix();
        njDrawMotion( OBJECT, MOTION, ff );

        ff+=0.2f;
        if( ff >= (MOTION->nbFrame) )

            njWaitVSync();
    }
}
```

NOTES

- This is the same as `njAction()` except for that it is separated into object and motion.

RELATED TOPICS

`njInit3D()`
`njDrawModel()`
`njDrawObject()`
`njControl3D()`
`njAction()`

njDrawMotionLink

Links motions.

FORMAT

```
#include <Ninja.h>
void njDrawMotionLink( object, motionlink, frame )
NJS_OBJECT      *object
NJS_MOTION_LINK *motionlink
Float           frame
```

PARAMETERS

None

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function links two motion structures.
- The frames in the motion link structure are the link source and link destination motion frames.
- When the frame parameter is 0, the frame is part of the motion of the link source frame; when the frame parameter is 1, the frame is part of the motion of the link destination frame.
- Other values ($0 < ff < 1$) interpolate the motion between the link destination frame and the link source frame.

EXAMPLE

```
#include <NINJA.H>

#define OBJECT    object_sample
#define MOTION1   motion_sample1 /* described in nam */
#define MOTION2   motion_sample2 /* described in nam */
#define STEPS     60

extern NJS_MOTION MOTION1[];
extern NJS_MOTION MOTION2[];

NJS_MOTION_LINK motionlink;

.....
motionlink.motion[0] = MOTION1; /* link source */
motionlink.motion[1] = MOTION2; /* link destination */
/* interpolate 1.5 frames of MOTION2 from the final frame of MOTION1 */
motionlink.frame[0] = MOTION1->nbFrame-1;
motionlink.frame[1] = 1.5;

.....
njDrawMotionLink( OBJECT, &motionlink, ff/STEPS ); /* Specify from 0 - 1 for frames */

ff+=0.2f;
if( ff >= STEPS - 1 ) ff=0.f;
.....
```

NOTES

The drawing performed by this function is identical to model drawing, except that motion has been added. In other words, all of the njControl3D settings are identical. This function corresponds to the model drawing function njDrawObject, so the light source is normal light.

RELATED TOPICS

njActionLink()
njFastActionLink()
njFastDrawMotionLink()

njDrawShapeMotion

Executes motion that includes shapes.

FORMAT

```
#include <Ninja.h>
void njInitShape( Float *buf )
Float    *buf
```

PARAMETERS

***buf**

Shape buffer

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function sets a temporary buffer for shapes.
- Assuming N is the maximum number of vertices in the models that are used as shapes within all objects, the number of buffers needed is $N \times 3$ for shapes that consist only of vertices or normal lines, and $N \times 6$ for shapes that consist of both.
- For example, given the objects `Person 1` and `Person 2`, in which only vertex shapes are used, then if the model for the `Face` of `Person 1` uses 1000 vertices, and this is the largest number of vertices within the object, then this function is specified as `buf [3000]`.

EXAMPLE

```
#include <NINJA.H>

#define OBJECT    object_sample /* described within NJA (NAM) file */
#define MOTION    motion_sample /* described within NAM file */
#define SHAPE     shape_sample  /* described within NAS file */
extern NJS_OBJECT OBJECT[];
extern NJS_MOTION MOTION[];
extern NJS_MOTION SHAPE[];
float  buf[6000];
float  ff=0.f;

.....
InitShape(buf);

.....
njDrawShapeMotion( OBJECT,MOTION,SHAPE,ff );

ff+=0.2f;
if( ff >= (MOTION->nbFrame-1) ) ff=0.f;
.....
```

NOTES

This function must be set for the following functions that draw shapes (vertex animation) (in which the shape motion parameter is not NULL): `njDrawShapeMotion`, `njFastDrawShapeMotion`, `njDrawShapeMotionLink`, and `njFastDrawShapeMotionLink`.

RELATED TOPICS

- `njDrawShapeMotion()`
- `njFastDrawShapeMotion()`
- `njDrawShapeMotionLink()`
- `njFastDrawShapeMotionLink()`

njDrawShapeMotionLink

Links motions that include shapes.

FORMAT

