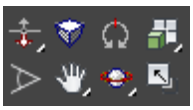
Tutorial 6: Rendering 1

Contents

Navigating Camera and Light Views

The Camera and Light view navigation buttons are the same with a few exceptions. The buttons are visible when a viewport with a Camera or Light view is active. The Camera and Light view navigation buttons do more than adjust your view. They transform and change the parameters of the associated camera or light object.



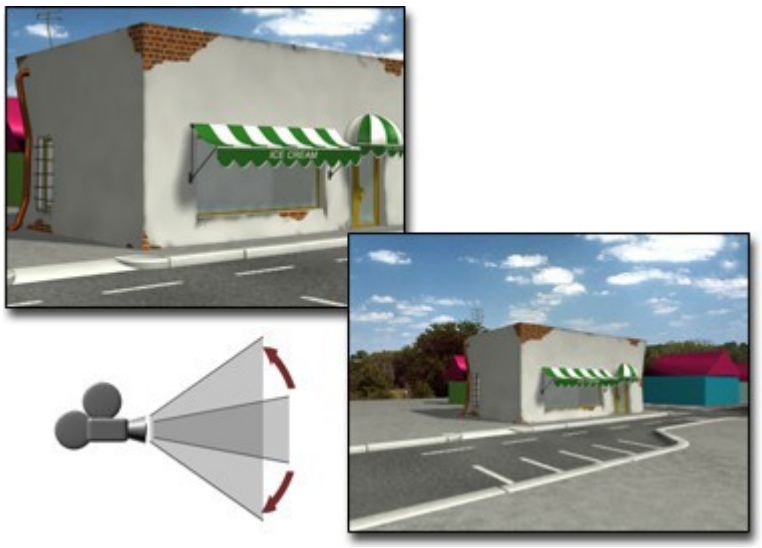
The camera navigation buttons

Light views treat the light (spotlight or directional light) as if it were a camera. The light falloff is treated the same as the camera field of view.

Keep in mind the following:

- Using the Camera and Light viewport navigation buttons is the same as moving or rotating the camera or Light, or changing their base parameters.
  Changes made with Camera or Light view navigation buttons can be animated the same as other object changes.

Zooming a Camera or Light View



Zooming a camera

 You zoom a camera view by clicking FOV and then dragging in the Camera viewport.

The field of view defines the width of your view as an angle with its apex at eye level and the ends at the sides of the view. The effect of changing FOV is exactly like changing the lens on a camera. As the FOV gets larger you see more of your scene and the perspective becomes distorted, similar to using a wide-angle lens. As the FOV gets smaller you see less of your scene and the perspective flattens, similar to using a telephoto lens.

 Click Light Hotspot for a light viewport to achieve the same effect as zooming.

The hotspot is the inner of the two circles or rectangles visible in a light viewport. Objects inside the hotspot are illuminated with the full intensity of the light. Objects between the hotspot and falloff are illuminated with decreasing intensity as objects approach the falloff boundary.

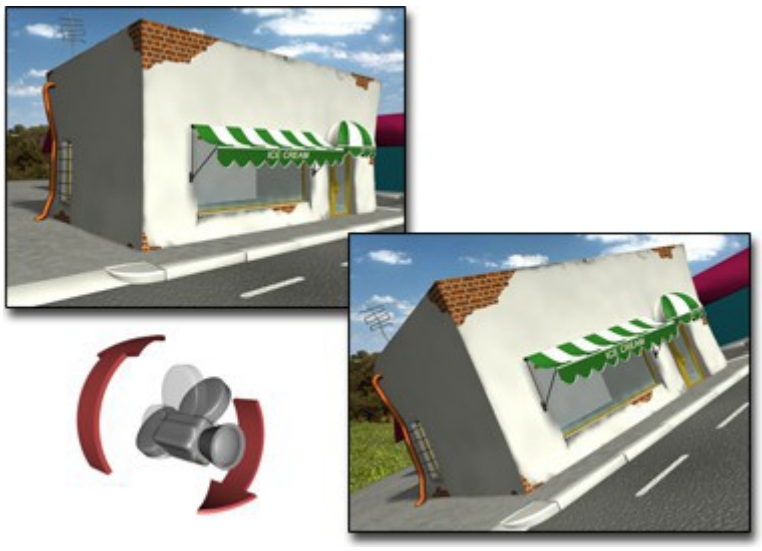
Moving a Camera or Light View

You move a camera or light view by clicking one of the following buttons and dragging in the camera or light viewport.

-  (Dolly) moves the camera or light along its line of sight.
-  (Truck) moves the camera or light and its target parallel to the view plane.
-  (Pan) moves the target in a circle around the camera or light. This button is a flyout that shares the same location with Orbit.

