

Lesson 9 - Cameras

Types

Standard - Physical (photometric) and Target/Free (non-photometric)

Arnold – VR Camera and Cylindrical, Fisheye, Spherical

V-Ray – V-RayPhysicalCamera, V-RayDomeCamera

Physical – “Real” camera, exposure control managed separately at **EACH** camera

CTRL-C in a perspective view will create corresponding Physical Camera.

NOTE: Will NOT add “Physical Camera Exposure Control”, if absent.

Basic

Targeted – Default “On”. “Positionable” target object.

Target distance – Adjust numerically or with target sub-object

Show Cone (Default = visible when camera selected)

Show Horizon Line – Camera’s view. Non-renderable

Physical Camera

Film – Film width (default = 35mm)

Lens

Focal Length – Wide < 40-50mm < Telephoto

FOV (Field of view) - Angle of cone. Tied to focal length

Zoom – Crops without affecting lens

Aperture (f-stop) – Size of lens opening

Smaller f-stop = Larger opening ($1/\text{f-stop}$)

Affects DOF and/or “Manual Exposure” control

Focus (Depth of Field) – Must be enabled.

Use target or custom distance.

Smaller f-stop = Larger opening (aperture) = Narrows DOF

Shutter (Motion Blur) – Must be enabled

Type – Frames (seconds, etc...)

Duration – Range either side of frame shutter stays “open”

Only relevant when objects are in motion.

Lesson 9 – Cameras (cont...)

Physical (cont...)

Exposure

Exposure Gain

1. “Target” - Exposure Value (EV). Range is -100 to +100 (default = 6)
Interior = ± 10 , Exterior = ± 14 . Larger number = “squint”

$$EV = \log_2 \frac{N^2}{t}, \quad (N = f\text{-number}, t = \text{shutter speed in seconds})$$

More intense light needs a larger EV (Squint)

Recommended: Adjust EV ± 0.5 at a time.

2. “Manual” - Traditional camera settings. f-stop, shutter speed, ISO
f-Stop – “shutter” opening. Smaller # = larger opening
Shutter Speed – Time to open and close the “shutter”
ISO – Film speed (sensitivity to light) - 100=low, 1600=high

White Balance – Shifts temperature scale so value is neutral

Vignetting – Adds darkening around edges of frame

Perspective Control – Corrects perspective distortion (keystone)

Use “Auto...”

Adjust using “Lens Shift” & “Tilt Correction”

Miscellaneous

Clipping Planes - Must “Enable”

Near – “removes” geometry from camera to clip plane

Far – “removes” geometry from clip plane beyond

Target/Free – Non-physical cameras.

Target -” Positionable”

Free – Used for perpendicular views (i.e. elevations)

Lens/FOV or choose from Stock Lenses

Orthographic – Best used with “Free” camera to create plans or elevations

Exposure control must be set **globally**. - “Rendering/Exposure Control/Global...”

Some functions require Target/Free cameras (i.e. Perspective/Camera Match)

Lesson 9 – Cameras (cont...)

Arnold Cameras – Work only in Arnold renderer. Use “Global Exposure” control

VR Camera – Creates 360°, stereoscopic image. Place in orthographic view.

Mode – Arrangement of stereoscopic views, “Side by Side” (default)

Aspect ratio - 2:1 (i.e. 2000x1000). Higher resolutions best.

Spherical – Creates (non-stereo) 360° panorama image. No parameters.

Cylindrical – For creating horizontal panorama, up to (Horizontal FOV) 360°.

Fisheye – Creates extreme wide-angle (“Fisheye”) view, up to 360°

Viewport (Camera)

Dolly – Moves camera in/out along camera to target axis. Very useful.

Perspective – Moves camera while “maintaining” perspective. Used for tweaking.

Roll – Rotates camera on local axis

Orbit – Moves camera around target. Maintains camera-target distance

Truck – Pans (moves) camera

Field of View – Changes camera’s lens/FOV cone



Safe Frame – Displays proportion of rendering size in viewport

Click on viewport name (i.e. “Perspective”) and then “Safe Frame”

Lesson 9 – Cameras (cont...)

Backgrounds – Solid color, Environments, Rendering (Backplate) and Viewports

Color (“Rendering/Environment”) – Sets solid color.

Environment Map (“Rendering/Environment”)

Depends on rendering engine, lighting &/or exposure control.

1. Physical Sun & Sky Environment – REQUIRED with “Sun Positioner”
Automatically assigned with sun positioner
Covered in Lesson 5 (Basic Rendering)
Drag backwards into Materials Editor to adjust settings
2. Texture Map – “General” bitmaps and procedurals (typically gradients)
Incompatible with “Sun Positioner”
Use Arnold’s “Backplate” or Arnold’s Sun

Drag backwards into Materials Editor to adjust settings

MUST use “Environ” setting under bitmap’s “coordinates”
Non-HDRI images (i.e. JPG’s) use “Screen”
Can adjust cropping and offset

“Physical Exposure Control” will manage
Adjust map’s “Output Amount” in Material Editor

Rendering (Backplate) – Arnold-only (“Arnold Renderer” tab in “Render Setup”)
Overrides “Color” & “Environment Map” in “Environment & Effects”

“Scene Environment” (default) – Renders “Environment” (map/color)
“Custom Color” – Solid color
“Custom Map” – Renders “Texture Map” (bitmap or procedural)

Viewport – “Views/Viewport Background/Configure...”

Environmental may assign to viewport.