```
#include <Ninja.h>
void njDrawShapeMotionLink( object, motionlink, shapelink, frame )
NJS_OBJECT      *object
NJS_MOTION_LINK *motionlink
NJS_MOTION_LINK *shapelink
Float           frame
```

PARAMETERS

object

Pointer to object structure

motionlink

Pointer to motion link structure

shapelink

Pointer to motion link structure (vertex animation)

frame

Frame number (from 0 to 1)

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function links two motion structures.
- The frames in the motion link structure are the link source and link destination motion frames.
- When the frame parameter is 0, the frame is part of the motion of the link source frame; when the frame parameter is 1, the frame is part of the motion of the link destination frame.
- Other values ($0 < ff < 1$) interpolate the motion between the link destination frame and the link source frame.
- This also applies to shapes (vertex animation).

EXAMPLE

```

#include <NINJA.H>

#define OBJECT    object_sample
#define MOTION1   motion_sample1 /* described within NAM file */
#define MOTION2   motion_sample2 /* described within NAM file */
#define SHAPE1    shape_sample1  /* described within NAS file */
#define SHAPE2    shape_sample2  /* described within NAS file */
#define STEPS     60

extern NJS_MOTION MOTION1[];
extern NJS_MOTION MOTION2[];
extern NJS_MOTION SHAPE1[];
extern NJS_MOTION SHAPE2[];

NJS_MOTION_LINK motionlink;
NJS_MOTION_LINK shapelink;

.....
motionlink.motion[0] = MOTION1; /* link source */
motionlink.motion[1] = MOTION2; /* link destination */
shapelink.motion[0] = SHAPE1; /* link source */
shapelink.motion[1] = SHAPE2; /* link destination */
/* interpolate 1.5 frames of MOTION2 from the final frame of MOTION1 */
motionlink.frame[0] =
shapelink.frame[0] = MOTION1->nbFrame-1;
motionlink.frame[1] =
shapelink.frame[1] = 1.5;

.....
njDrawShapeMotionLink( OBJECT, &motionlink, &shapelink, ff/STEPS );
/* Specify from 0 - 1 for frames */

ff+=0.2f;
if( ff >= STEPS - 1 ) ff=0.f;
.....

```

NOTES

The drawing performed by this function is identical to model drawing, except that motion and shapes (vertex animation) have been added.

In other words, all of the njControl3D settings are identical. This function corresponds to the model drawing function njDrawObject, so the light source is normal light.

RELATED TOPICS

njInitShape()

njFastDrawShapeMotionLink()

njFastAction

Draws Motion.

FORMAT

```
#include <Ninja.h>
void njFastAction( action, frame )
NJS_ACTION *action
Float frame
```

PARAMETERS

action

pointer for the action structure

frame

frame number

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function draws an object structure with motion - an action structure.
- Because floating-point data can be used for frame numbers, the motion data can be interpolated.
- In the case of a motion consisting of 10 frames, the frame numbers can range from 0 to just under 10 (i.e., 9.9999).
- For example, if the frame number is 0.5, the values used for drawing are interpolated as exactly halfway between the values for frame 0 and the values for frame 1.
- Interpolation from 9 to just under 10 (9.9999) becomes interpolation between the last frame and the first frame.

EXAMPLE

```
#include <NINJA.H>

#define ACTION    action_sample /* described in nam */
extern NJS_ACTION ACTION[];

.....
njFastAction( ACTION,ff );

ff+=0.2f;
if( ff >= (ACTION->motion->nbFrame-1) ) ff=0.f;
```

NOTES

- The drawing performed by this function is identical to model drawing, except that motion has been added. In other words, all of the njControl3D settings are identical. This function corresponds to the model drawing function njFastDrawObject, so the light source is bright light.

RELATED TOPICS

[njFastDrawMotion\(\)](#)

[njAction\(\)](#)

[njDrawMotion\(\)](#)

njFastActionLink

Links motions.

FORMAT

```
#include <Ninja.h>
void njFastActionLink( actionlink, frame )
NJS_ACTION_LINK *actionlink
Float           frame
```

PARAMETERS

actionlink

Pointer to action link structure

frame

Frame number (from 0 to 1)

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function links two motion structures.
- The frames in the motion link structure are the link source and link destination motion frames.
- When the frame parameter is 0, the frame is part of the motion of the link source frame; when the frame parameter is 1, the frame is part of the motion of the link destination frame.
- Other values ($0 < ff < 1$) interpolate the motion between the link destination frame and the link source frame.

EXAMPLE

