

LightWave® v9 Feature Highlights

Layout

Rendering

Major Core Changes to the LightWave Rendering Engine

The following changes have been made to the LightWave Render Core:

- Implementation of BSP/KD Tree Algorithm to achieve improved speeds as scene complexity rises
- Complete replacement of the original ray tracing core
- Any function that uses ray tracing calls will be significantly faster in most cases
- Improved multi-threading with dynamic segmentation to insure maximum use of available CPUs
- Typical speed improvements at 2.5x over LightWave version 8.5 for today's increasingly ambitious high-polygon count production scenes

The actual core of the LightWave rendering engine has been replaced with a modern implementation that reflects some of the latest developments in the CG industry. This new core allows for the addition of new rendering technologies, and lays a very strong foundation for the future. In addition to being higher quality, the rendering engine is now significantly faster for today's ambitious production needs - and the more complex the scene, the higher the speed differential!

Adaptive subdivision of a mesh based on distance from camera and visibility

- Added Adaptive Sub-division methods - Per Object, Per Polygon and Per Pixel
- Highly optimized mesh, tied to render resolution when using Per Pixel
- Visibly similar to micro-poly displacement
- Improvements to Sub-division surfaces
- Support for both LightWave Subdivision Surfaces and Catmull-Clark Subdivision Surfaces
- Subdivision level can be controlled via numerical values, envelopes, expressions, motion modifiers, textures, procedurals, gradients and more

Improvements have been made to sub-division surfaces (SDS) in Layout, including support for Catmull-Clark subdivision surfaces. A new subdivision control mode has been added, called Adaptive Pixel Subdivision, which provides the user with flexible control of subdivision and level-of-detail at render time. This approach has several benefits, such as significantly improved displacement performance, as the mesh is highly optimized. For example, if you are rendering an image and you set a pixel value of 4, then no polygon will have an area larger than 4 pixels in size. The value can also be set in the sub-pixel range (values below 1.0). This results in the ability to displace and deform with higher accuracy. While not true micro-poly displacement, this method will yield similar results in many cases.

Material Shader Node Editor - And New Shading Models!

LightWave v9 includes an integrated node editor to create complex shading networks or shader trees. Using new and improved LightWave shaders, the node editor allows the user to connect parameters of various shaders and operators together to create powerful shaders without any user coding required. Not just a face lift, the Node Editor is a completely new method of working with materials, which provides an order of magnitude more capability than LightWave's surface and material edit system previously offered.

The Node Editor also takes LightWave to a new level of flexibility in rendering. Until now, LightWave's renderer has used only the Blinn shading model with Lambert diffusion, but with version 9 now offers several additional shading models to choose from, including Phong, Cook-Torrance, Oren-Nayar, and new implementations of Blinn and Lambert. We've also added Anisotropic and SubSurface Scattering (SSS) shaders to the mix. These new shading models and functionality bring artists a greatly expanded range of control over the final look of the render, making it easier than ever for LightWave to provide precisely the look you want at render time.

- New Shading Models
- Normal Maps from Z Brush 2 Supported
- Branches can be imported and exported
- Math Animation Nodes
- Animated Gradient Node
- Work how you want to work: Layers in Nodes; Nodes in Layers; Layers Only; Nodes Only
- Full support of native controls and envelopes
- Available in Layout and Modeler, and maintains context when switching between the two
- Full SDK Support for third parties to create nodes (including shading models) and for third party renderers to interface with / query nodal shaders.

Node-based Displacement

Added Node-based displacement to the Object Properties displacement capabilities. Compatible with ZBrush 16-bit TIFF displacement maps.

Advanced Camera Tools

New rendering technology renders scenes using arbitrary camera lenses and warps. This allows for some fantastic effects, such as:

- Camera plane deformations
- Arbitrary projections
- UV map generation

- True orthographic rendering
- Space warp simulations
- Lens distortion duplicating physically accurate real world lenses or non-existent “imaginary” lenses
- 360 degree panorama rendering (one camera)
- And more

The Advanced Camera Tools camera lens shader system is a whole new way of rendering in LightWave 3D. Renders are no longer limited to the standard perspective camera. Instead, you can now create any type of camera lens you wish: Perspective, orthographic, fisheye, 360 degree panorama.

You can even render the scene as seen from the surface of a mesh. The lens shader gives you full control over what part of the scene is rendered for any part of the image.

Previously, effects such as these were achieved with post-process filtering, which caused artifacts, and degraded the overall quality of the image. Now, these effects are done mimicking actual light physics, resulting in a very high-quality result. However, no camera lens is perfect; the camera lens shader will let you reproduce that reality as well, by allowing you to create lens artifacts such as barrel distortions. Don't stop there, though. The lens shader will also allow you to create outlandish, impossibly warped and twisted views for that unique look when normal just won't do.

