NINTENDO
NITRO-System

G3D Library Release Notes

Version 1.0.4

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Revision History

Version	Revision Date	Details of Revision
1.0.4	08/30/2005	Added support for 09/01/2005 version
1.0.3	06/16/2005	Corrected bug in 1.0.2
1.0.2	06/06/2005	Corrected bug with `.ica` conversion using `-OS` option
1.0.1	03/28/2005	Added support for the 03/28/2005 version
1.0.0	01/31/2005	Added support for the 01/31/2005 version
0.9.2	12/06/2004	Added support for the 12/06/2004 version
0.8.1	11/10/2004	Added support for 11/10/2004 version
0.6.0	10/12/2004	Added support for 10/12/2004 version Added warning about multithreaded operations
0.4.0	09/16/2004	Added support for 09/16/2004 version
0.3.1	09/02/2004	Added support for 09/02/2004 version
0.2.0	08/10/2004	Added support for 08/10/2004 version
0.1.0	08/02/2004	Initial version

1 The G3D Library

1.1　The Runtime Library

The 3D Graphics Library allows easy and efficient playback on Nintendo DS, simply by converting the NITRO intermediate file format model and animation data through the converter. By using this library, the 3D model data output from the 3D Material Editor supplied in the NITRO System can easily be drawn on the screen.

For further details on the G3D Library, refer to `NitroSystem\docs\G3D\G3D_Overview.pdf` and the function reference.

1.2　Multi-thread Operations

NITRO-System library was not designed to be fundamentally thread-safe. Therefore, G3D library API calls made from interrupt handlers and multiple threads may not always work correctly.

1.3　The Binary Converter

The G3D library uses drawing data in a binary format. The NITRO System provides a converter named `g3dcvtr.exe` for converting XML-format NITRO intermediate files into G3D library dedicated binary files for use with the G3D libraries.

For instructions on using `g3dcvtr.exe` converter, see `NitroSystem\docs\G3D\g3dcvtr_UsersManual.pdf`.

2 Major Changes

2.1   Changes in the 09/01/2005 Version

2.1.1 Fixed Bug

Corrected a problem to smoothly do animations that rotate through small angles.

2.2   Chnages in the 06/16/2005 Version

2.2.1 Fixed Bug

Corrected a bug in the 06/06/2005 version.

2.3   Changes in the 06/06/2005 Version

2.3.1 Fixed Bug

When converting `.ica` files using the `-OS` option, replay did not work in some cases. This was fixed.

2.4   Changes in the 03/28/2005 Version

2.4.1 Improved Frame Interpolation Precision

When frame interpolation was used with joint animation and the amount of rotations between key frames was large, distortions in the models would increase in size in some cases. This was improved.

2.4.2 Fixed Bug in SBC Instruction Callback

In SBC instructions `NODEDESC` and `BBY`, with `TIMING_C`, the `NNS_G3D_RSFLAG_SKIP` flag for `TIMING_B` was used by mistake. This problem was fixed.

Also in SBC instructions `NODEDESC`, `BBY` and `BB`, if processing was skipped with `TIMING_C`, subsequent processing would fail. This problem was fixed.

2.4.3 Fixed Bug in g3dcvtr

When multiple `.imd` files were converted, the environment map codes would malfunction. This was fixed.

2.5   Changes in the 01/31/2005 Version

2.5.1   Support for Environmental and Projection Mapping

Added the `NNSi_G3dFuncSbc_ENVMAP` and `NNSi_G3dFuncSbc_PRJMAP` functions to support environment and projection mapping (orthogonal projection).

2.5.2   g3dcvtr Support for the NITRO Intermediate File Version 1.6.0

`g3dcvtr` now supports the NITRO intermediate file version 1.6.0. It will convert `.imd` files that contain environment maps and projection maps.

2.5.3   Addition of a Sample

A sample was added.

- The `EnvMap` sample: this is a sample that displays an environmentally mapped sphere.
- The `ProjMap` sample: this is a sample that displays a projection-mapped (orthogonal projection) sphere.

2.5.4   Various Bug Fixes

Fixed the bug in which the drawing was not performed properly because a portion of the data in the `.nsbmd` file output by `g3dcvtr` is invalid if classic scale off was configured with a weighted envelope model (Softimage3D or Softimage|XSI).

2.6   Changes in the 12/06/2004 Version

2.6.1   Added a Document Regarding the G3D Binary File Format

The binary file format used with G3D is described in `NitroSystem\docs\G3D\G3D_BinaryFormat.pdf`.

2.6.2   `g3dcvtr` Supports Specifications Added with NITRO Intermediate Files Version 1.5.0

Provided support for addition attributes for `<material>` and `<display>` elements added with Version 1.5.0 of the NITRO intermediate files.

2.6.3   Added a Sample

The Translucent sample was added. This sample involves the rendering of a model in which translucent polygons overlap.