```

#include <NINJA.H>

#define OBJECT    object_sample
#define MOTION1   motion_sample1 /* described in nam */
#define MOTION2   motion_sample2 /* described in nam */
#define STEPS     60

extern NJS_MOTION MOTION1[];
extern NJS_MOTION MOTION2[];

NJS_MOTION_LINK motionlink;
NJS_ACTION_LINK actionlink;

.....
actionlink.motionlink = &motionlink;
actionlink.object = OBJECT;
motionlink.motion[0] = MOTION1; /* link source */
motionlink.motion[1] = MOTION2; /* link destination */
/* interpolate 1.5 frames of MOTION2 from the final frame of MOTION1 */
motionlink.frame[0] = MOTION1->nbFrame-1;
motionlink.frame[1] = 1.5;

.....
njFastActionLink( &actionlink, ff/STEPS ); /* Specify from 0 - 1 for frames */

ff+=0.2f;
if( ff >= STEPS - 1 ) ff=0.f;
.....

```

NOTES

The drawing performed by this function is identical to model drawing, except that motion has been added. In other words, all of the njControl3D settings are identical. This function corresponds to the model drawing function njFastDrawObject, so the light source is bright light.

RELATED TOPICS

Related Items

[njActionLink\(\)](#)

[njDrawMotionLink\(\)](#)

[njFastDrawMotionLink\(\)](#)

njFastDrawMotion

Draws Motion.

FORMAT

```
#include <Ninja.h>
void njFastDrawMotion( *object, *motion, frame )
NJS_OBJECT *object
NJS_MOTION *motion
Float      frame
```

PARAMETERS

object

pointer for the object structure

motion

pointer for the motion structure

frame

frame number

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function draws motion according to the motion data.
- Because floating-point data can be used for frame numbers, the motion data can be interpolated.
- In the case of a motion consisting of 10 frames, the frame numbers can range from 0 to just under 10 (i.e., 9.9999).
- For example, if the frame number is 0.5, the values used for drawing are interpolated as exactly halfway between the values for frame 0 and the values for frame 1.
- Interpolation from 9 to just under 10 (9.9999) becomes interpolation between the last frame and the first frame.

EXAMPLE

```
#include <NINJA.H>

#define OBJECT    object_sample
#define MOTION    motion_sample
extern NJS_MOTION MOTION[];
extern NJS_OBJECT OBJECT[];

.....
njFastDrawMotion( OBJECT,MOTION,ff );

ff+=0.2f;
if( ff >= (MOTION->nbFrame-1) ) ff=0.f;
.....
```

NOTES

- This function is identical to `njAction()`, except that the action structure has been divided into objects and motion. This function corresponds to the model drawing function `njFastDrawObject`, so the light source is bright light.

RELATED TOPICS

`njFastAction()`

`njAction()`

`njDrawMotion()`

njFastDrawMotionLink

Links motions.

FORMAT

```
#include <Ninja.h>
void njFastDrawMotionLink( object, motionlink, frame )
NJS_OBJECT      *object
NJS_MOTION_LINK *motionlink
Float           frame
```

PARAMETERS

object

Pointer to object structure

motionlink

Pointer to motion link structure

frame

Frame number (from 0 to 1)

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

EXAMPLE

```
#include <NINJA.H>

#define OBJECT    object_sample
#define MOTION1   motion_sample1 /* described in nam */
#define MOTION2   motion_sample2 /* described in nam */
#define STEPS     60

extern NJS_MOTION MOTION1[];
extern NJS_MOTION MOTION2[];

NJS_MOTION_LINK motionlink;

.....
motionlink.motion[0] = MOTION1; /* link source */
motionlink.motion[1] = MOTION2; /* link destination */
/* interpolate 1.5 frames of MOTION2 from the final frame of MOTION1 */
otionlink.frame[0] = MOTION1->nbFrame-1;
    motionlink.frame[1] = 1.5;

.....
njFastDrawMotionLink( OBJECT, &motionlink, ff/STEPS );
/* Specify from 0 - 1 for frames */

ff+=0.2f;
if( ff >= STEPS - 1 ) ff=0.f;
.....
```

NOTES

The drawing performed by this function is identical to model drawing, except that motion has been added. In other words, all of the njControl3D settings are identical. This function corresponds to the model drawing function njFastDrawObject, so the light source is bright light.

RELATED TOPICS

Related Items

[njActionLink\(\)](#)

[njDrawMotionLink\(\)](#)

[njFastActionLink\(\)](#)

njFastDrawShapeMotion Executes motion that includes shapes.

FORMAT

