

Integrators



Disco teapots, rendered using the PxrVCM integrator.

Integrators take the camera rays and return results to the renderer. For the main integrators these are estimates of the light energy (radiance) from the surfaces seen from the outside along the rays. These main integrators are responsible for computing the overall light transport, that is, light that travels from a light source through your scene from object to object (or through objects and volumes) to reach the camera. Interior integrators assist in specialized cases by handling the light within surfaces or volumes. We provide three main production quality integrators, though users can substitute their own.

[PxrPathTracer](#) implements a unidirectional path tracer. This combines information from the materials at the hit points with light samples to estimate direct lighting and shadowing, then spawns/shoots additional rays to handle indirect lighting. This works well with environment lights, and large direct light sources. Typically exterior scenes, scenes lit by dome lights/HDRI, and many typical visual effects shots are rendered with this integrator.

[PxrVCM](#) extends this with bidirectional path tracing. In addition to the paths from the camera, it traces paths from the light sources and tries to connect them. It can resolve complicated indirect paths that may be slow to converge with PxrPathTracer. In particular, it is designed to handle specular caustics. Caustics are an effect of light being refocused after reflecting or refracting off a surface. The above image illustrates both of these effects. If your scene requires these effects or you have complex lighting where some lights may be covered or hidden in fixtures, then the PxrVCM integrator is your most likely efficient choice.

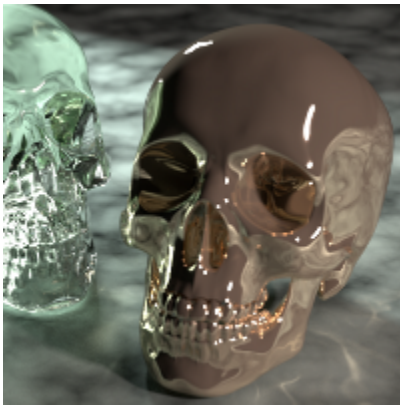
[PxrUPBP](#) improves on the PxrVCM approach by using multiple importance sampling (MIS) to combine different techniques in volume rendering: combining photon points, photon beams and ray paths to give good radiance estimates in both dense and sparse volumes. The name UPBP comes from "Unified Points, Beams, and Paths". This integrator excels at rendering many kinds of participating media including "God rays" and volume caustics. This integrator is an experimental Integrator included with, but not exposed automatically, in RenderMan integrations. This integrator can be used on the same types of scenes you'd find efficient for PxrVCM as well as scenes with volumes. These volumes can be anything from smoke and clouds to milk and explosions.

Examples

PRMan includes example RIB files and shaders demonstrating the integrators, at the heart of RenderMan. These examples can be found in the `/lib/examples/RIS/scenes` directory of your RenderMan Pro Server installation, in the `/spt` and `/vcm` subdirectories. Some of the examples are discussed in detail in the pages below. Whether or not you're inclined to open up a terminal window and render along, these pages serve as a broad overview of the features and capabilities of PRMan.



[Soho](#) - a teapot and emissive geometry in a volume, with reflections all around, this scene demonstrates improved volume sampling capabilities in a complicated lighting scenario. This example uses the [PxrPathTracer](#) integrator



[Skulls](#) - This example demonstrates the ability of the [PxrVCM](#) integrator to resolve complex light paths, in particular the specular-diffuse-specular that arise from reflections or refractions of caustics.