Timewarp – Time Re-mapping and Warping Shader

This shader remaps time for:

- Bullet-time
- Freeze-time
- Slow-motion effects
- Fast-motion effects

Timewarp manipulates time. Previously time has just been a steady clock ticking away at a certain number of frames per second. Now with Timewarp you can slow the clock down, speed it up, even wind it back, all during a single animation.

Timewarp can warp the time in a scene while keeping the camera unwarped. This will allow for unblurred camera motion, while retaining blurred motion of the action within the camera's field of view. Effects like bullet-time can be created in this way. Timewarp can also manipulate motion blur in new ways for special effects. You can now fly through a motion blur, without additional blurring from the camera's motion

CCTV Shader

CCTV is a shader that paints a view of the scene on a surface; render a view from a camera onto a surface, with controls for brightness, saturation and contrast:

- Create a closed-circuit TV display
- Simulate digital camera displays
- Render a view through binoculars and magnifying scopes
- Create holographic instances

HV Deformer: HyperVoxel Particle Displacement Shader

This shader stretches and squashes HyperVoxel particles based on particle properties and distance between particle and mesh. HV Deformer gives you new levels of control over HyperVoxel particles. With HV Deformer you can:

- Create more realistic looking pools of water
- Change the orientation of HyperVoxel particles arbitrarily
- Stretch and squash HyperVoxels based on the properties of individual particles
- Alter the size of HyperVoxels as a function of time, space, or distance to an object
- ...and much more.

More precisely, HV Deformer allows you to change the size, thickness (or flatness), and orientation of particles as a function of distance to object surfaces, particle properties, or any arbitrary envelope.

Stress Map

Modulates bump amplitude based on degree of dynamic local mesh deformation.

- Create wrinkles on bending joints
- Alter the color of a surface based upon polygon distortion

Stress Map makes more realistic, dynamic wrinkles. This is done by altering the degree of bump mapping used based on the amount of local polygon distortion. For example, when an arm is bent, wrinkles applied as a bump map become more pronounced around the joint, where the mesh is being squeezed. If the mesh is instead being stretched, the wrinkles will disappear.

Stress Map can also be used to alter the color of a surface based on how much a polygon has expanded or shrunk due to some distortion. This could be used to simulate the whitening of the skin as it is stretched, or to indicate areas where the mesh is being stressed.

Sketch Image Filter

This new image filter enables a render to be post processed with a sketch-like treatment.

New "Dissolve Ray"

LightWave v9 implements a new "dissolve ray". This is used to correctly implement the object dissolve feature when raytracing.

Z-Buffer Improvements

- Buffer Output to RGB can now handle Z Buffer values correctly. It also supports invert for screen mode now.
- Computation of Z-Buffers for classic anti-aliasing modes has been improved.

Realistic Fog:

New fog mode generates realistic fog that supports transparent, refractive and reflective objects inside the fog.

"Unaffected by Object" Alpha Channel mode

- "Unaffected by Object" Alpha Channel mode is now implemented for ray-traced transparency and the new camera modes.

Dynamics Improvements

- Faster Loading of Dynamics Scene Files
- Better Workflow with Access to Dynamics in the Scene Editor
- Improved Solving Precision
- More accurate representation of wind vector fields in Layout
- Animation Paths for Winds
- FXDynamic-Linker links objects to particles with smart routines that reduce memory requirements

Improvements in dynamics loading and solving, and workflow improvements including access via the Scene Editor make dynamics more attractive and easier to use. Higher precision in solver engines allow for better results right out of the box.

ParticleFX Improvements

- Particles have a new operation control -- random rotation and scale. This is also passed on to HyperVoxels, as noted above.
- Added a "Save All Selected Motions" option

Hypervoxels Improvements:

- Tuned for better performance with raytracing.
- Memory usage has been optimized. Gain is more noticeable as the number of particles increases - up to 40X less memory required.
- Improved rendering precision.

- Two new functions for use in conjunction with a new ParticleFX function: "Use Particle Orientation" and "Use Particle Scale".
- The HVs now make use of their rotated flag. Rotations have been simplified by calling a vector multiplication routine.
- Added "Orient Slices To Ray" setting for sprite HVs to the sprite basics panel. It orients the sprite's coordinate system with the ray, rather than the default of aligning with the camera, allowing the use of sprites in scenes where output from multiple cameras will be assembled for a panoramic view.
- HVs now can have their self-shadowing enabled and disabled again (you still have to enable ray traced shadows in the render options to get HV shadows).
- Hypervoxels are now calculated pixel by pixel in the new camera modes. Previously they were rendered in a separate pass.
- Refractions now work for non-blended HV surfaces.
- Shadows work now for non-blended surface HVs.
- The way HV volume shadows are activated as been simplified. They work just like all other inter-object shadows now.
- Removed the need to check the self shadow option for surface HV objects in order to use the internal HV self shadow option.
- HV surfaces can now render non-blended spheres correctly.