```
#include <Ninja.h>
void njFastDrawMotion( object, motion, frame )
NJS_OBJECT *object
NJS_MOTION *motion
NJS_MOTION *shape
Float      frame
```

PARAMETERS

object

Pointer to object structure

motion

Pointer to motion structure

shape

Pointer to motion structure (vertex animation data)

frame

Frame number

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function draws motion according to the motion data.
- Because floating-point data can be used for frame numbers, the motion data can be interpolated.
- In the case of a motion consisting of 10 frames, the frame numbers can range from 0 to just under 10 (i.e., 9.9999).
- For example, if the frame number is 0.5, the values used for drawing are interpolated as exactly halfway between the values for frame 0 and the values for frame 1.
- Interpolation from 9 to just under 10 (9.9999) becomes interpolation between the last frame and the first frame.
- This also applies to vertex animation.

EXAMPLE

```
#include <NINJA.H>

#define OBJECT    object_sample /* described within NJA (NAM) file */
#define MOTION    motion_sample /* described within NAM file */
#define SHAPE     shape_sample  /* described within NAS file */
extern NJS_OBJECT OBJECT[];
extern NJS_MOTION MOTION[];
extern NJS_MOTION SHAPE[];
float  buf[10000];
float  ff=0.f;

.....
InitShape(buf);

.....
njFastDrawShapeMotion( OBJECT,MOTION,SHAPE,ff );

ff+=0.2f;
if( ff >= (MOTION->nbFrame-1) ) ff=0.f;
.....
```

NOTES

The drawing performed by this function is identical to model drawing, except that motion and shapes (vertex animation) have been added.

In other words, all of the njControl3D settings are identical. This function corresponds to the model drawing function njFastDrawObject, so the light source is bright light.

RELATED TOPICS

njInitShape()

njDrawShapeMotion()

njFastDrawShapeMotionLink Links motions that include shapes.

FORMAT

```
#include <Ninja.h>
void njFastDrawShapeMotionLink( object, motionlink, shapelink, frame )
NJS_OBJECT            *object
NJS_MOTION_LINK      *motionlink
NJS_MOTION_LINK      *shapelink
Float                 frame
```

PARAMETERS

object

Pointer to object structure

motionlink

Pointer to motion link structure

shapelink

Pointer to motion link structure (vertex animation)

frame

Frame number (from 0 to 1)

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- This function links two motion structures.
- The frames in the motion link structure are the link source and link destination motion frames.
- When the frame parameter is 0, the frame is part of the motion of the link source frame; when the frame parameter is 1, the frame is part of the motion of the link destination frame.
- Other values ($0 < ff < 1$) interpolate the motion between the link destination frame and the link source frame.
- This also applies to shapes (vertex animation).

EXAMPLE

```

#include <NINJA.H>

#define OBJECT    object_sample
#define MOTION1   motion_sample1 /* described within NAM file */
#define MOTION2   motion_sample2 /* described within NAM file */
#define SHAPE1    shape_sample1  /* described within NAS file */
#define SHAPE2    shape_sample2  /* described within NAS file */
#define STEPS     60

extern NJS_MOTION MOTION1[];
extern NJS_MOTION MOTION2[];
extern NJS_MOTION SHAPE1[];
extern NJS_MOTION SHAPE2[];

NJS_MOTION_LINK motionlink;
NJS_MOTION_LINK shapelink;

.....
motionlink.motion[0] = MOTION1; /* link source */
motionlink.motion[1] = MOTION2; /* link destination */
shapelink.motion[0] = SHAPE1; /* link source */
shapelink.motion[1] = SHAPE2; /* link destination */
/* interpolate 1.5 frames of MOTION2 from the final frame of MOTION1 */
motionlink.frame[0] =
shapelink.frame[0] = MOTION1->nbFrame-1;
motionlink.frame[1] =
shapelink.frame[1] = 1.5;