   (Orbit) moves the camera or light in a circle around the target. The effect is similar to Orbit for non-camera viewports.

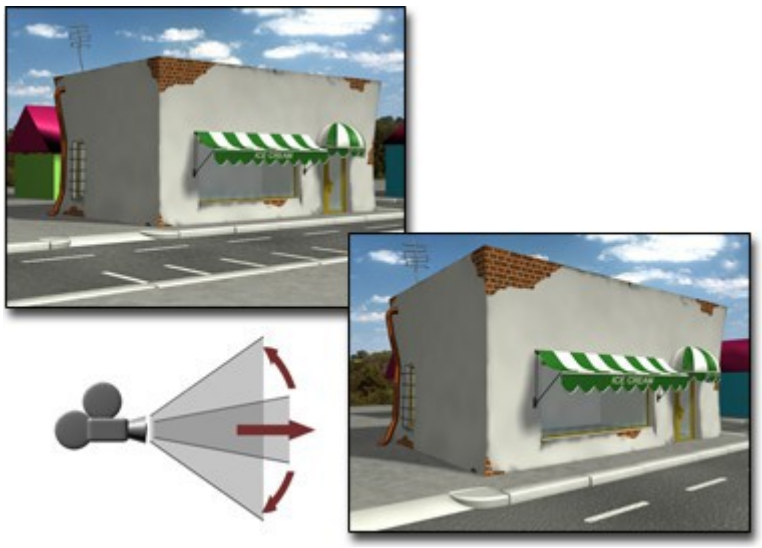
Rolling a Camera or Light View



Rolling a camera

 Click Roll, and drag in a camera or a light viewport to rotate the camera or light about its line of sight. The line of sight is defined as the line drawn from the camera or light to its target. The line of sight is also the same as the camera's or the light's local Z axis.

Changing Camera Perspective



Changing perspective

 Click Perspective, and drag in a camera viewport to change the Field of View (FOV) and dolly the camera simultaneously. The effect is to change the amount of perspective flare while maintaining the composition of the view.

Open "Introduction to Lighting – 01 Standard Lights, and Viewport Setup.max"

In Render Setup->Renderer, choose "NVIDIA mental ray". Since Renderer calculate lights, different Renderer will have different calculations for rendering.

Render Production: Actual rendering

Rendered Frame Window: brings up the window you just rendered (maybe halfly rendered ones)

Create->Lights->Standard Lights->Omni (in all directions, no need to have target)

Render again to see the difference.

Setup the viewport closer to render:

1. In the third bracket [], choose "Realistic" (include lightings and shadows)

2. In the third bracket [], choose Lighting and Shadows->illuminate with Scene lights (illuminate with Default lights is for the case where no light is placed)

Viewport is calculated on GPU (real-time render, for game, 60 frames per second)

Render is calculated on CPU (software render)

They are two different systems, may not match perfectly.

Create->Cameras->Target Camera

FOV (Field of View): related to focal length of Lens

shorter Lens, wider FOV

- For short lens (15mm, 20mm)
    - since lens is convex, objects closer to the lens is a bit distorted
    - also, farther objects become exaggeratedly smaller, closer objects become exaggeratedly larger
    - short lens is for scenery or interior use
- 85mm for people portraits
- long lens for architecture or moon

Create two cameras shooting at the woman, one is 20mm and the other one is 85 mm.

Zoom closer to the woman's head with similar size, see the difference of the background.

1. Shooting with 20mm Camera

2. Shooting with 85mm Camera

Lights

Lights are objects that simulate real lights such as household or office lamps, the light instruments used in stage and film work, and the sun itself. Different kinds of light objects cast light in different ways, emulating different kinds of real-world light sources.

-  Create panel >  (Lights)

When there are no lights in a scene, the scene is shaded or rendered with default lighting. You add lights to give the scene a more realistic appearance. Lighting enhances the clarity and three-dimensionality of a scene. In addition to general lighting effects, lights can be used to project images.

Light objects *replace* the default lighting. As soon as you create a light, the default lighting is turned off. If you delete all the lights in the scene, default lighting is turned back on. The default lighting consists of two invisible lights: one is above and to the left of the scene, and the other is below and to the right.

Types of Lights

3ds Max provides two types of lights: photometric and standard. All types are displayed in viewports as light objects. They share many of the same parameters, including shadow generators.

Photometric Lights

Photometric lights use photometric (light energy) values that enable you to more accurately define lights as they would be in the real world. You can set their distribution, intensity, color temperature, and other characteristics of real-world lights. You can also import specific photometric files available from lighting manufacturers to design lighting based on commercially available lights.