Viewport background can differ from environmental map

Set renderer’s output size to match proportion of image size
Lock “Image Aspect Ratio”
Activate viewport’s “Safe Frame”

Lesson 9 – Cameras (cont...)

Rendering with backgrounds in Arnold:

1. Under “Rendering/Environment & Effects”, Check the “Environment Map”
2. IF occupied by “Physical Sun & Sky”, right-click and “Clear”
3. If/When “Environment Map” = “None”, Click and add “General/Bitmap”
4. Drag this Map back to the Material Editor & “Instance”
5. Verify that “Environ” is active and “Mapping:” is set to “Screen”
6. Set rendering output size to background bitmap’s size.
7. Lock “Image Aspect Ratio” and reduce “Width/Height” to speed up testing
8. Activate “Safe Frame”
9. Bitmap should appear in viewport. Use “Offset” to adjust position

Additional steps IF using the “**Sun Positioner**”:

1. Open the “Render Setup” dialog box. Click on the “Arnold Renderer” tab.
2. Click on the “Environment, Background, & Atmosphere” rollout
3. Change “Background (Backplate)”, “Source” to “Custom Map”.
4. Drag and instance background bitmap from Material Editor to slot below
5. Place (or if present, select) the “Sun Positioner”
6. In the “Sun Position” rollout, click “Install Sun & Sky Environment”

Proceed with testing

1. Render
2. Depending on Light level & EV, adjust bitmap’s “Output Amount”
3. Using a sun will likely require output amount of around ± 50 .

Shadow Matte – Arnold Renderer

Material will render background rather than geometry

Use “Map to Material” (“Arnold/Surface”) with “Shadow Matte” as the map

Parameters:

Shadow - Material receives shadows (default)

Color and opacity - Color and density of shadow

Alpha Mask – Object contributes to alpha (transparency)

Specular – Material reflects if enabled (checked)

Roughness & IOR – same as with materials

Intensity – Intensity of reflection

Grainy shadows and reflections:

“Render Setup/Arnold Renderer” tab

“Samples (Quality):” under “Environment Lighting & Reflections”

Lesson 9 – Cameras (cont...)

Perspective Matching – Creating a virtual camera that matches background image

Camera + Model = Image
Camera + Image = Model
Model + Image = Camera

Rendering
Photomodeling
Perspective Matching

Three mechanisms – “Eye-balling”, Perspective Match and Camera Match

1. “Eye-balling” – Placing and manually adjusting view to match perspective
Not accurate, but easy, especially with an empty site.
More difficult as match becomes more complex

Camera - Can create camera first and then move/adjust.

Perspective View – Use viewport controls/mouse.

“Ctrl-C” to create physical camera.

Will need to manually add “Physical Camera Exposure Control”

2. Perspective Match – Matching of camera against background image.
Typically used to build/place models in front of the camera

Preparation:

1. Create a “Free Camera”, **NOT** “Target” or Physical”.
2. Activate the camera’s viewport
3. Place desired image in the background (see previous page)
4. Set rendering size to background image’s proportions
5. Activate viewport’s safe frame

Tool:

1. Initialize - Utility tab & “Perspective Match”
2. Click “Show Vanishing Lines”

Two each of X, Y and Z vanishing lines.

Follows RGB = XYZ

Align lines to corresponding axes in image

3. In viewport, align “vanishing lines” to background image

Lesson 9 – Cameras (cont...)

2. Perspective Match (cont...)

Tweaks:

Import model and make it (or a portion of) the anchor point
Use “Camera Adjustment” spinners to aim camera at any geometry
Camera adjustments work **ONLY** in camera viewport
Wireframe can help visualize
May use camera viewport controls, but carefully.
Make sure “Allow Distorted View” is unchecked

To create a “physical camera”:

1. Change view to “Perspective” or type “P”
2. Type “CTRL-C” to convert to a physical camera
3. If perspective jumps, wait to tweak “physical camera”

3. Camera Match - Accurate matching of model against image.

Creates “Free” camera.

1. Preparation

Prepare the Background Image - Take picture. Color correct, etc...
Tip. Create matching image with dots on “cam points”

Prepare the existing Model
Build an accurate model of what’s visible in the image
“Mass model” is usually sufficient.

Combine in 3DS Max

1. 3D Model – Import or Link
2. Image - Place in viewport background
Directly if using the Sun Positioner.
All others, place as “Environment Map”

Set rendering size to background image size
Lock “Image Aspect Ratio”
Adjust (lower) width to speed up testing

Lesson 9 – Cameras (cont...)

3. Camera Match (cont...)

2. Matching Perspective

“CamPoints” – Sub-category of “Helpers” in the Command Panel

Click on **3D** points of model that appear in the background

Must set and use Osnaps for accuracy (endpoint works well)
Minimum of **FIVE** points. 8-10 typical.

Organization is important (name those cam points)

Camera Match – Utility Tab (click “More...” button)

Chose a listed campoint under “CamPoint Info”

Click the corresponding spot in viewport background image

Repeat for the other campoints

Click “Create Camera”

Activate camera’s viewport (remember view is “Perspective”)

Errors - Biggest is mixing up 3d points and 2d image points.
Also too few points or too many points in single plane

Tweaking – Use Camera viewport controls

“Perspective”, “Dolly” and/or “Field-of-View”

Try one at a time first, rather than all three

If one does not work. Make an additional camera

3. Rendering

Shadow Matte map works well to mask existing geometry

Try to mimic light angle(s) with existing image’s lighting

Reset rendering size to background image’s size

4. Compositing - Photoshop

From original image, isolate any foreground elements

Place on top layer(s)