.....
njFastDrawShapeMotionLink( OBJECT, &motionlink, &shapelink, ff/STEPS );
/* Specify from 0 - 1 for frames */

ff+=0.2f;
if( ff >= STEPS - 1 ) ff=0.f;
.....

```

NOTES

The drawing performed by this function is identical to model drawing, except that motion and shapes (vertex animation) have been added.

In other words, all of the `njControl3D` settings are identical. This function corresponds to the model drawing function `njFastDrawObject`, so the light source is bright light.

RELATED TOPICS

`njInitShape()`

`njDrawShapeMotionLink()`

njSetMotionCallback

Registering motion callback routine.

FORMAT

```
#include <Ninja.h>
void njSetMotionCallback( func )
void (*func)(NJS_OBJECT *obj)
```

PARAMETERS

func

callback routine pointer

obj

callback parameters

RETURN VALUE

None

ERROR VALUE

None

FUNCTION

- Registers motion callback routine.
- After motion matrix operation, it is called right before drawing.

EXAMPLE

NOTES

RELATED TOPICS

`njInit3D()`

`njDrawModel()`

`njDrawObject()`

`njControl3D()`

`njAction()`



16. Memory Functions

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njMemCopy

Memory Copy.

FORMAT

```
#include <Ninja.h>
void njMemCopy( *dst, *src, num)
void  *dst
void  *src
Sint32  num
```

PARAMETERS

***dst**

Destination

***src**

Source

num

Number of bytes

RETURN VALUE

None

FUNCTION

- Copies num bytes from src to dst.

EXAMPLE

```
Uint8 dst[256];
Uint8 src[256];

/* Copies 256 bytes */
njMemCopy(dst,src,256);
```

NOTES

RELATED TOPICS

[njMemCopy2](#)

[njMemCopy4](#)

njMemCopy4

Memory Copy. (Word)

FORMAT

```
#include <Ninja.h>
void njMemCopy2( *dst, *src, num)
void *dst
void *src
Sint32 num
```

PARAMETERS

***dst**

Destination

***src**

Source

num

Number of words

RETURN VALUE

None

FUNCTION

- Copies num words from src to dst.

EXAMPLE

```
Uint16 dst[256];
Uint16 src[256];

/* Copies 256 words */
njMemCopy2(dst, src, 256);
```

NOTES

RELATED TOPICS

njMemCopy

njMemCopy4

njMemCopy2

Memory Copy. (Long)

FORMAT

```
#include <Ninja.h>
void njMemCopy4( *dst, *src, num)
void  *dst
void  *src
Sint32  num
```

PARAMETERS

***dst**

Destination

***src**

Source

num

Number of long

RETURN VALUE

None

FUNCTION

- Copies num long from src to dst.

EXAMPLE

```
Uint32 dst[256];
Uint32 src[256];

/* Copies 256 long */
njMemCopy4(dst,src,256);
```

NOTES

RELATED TOPICS

njMemCopy()

njMemCopy2()



17. Drawing Functions

Contents

njDrawPolygon.....	Draws polygons without textures.	NLS-452
njDrawTexture.....	Draw texture polygons.	NLS-454

njDrawPolygon

Draws polygons without textures.

FORMAT

```
#include <Ninja.h>
void njDrawPolygon( *polygon, count, trans )
NJS_POLYGON_VTX *polygon
Int    count
Int    trans
```

PARAMETERS

***polygon**

Pointer for NJS_POLYGON_VTX structure

count

Number of vertices

trans

Translucent valid(TRUE), invalid(FALSE)

RETURN VALUE

None

FUNCTION

- Draws polygons without texture. Count vertices in strip format, and set the number to count.
- Set trans to TRUE when translucent is used and to FALSE when it is not used.

EXAMPLE

Draws rectangle.

Vertices order as follows:

1 3

2 4

```
NJS_POLYGON_VTX poly[4];
```

```
poly[0].x = 100.f;  
poly[0].y = 100.f;  
poly[0].z = 0.5f;  
poly[0].col = 0xFFFFFFFF;
```

```
poly[1].x = 100.f;  
poly[1].y = 300.f;  
poly[1].z = 0.5f;  
poly[1].col = 0xFFFFFFFF;
```

```
poly[2].x = 300.f;  
poly[2].y = 100.f;  
poly[2].z = 0.5f;  
poly[2].col = 0xFFFFFFFF;
```

```
poly[3].x = 300.f;  
poly[3].y = 300.f;  
poly[3].z = 0.5f;  
poly[3].col = 0xFFFFFFFF;
```