IK Booster

- Support fractional frames at make key for IK Booster
- Update Bake-able Match Goal Orientation for IK Booster

Pixie Dust

Allows for fast rendering of large numbers (order of 1 million) of simple volumetric particles.

Animation/Character Animation

Relativity 2

LightWave v9 includes the Relativity Expression Engine developed by Prem Design.

- Point-and-click set-up using "professors"
- Multiple levels of expressions: one object can reference another object with an expression on it, and so on.
- Expressions to react to IK-based motions
- Ease of navigation between multiple instances of Relativity, so mass updates of expressions can be done with ease
- Relative referencing of motion data (SELF, PARENT, ROOT, PREV, NEXT and relative referencing of a matched object name within a hierarchy), so it is possible to copy expressions between objects and have each know what it's supposed to do

- A number of higher level functions are included that can measure path distance traveled, sum up an item's channel values over time, determine optimal following distances, watch for events, etc.
- Functions to measure speed, acceleration, velocity, interpolation, etc.
- Comments can be embedded within expressions, so you don't end up totally confused when revisiting an expression set up a month or two ago
- Language is simple and easy to understand
- Includes a large set of "scratch variables" that allow complex setups of expressions
- Receive detailed feedback when errors are encountered
- Expression-based morphing and displacement, including complex morphing forms like traveling morphs, effector morphs, etc.
- Objects can follow points on other objects and morph between points on multiple objects, allowing higher-level "crowd control" with a series of morph targets.
- Textures can be used for displacement, deformation, color envelopes, etc.

Sticky

This new Item Motion plug-in allows an object to move on or by an offset distance across the surface of a target mesh.

Proximity

A new Proximity channel modifier modifies a channel based on closest distance between an object and a mesh or other items.

Quaternion Rotations

A new rotation controller offers quaternion rotations to minimize gimbal lock.

Align to Path

LightWave's Align to Path command now offers a robust new align-to-path algorithm, unaffected by very slow or no motion. The original Align to Path is still available, and is now renamed to more accurately describe its function, "Align to Velocity."

User Interface/Workflow Improvement

Mesh Editing in Layout

- Many modeling plug-ins now operate in Layout
- Use Vertex Paint in Layout to modify vertex maps
- Create Text in Layout

The core workflow has begun a radical new paradigm shift in LightWave. Many Modeler Plug-ins which operate on the entire mesh can now be used in Layout. In addition, the user can create text within Layout, speeding up motion graphics workflow. NewTek will be building more and more mesh-editing capabilities into Layout throughout the 9.x development cycle, eventually allowing the user to move the modeling process over to Layout very early, and continue refining the mesh, rigging the mesh, and adding and editing mesh weight and vertex maps directly from within Layout, saving many hours in the creation and animation process.

Workflow Improvements

Selection workflow has been enhanced with a new List Manager panel, available by clicking a new button by the Current Item popup. The List Manager allows fast selection of groups of items and quick and easy creation of selection sets. We've also cut the number of keystrokes required to custom-tailor nulls for your scene from 13 to 3 - and this is exemplary of the workflow speedups that NewTek will turn our concentration to for the forthcoming releases in the v9 cycle - fewer keystrokes, tool consolidation, and tool designs that optimize your productivity. ScreamerNet now offers the ability to abort rendering in progress.

Complete Re-implementation of Open GL in Layout

- Much faster UI performance
- Preview Lighting scenarios within the UI
- Less need for preview renders
- Hardware shading of materials and textures
- Hardware shading of procedural textures

LightWave v9 Layout fully supports the OpenGL 2.0 specification, leveraging the power of the latest graphics cards. New drawing modes provide new ways of interacting with scene objects and meshes, and provide for a faster turnaround of the creative process. Results from real time OpenGL shading very closely mirror the results of the LightWave rendering engine, which reduces the amount of test renders that are required. Lighting and materials can be previewed directly within the user interface with a much higher degree of accuracy than ever before.

UI Configuration

Now the user has more control over how the user interface appears and operates:

- the ability to change colors of almost any element; the ability to create special tabs with user defined commands
- the ability to change the colors of animation channels
- the ability to customize display and selection colors of points, edges and polygons
- the ability to control the display of polygon normals beyond what was previously available

View Renders and Image Files in UI Viewports

The user can now create a viewport viewer with full control in terms of context, placement and size.