2.6.4   Various Bug Fixes

- Fixed the bug where a thick object did not appear properly when a Y-axis billboard conversion was carried out on it.
- Improved binary generation for when a billboard is added to a joint with multiple `<display>` elements.
- Fixed the bug involving the calling of an incorrect callback when the `NNS_G3D_SBC_CALLBACK_TIMING_A_DISABLE` macro was defined and G3D was compiled.

2.7   Changes in the 11/10/2004 Version

2.7.1   Support for Partial Playback of Joint Animation

Added the `NNS_G3dAnmObjDisableID` and `NNS_G3dAnmObjEnableID` functions to support the playback of the joint animation in which only some of joints are animated.

2.7.2   Support for Fractional Frame Interpolation Playback in Joint Animation

If `linear` is specified for `<node_anm_info>::interpolation` in the `.ica` file, when the decimal part of the frame is specified, the joint animation is played back by performing linear interpolation with neighboring frames. To loop playback of the animation, `<node_anm_info>::interp_end_to_start` must be set to `ON`.

2.7.3   Increased Display Speed of Weighted Envelopes

Improved the implementation of the `NNSi_G3dFuncSbc_NODEMIX` function, and sped up the display of models that have weighted envelopes.

2.7.4   Added Accessor for NNSG3dRenderObj Structure and NNSG3dRS Structure

Added accessor for the `NNS_G3dRenderObj` and `NNS_G3dRS` structures.

2.7.5   Added Samples

Added samples.

- `PartialAnm1` — Plays a portion of the joint animation.
- `PartialAnm2` — Plays a portion of the joint animation; more complex than `PartialAnm1`.
- `SlowMotion` — Plays the joint animation in slow motion.
- `SharedMotion` — Plays the same joint animation resource as two models with different shapes.
- `ScreenUtil` — This is a coordinate transformation utility API sample. Converts from world coordinate system to BG screen coordinate system, or from BG screen coordinate system to world coordinate system.

2.7.6   Various Bug Fixes

- Fixed the bug found in the 10/12/2004 version that prevented the animation with alpha value for the material color animation to be played back properly.
- Fixed the bug that caused occasional generation of redundant animation data near the last frame if the frame step was set to 2 or 4 when converting `.ica` file with `g3dcvtr`.
- Fixed the bug that caused invalid playback when the frame step was set to 2 or 4 if there were frames with scale greater than or equal to 8 or less than or equal to 0.125 in the joint animation.
- Fixed the bug that caused the invalid display if the camera was far or close when using weighted envelopes because it caused the temporary variable being used in G3D to overflow.
- Fixed the bug that caused a part of the data to be output improperly when converting multiple `.imd` files into one `.nsbmd` file with `g3dcvtr`.
- Fixed the bug that did not take the alignment of the second and subsequent animation data properly when converting multiple `.ima` files with `g3dcvtr`.
- Fixed the bug that output the `pos_scale` value of `<model_info>` as the data that corresponds to the `pos_scale` value of `<box_test>` with `g3dcvtr`.

2.8 Changes in the 10/12/2004 Version

2.8.1   Added the Display of Weighted Envelopes

The `NNSi_G3dFuncSbc_NODEMIX` function was added and now models having weighted envelopes converted with `g3dcvtr` can be displayed. In addition, the `.nsbmd` file format has been extended, and `.imd` files must be converted again.

2.8.2   Changes to Callback Specifications

Callback specifications were changed. In some cases, they may not be compatible with previous versions.

- By using the `NNS_G3dRenderObjSetInitFunc` function, you can execute functions that use the `NNSG3dRS` structure as an argument immediately before rendering.
- By allocating an `NNSG3dRS` callback function pointer for each SBC instruction, one callback can be registered to each type of SBC instruction during rendering. This change makes it easy to use multiple callbacks.
- Callbacks cannot be called by specifying the address of an SBC instruction. Accordingly, the value of the third argument of `NNS_G3dRenderObjSetCallBack` is now invalid.
- The code inside a callback function that changes the callback conditions or the callback function itself must be changed. For details, see the callback4 and callback5 samples.

2.8.3   Tuning of Material Animation

The performance of material color animations and texture SRT animations was improved and the code was reduced in size. Fixed the bug that always enabled the specular reflection shininess table when a material color animation was executed.

2.8.4   Changes to the g3dcvtr Summary Display Format (.nsbma, .nsbtp, and .nsbta files)

The format of the summary display shown when `.nsbma`, `.nsbtp`, and `.nsbta` files are passed to `g3dcvtr` as arguments has been changed.

2.8.5   Added Samples

The following samples were added:

- `RecordMtx` — By using the `−s` option of g3dcvtr to convert an `.imd` file, the same process as the callback2 sample can be carried out without using callback functions.
- `ManualSetup` — Explains how to set up a loaded `.nsbmd` file without using `NNS_G3dResDefaultSetup`.
- `callback5` — Now that multiple callback functions can be registered, the sample that uses callbacks was added.
- `ShadowVolume` — Describes how to display shadow volumes using G3D.

- `Envelope` — Compares the display quality and performance of models with and without weighted envelopes.