```
njDrawPolygon( poly, 4, FALSE);
```

NOTES

RELATED TOPICS

[njDrawTexture](#)

njDrawTexture

Draw texture polygons.

FORMAT

```
#include <Ninja.h>
void njDrawTexture( *polygon, count, tex, trans )
NJS_POLYGON_VTX *polygon
Int    count
Int    tex
Int    trans
```

PARAMETERS

***polygon**

Pointer for NJS_POLYGON_VTX structure

count

Number of vertices

tex

Texture global index

trans

Translucent valid(TRUE), invalid(FALSE)

RETURN VALUE

None

FUNCTION

- Draws texture polygons. Count vertices in strip format, and set the number to count.
- Before using this function, it is necessary to initialize, load, and set textures.
- Set trans to TRUE when translucent is used and to FALSE when it is not used.

EXAMPLE

Draw rectangles.

Vertices order as follows:

```
1 3
2 4
```

```

NJS_TEXNAME texname[1];
NJS_TEXLIST texlist = {texname,1};
NJS_TEXMEMLIST tex[1];

NJS_TEXTURE_VTX poly[4];

/* Initializing textures*/
njInitTexture( tex,1);
njSetTextureName(&texname[0],"file0.pvr",0,NJD_TEXATTR_TYPE_FILE |
                                                         NJD_TEXATTR_GLOBALINDEX);

njLoadTexture( &texlist );
njSetTexture( &texlist );

poly[0].x = 100.f;
poly[0].y = 100.f;
poly[0].z = 0.5f;
poly[0].u = 0.f;
poly[0].v = 0.f;
poly[0].col = 0xFFFFFFFF;

poly[1].x = 100.f;
poly[1].y = 300.f;
poly[1].z = 0.5f;
poly[1].u = 0.f;
poly[1].v = 1.f;
poly[1].col = 0xFFFFFFFF;

poly[2].x = 300.f;
poly[2].y = 100.f;
poly[2].z = 0.5f;
poly[2].u = 1.f;
poly[2].v = 0.f;
poly[2].col = 0xFFFFFFFF;

poly[3].x = 300.f;
poly[3].y = 300.f;
poly[3].z = 0.5f;
poly[3].u = 1.f;
poly[3].v = 1.f;
poly[3].col = 0xFFFFFFFF;

/* Map the texture of global index #0 to polygon */
njDrawTexture( poly, 4, 0, FALSE);

```

NOTES

RELATED TOPICS

[njDrawPolygon](#)



18. Input Functions

Contents

njGetPeripheral.....	Gets information of input device. (Peripheral).	NLS-458
njPrintPeripheralInfo	Displays peripheral condition.	NLS-462

njGetPeripheral

Gets information of input device. (Peripheral).

FORMAT