You can:

- Create a Standalone Image viewer
- Create an Embedded Image viewer
- View texture images, renders, preview renders
- View as many images as you have memory for

File Format Support

TIFF importer now can load 8-bit and 16-bit of every flavor

Configuration Files

- A new configuration preset called "Studio Production Style" is now available. This is based on menu configurations developed over the years by VFX artist Richard Morton, and used at Station X, Digital Domain and other studios and artists worldwide.
- Initial Configs are now created when the application is first run, instead of by the installer, including automatically scanning plugins.
- Added user option settings for scanning plugins automatically, and for setting the number of rendering threads upon first launch of Layout or Modeler if the config file doesn't exist.
- Customization changes now affect the config file without requiring a shutdown of the Hub.
Layout General and Display Options Redesigned
- Improved logical grouping of elements
- New default options available for new and previously existing features.
- Path default options now available
- Reduced footprint with tabbed sections

New Render Status Panel

Improved layout, adds additional information about the render in progress.

- Current frame, segment and pass information
- Current Frame Point, Polygon and Memory Statistics
- Rendering status line with description of the current rendering activity
- Current frame and sequence time elapsed and time remaining
- Progress bars for both individual frames and sequences.
- Persistent data for last frame rendered and render time
- Status for 23 Render settings including Camera and Raytrace options
Render Globals
- All Render related controls on one convenient tabbed panel
- Option to use global or local settings for each camera
- Camera panel value displays toggle between global or local when user changes selection

Deformation Evaluation Order Controls

To enhance the capabilities of APS in combination with displacements, the ability has been provided to set the evaluation order of the built-in Displacement Map and Bump Displacement in the object properties' Deform tab. There are two dropdowns to set the order for the displacement map and bump displacement respectively.

Load-From-Scene System Redesigned

- Allows individual scene components to be selected from several pre-defined categories.
- Selection is available from a new panel with nested lists.

Scene Loading

- Layout Scene loading logic redesigned to improve loading time for scene
- Scene Editor loading logic redesigned to improve loading time for scenes using the Scene Editor

Modeling Improvements

Redesign of the Core Subdivision Surface Engine

These days, subdivision surfaces have become the standard by which most characters, props and environments are created. LightWave led the way with the first commercial implementation of subdivision surfaces. Now, LightWave sets the bar again, re-engineering the core algorithms for even faster speed, and better results. That means modeling in a shorter period of time.

Expansion of Subdivision Surfacing Tools with Edges and N-sided Polygons

In addition to making the subdivision surface engine faster and more efficient, the capabilities of the engine have been expanded to include the ability to use edges in the construction process, add weighting to edges which allows for sharp corners and creases with no additional geometry needed, and the ability to use polygons with greater than four sides in the process.

Edge Selection and Operation Added to Many Modeler Tools

Edge selection and operation are now allowed in many tools available within Modeler. This powerful addition to the Modeler toolset will allow the user new ways of creating and refining shapes, and improve productivity in the creation process. The capability will be extended throughout the Modeler toolset in coming releases.

New Modeler Tools

- Center Pivot tool
- Global Toggle Subpatch tool that preserves the user's selection when toggling subpatch mode.
- Set Sharpness, Increase/Decrease Sharpness tools for edge weighting adjustment.
- New improvements to Multishift, including operating across multiple layers

New LScripts

- Deuce LScripts: Contributed by Deuce Bennett: "Added 9 LScript tools that I have used in the past, want to share and make them part of LightWave. I also wanted these to be uncompiled LScripts so that others could learn just how easy some of these tools are to make."
- Flip it / Flip it Fast: These tools take the current geometry and "turn them inside out, then flip the polygons". Wrote these because most STL imports from CAD programs are correct, but mirror images of what they should be. Flipit gives you a choice of flipping axis, where FlipItFast does it only on the X axis.
- AbsoluteMeasure: select two points and this script will tell you exactly how far apart they are.

- CutSwapPaste/CopySwapPaste: Select a background layer, and the selected geometry on the foreground layer will be either copied and pasted or cut and pasted to the background layer.
- CopyUndoPaste: Takes the selected geometry copies it, undoes the last operation, and pastes the geometry down. Useful for quickly placing objects. Select a block, move it to a new location, hit "copyundopaste" and you have the block in the new location as well as the old one.
- MirrorX, MirrorY, MirrorZ: These are scripts that take away the many keystrokes to just mirror something across the "Zero" of the primary axes. It also merges points.

SDK Improvements

- Node Graph SDK, including the functions needed to add more shading models
- Access to information about new camera types
- Access to additional information from volumetrics
- The AnimUV, Camera and Nodes plug-in classes have been added to the support list of the LScript Object's server() method.
- Config files now allow loading and saving of double-precision integers (formerly only allowed floating-point)
- Modeler SDK updated with extensive list of new functions and improvements, including support for edge information for plug-ins, and elimination of redundant scanning for successive edit operations
- Many more improvements

Documentation Improvements

Reformatted documentation includes many improvements and additional material to help make LightWave easier to learn.