Introduction to Light Path Expressions

Light Path Expressions (LPEs) are useful for outputting light into specific AOVs. LPEs describe the transport of light through the scene, starting from a source of light, bouncing between objects and finally ending up at the camera. LPEs can be used to extract specific light contributions from Arnold into separate built-in or custom AOVs which can be output and recombined in various ways in a compositing package.

It is recommended that you familiarize yourself with Light Path Expression AOVs first.

The final scene can be found on the Learning Scenes page.

Built-in LPE AOVs

Custom AOVs

Light Groups and LPEs

Custom Shaders

Built-in LPE AOVs

LPEs are not particularly artist friendly, and so a list of built-in LPE AOVs are provided in Arnold. Below are some examples of the built-in light path expression AOVs that have been used in this scene.
Custom AOV with LPE 'C[T].'*L|O' entered in AOV node and viewed in Arnold RenderView
**Custom AOVs**

The built-in AOVs are suitable for most tasks. However, custom AOVs can give more control when using LPEs. For example, you can choose combinations of LPEs to use when rendering the scene.

**Example**

In the example below `C[ST].*C[LO]` renders Specular and Transmission `ST`. Diffuse `D` has not been used in this case, and therefore the background is not rendered as it only has a diffuse component.

Below are some further examples of LPEs used with Custom AOVs.
**Light Groups and LPEs**

It is also possible to output per light AOVs. Combining light groups with LPEs can be a powerful tool when compositing AOVs. By default, LPEs use all of the lights in the scene. We can limit the light contribution from single or multiple lights using light groups.

- In this case, we have used the following **AOV Light Group** names for each light: key light (white), rim light1 (*magenta*) and rim light2 (*blue*).

- We will add a custom AOV, for example, an "**RGBA**" prefix. The light group name for the blue rim light would therefore be "**RGBA_blue**".

RGBA has been used in this example, but you can use any other **LPE**.

- Now we can use the `<L.'groupname'>` syntax to isolate the specular reflection contribution from the blue light using the following expression:

  \[
  \text{C<RS}<L.'blue'>.\]

For light group AOVs, using `<L.>` is required instead of just `L`. 
Custom Shaders

We can restrict expressions to specific shader parameters. In the example below, \texttt{C<RS[^'coat']>*} has been used to render the scene without coating. The helmet shader is therefore not apparent in the rendered image when \textit{Coat} is at 1. However, specular (\texttt{RS}) is visible in the helmet when \textit{Coat} is below 1.
Helmet is invisible when its Coat value is 1 (rollover image for specular only)