2.8.6   Various Bug Fixes

- Fixed the bug that occurred when `NNS_G3dGeSendDL` was used while `GX_DMA_NOT_USE` was selected with NITRO-SDK's `GX_InitEx` function.
- Fixed the bug in which texture scaling became invalid when a textured model was created using SoftImage3D .
- Fixed the bug in which the light direction was set improperly with the `NNS_G3dGlbFlushWVP` function.
- Fixed the bug in which large textures were sometimes not displayed.

2.9   Changes in the 09/16/2004 Version

2.9.1   Added Function to Obtain the Current Matrix

Using the `NNS_G3dGetCurrentMtx` function, the current position coordinate matrix and direction vector matrix can be obtained.

2.9.2   Added NNS_G3dGlbFlushP, NNS_G3dGlbFlushVP, and NNS_G3dGlbFlushWVP Functions

The various functions that initialize the current matrix etc. before rendering were broken into three types. These functions differ only in how they set the current matrix, as described below.

- `NNS_G3dGlbFlushP` sets the projection transformation matrix as the current projection matrix, and combines the camera matrix and the modeling matrix and sets the resulting matrix as the current position coordinate matrix and the direction vector matrix.
- `NNS_G3dGlbFlushVP` combines the projection transformation matrix and the camera matrix and sets the resulting matrix as the current projection matrix and sets the modeling matrix as the current position coordinate matrix and direction vector matrix.
- `NNS_G3dGlbFlushWVP` combines the projection transformation matrix, the camera matrix and the modeling matrix and sets the resulting matrix as the current projection matrix and sets the identity matrix as the current position coordinate matrix and direction vector matrix.

Due to the above function differences, the current matrices obtained during rendering will be the camera coordinate system, world coordinate system and local coordinate system matrices, respectively. By using these three functions accordingly, the calculation such as multiplying inverse matrix can be omitted when obtaining necessary data.

The `NNS_G3dGlbFlushP` function works the same as the existing function, `NNS_G3dGlbFlush`. The same is true for `NNS_G3dGlbFlushWVP` and `NNS_G3dGlbFlushAlt`.

2.9.3   Added accessor for the NNSG3dGlb Structure

Added accessor functions that read from and write to the data in the `NNSG3dGlb` structure.

2.9.4   Changed g3dcvtr Summary Display Format (.nsbca and .nsbva files)

Changed the summary display format used when `.nsbca` files and `.nsbva` files are passed as arguments to `g3dcvtr`.

2.9.5   Various Bug Fixes

Fixed various bugs.

- Fixed the bug that caused `NNS_G3dDraw1Mat1Shp` to perform scaling incorrectly at times.
- Fixed the bug that caused `NNS_G3dDraw1Mat1Shp` to incorrectly draw models that use textures based on `TexCoord` source.
- Deleted unused code.

2.10   Changes in the 09/02/2004 Version

2.10.1   Added Functions to Draw Simple Object Quickly

Added the `NNS_G3dDraw1Mat1Shp` function which allows a simple object to be drawn quickly.

2.10.2   Improved the Error Display of g3dcvtr

Improved the error display of the error in the input XML file.

2.10.3   Dealt with the Problem with Geometry FIFO (09/01/2004)

Corrected the problem with Geometry FIFO.

2.10.4   Optimization

A display list that is shorter than 256 bytes is transferred via the CPU without using the DMA.

Because the output of `g3dcvtr` was improved, the stall period that is related to the DMA transfer of the display list was shortened.

2.10.5   Various Bug Fixes

Fixed the bug that caused the improper conversion of fully weighted envelope models with `g3dcvtr`.

Fixed the bug that the child node list output by `NNS_G3dGetChildNodeIDList` that was not correct.

Fixed the bug that did not play back the animation when multiple animations were added to the same rendering object.

2.11   Updates to the 08/10/2004 Version

2.11.1   Support for Material Color Animation

The library now supports the playback of material color animations.

2.11.2   Support for Texture SRT Animation

The library now supports the playback of texture SRT animations.

2.11.3   Various Bug Fixes

Fixed bugs in the texture matrix calculation, animation blending, and texture pattern animation, among others.

3 Known Problems

3.1 Limits on the Size of the Texture Block

The maximum size of the texture blocks contained in `.nsbmd`, and `.nsbtx` files is 524272 bytes. In other words, 16 bytes short of 512 kilobytes. The reason for this is that the size portion inside the VRAM key is a 15-bit field that has been left-shifted 4 bits.

3.2 Problem when Blending the Joint Animation that Includes Scale

When blending multiple animations that include scale animations (particularly those with strong Scales applied) with models that use the Maya SSC (Segment Scale Compensate), the blended scale may be inappropriate. To correct this problem, use the following countermeasures:

Use a model that does not use the Maya SSC when blending an animation that includes Scale.

- If doing so is impossible, try to blend the animation that does not have a strong Scale applied.

4 Future Plans

In the future, we may add:

- Addition of utility API
- Fine-tune performance