```
#include <NinjaWin.h>
NJS_PERIPHERAL *njGetPeripheral(port)
Uint32 port
```

PARAMETER

port

Peripheral port number

NJD_PORT_SYSKEYBOARD	System keyboard
NJD_PORT_SYSMOUSE	System mouse
NJD_PORT_JOYSTICK1	Joystick port 1
:	
NJD_PORT_JOYSTICK16	Joystick port 16

RETURN VALUE

The address of peripheral structure

FUNCTION

- Gets information about peripheral connection, kinds, and button.
- By referring members of peripheral structure, applications can get various information.
- Explanation of NJS_PERIPHERAL structure members

The kind of connected peripheral

NJD_DEV_NODEVICE	Disconnected
NJD_DEV_SYSKEYBOARD	System keyboard
NJD_DEV_SYSMOUSE	System mouse
NJD_DEV_JOYSTICK	Joystick
NJD_DEV_UNDEFINED	Undefined

 **NOTE:** Do not mix them up with peripheral port numbers.

on button information(ON)

Button information is stored.

If buttons are pushed, the bit which matches the button becomes 1, if not pushed, the bit becomes 0.

Gets ON/OFF of buttons using AND with the following macro.

NJD_DGT_KU	Directional key Up
NJD_DGT_KD	Directional key Down
NJD_DGT_KL	Directional key Left
NJD_DGT_KR	Directional key Right
NJD_DGT_TA	A button
NJD_DGT_TB	B button
NJD_DGT_TC	C button
NJD_DGT_TX	X button
NJD_DGT_TY	Y button
NJD_DGT_TZ	Z button
NJD_DGT_TL	L button
NJD_DGT_TR	R button
NJD_DGT_ST	START button

off button information(OFF)

Contrary to member on, the bit which matches the button becomes 0, if not pushed, the bit becomes 1.

push button information(ON edge)

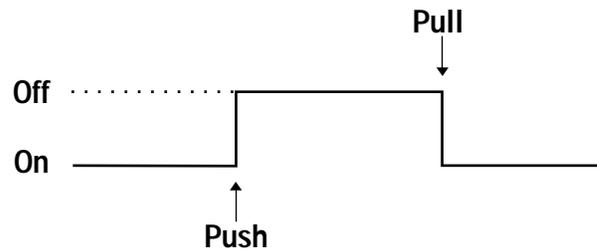
The moment the button is pushed, the bit becomes 1.

Uses it for edge detection.

pull button information(OFF edge)

The moment the button is pulled, the bit becomes 1.

Uses it for edge detection.



x,y,z,r,u,v

Gets data of analog axis.

The value must be 16bit and from -32768 to 32767.

extend

The address of extended data corresponding to the kind of peripherals is set.

Not available!!

name

The pointer of peripheral name string (ASCIIZ) is set.

- Keyboard and digital pad

Digital Pad	Keyboard
Direction key UP	Cursol UP or Ten key 8
Direction key DOWN	Cursol DOWN or Ten key 2
Direction key LEFT	Cursol LEFT or Ten key 4
Direction key RIGHT	Cursol RIGHT or Ten key 6
A Button	Z Key
B Button	X Key
C Button	C Key
X Button	A Key
Y Button	S Key
Z Button	D Key
L Button	Q Key
R Button	E Key

START Button

SPACE Key or RETURN Key

EXAMPLE

```

Sint32 njUserMain(void)
{
    NJS_PERIPHERAL* per;

    /* Gets information of peripheral which is
    * connected to joystick port1.
    */
    per = njGetPeripheral(NJD_DEV_JOYSTICK1);

    if(per->id == NJD_DEV_NODEVICE){
        /* Peripheral disconnected */
    }

    if(per->push & NJD_DGT_ST){
        /* Start button is pushed (edge) */
    }

    if(per->on & NJD_DGT_KU){
        /* Directional key is pushed */
    }

    if((per->on & (NJD_DGT_TA | NJD_DGT_TB))==(NJD_DGT_TA | NJD_DGT_TB)){
        /* Judgement for some buttons pushed
        * simultaneously - Both button A and B are pushed.
        */
    }

    return NJS_USER_CONTINUE;
}

```

NOTES

- Peripheral information is updated in the system after calling back njUserMain. Please note that peripheral information isn't updated in the case that it doesn't return from njUserMain.
- Joystick must be set up properly at the control panel.
- Only two joysticks can be used at present version.

RELATED TOPICS

njPrintPeripheralInfo

NjWinDef.h

njPrintPeripheralInfo

Displays peripheral condition.

FORMAT

```
#include <NinjaWin.h>
void njPrintPeripheralInfo(Int loc, Uint32 port)
Int loc
Uint32 port
```

PARAMETERS

loc

Displayed text coordinate

port

Peripheral port number

NJD_PORT_SYSKEYBOARD	System keyboard
NJD_PORT_SYSMOUSE	System mouse
NJD_PORT_JOYSTICK1	Joystick port 1
:	
NJD_PORT_JOYSTICK16	Joystick port 16

RETURN VALUE

None

FUNCTION

- Displays main members of peripheral structure in text format.

EXAMPLE

```
Sint32 njUserMain(void)
{
    njPrintPeripheralInfo(NJM_LOCATION( 0, 0), NJD_PORT_SYSKEYBOARD);
    njPrintPeripheralInfo(NJM_LOCATION(20, 0), NJD_PORT_SYSMOUSE);
    njPrintPeripheralInfo(NJM_LOCATION(40, 0), NJD_PORT_JOYSTICK1);
    njPrintPeripheralInfo(NJM_LOCATION(60, 0), NJD_PORT_JOYSTICK2);
    return NJS_USER_CONTINUE;
}
```

NOTES

RELATED TOPICS

[njGetPeripheral](#)

[NjWinDef.h](#)