Tip: For the most physically accurate, photorealistic lighting, use Photometric lights and the mental ray renderer. When you render with mental ray, use Final Gather and the mental ray Photographic exposure control. With this setup, you also can do lighting analysis of your model.

Standard Lights

Standard lights are computer-based objects that simulate lights such as household or office lamps, the light instruments used in stage and film work, and the sun itself. Different kinds of light objects cast light in different ways, simulating different kinds of light sources. Unlike photometric lights, Standard lights do not have physically-based intensity values.

Tips

- You can animate not only the location of a light, but also its color, intensity and some other creation parameters.
- A Light viewport can be a useful way to adjust lights other than omni lights.
- To simulate sunlight, use a daylight or sunlight system, which allows you to set the date, time, and geographic location of your model. The daylight system is photometric, while the sunlight system uses a standard directional light.

Standard Lights

Standard lights are computer-based objects that simulate lights such as household or office lamps, the light instruments used in stage and film work, and the sun itself. Different kinds of light objects cast light in different ways, simulating different kinds of real-world light sources. Unlike photometric lights, standard lights do not have physically-based intensity values.

For parameters specific to a particular kind of light, see the description of that light type. Parameters specific to standard lights in general, as well as rollouts specific to spotlights and directional lights, are described in this section.

Topics in this section

- **Target Spotlight**
  A spotlight casts a focused beam of light like a flashlight, a follow spot in a theater, or a headlight. A target spotlight uses a movable target object to aim the light.
- **Free Spotlight**
  A spotlight casts a focused beam of light like a flashlight, a follow spot in a theater, or a headlight. Unlike a targeted spotlight, a Free Spot has no target object. You can move and rotate the free spot to aim it in any direction.
- **Target Directional Light**
  Directional lights cast parallel light rays in a single direction, as the sun does (for all practical purposes) at the surface of the earth. Directional lights are primarily used to simulate sunlight. You can adjust the color of the light and position and rotate the light in 3D space.

- **Free Directional Light**
  Directional lights cast parallel light rays in a single direction, as the sun does (for all practical purposes) at the surface of the earth. Directional lights are primarily used to simulate sunlight. You can adjust the color of the light and position and rotate the light in 3D space.
- **Omni Light**
  An Omni light casts rays in all directions from a single source. Omni lights are useful for adding "fill lighting" to your scene, or simulating point source lights.
- **Skylight**
  The Skylight light models daylight. You can set the color of the sky or assign it a map. The sky is modeled as a dome above the scene.
- **mr Area Omni Light**
  The area omni light emits light from a spherical or cylindrical volume, rather than from a point source, when you render a scene using the mental ray renderer. With the default scanline renderer, the area omni light behaves like any other standard omni light.
- **mr Area Spotlight**
  The area spotlight emits light from a rectangular or disc-shaped area, rather than from a point source, when you render a scene using the mental ray renderer. With the default scanline renderer, the area spotlight behaves like any other standard spotlight.

Open "Introduction to Lighting - 02 Intensity, Colour, and Attenuation.max"

- Change the viewport to Left view.
- Add a Target Spot light for the object on the left. (Create->Lights->Standard Lights->Target Spotlight)
- Add a Omni light inside the object in the middle. (Create->Lights->Standard Lights->Omni)
- Add a Omni light to the top right of the object on the right. (Create->Lights->Standard Lights->Omni)
- Change the viewport to Top view.
- Add a Physical Camera on the bottom left targeted at the three lights.

For light settings: brightness, color, attenuation, size

1. Brightness is set at Intensity/Color/Attenuation->Multiplier

2. Color is next to Multiplier

3. Far Attenuation->tick "Use"; End radius indicates how large the light is, after End radius, the light is chopped off; the Start radius is the starting point where the light starts to decay until End radius. If Start and End is really close, the End is chopped off sharply.

Decay Type: inverse square (stronger decay)

only mr Area Spot and mr Area Omni can set size of the light. "mr" stands for "mental ray".

Create mr Area Spot light.

Modifier->Area Light Parameters->Type->Disc->Adjust Radius

The larger the light, the softer the shadow. (Try rendering to see the difference.)

For Spotlight setting->Spotlight Parameters:

Hotspot/Beam is same as Start radius; Falloff/Field is same as End radius

Open "Introduction to Lighting – 3 Shadow.max"

There are 5 types of Shadows (under General Parameters rollout), but actually only two are useful (Shadow Map and Ray Traced Shadows).

Shadow map does not support transparency.

Ray Traced Shadows take more time for calculations.

The position of shadow cannot be set, only determined by the position of the light.

Select Shadow Map:

1. Bias (under Shadow Map Params rollout) setting affects where the shadow starts, the logical reason behind may be due to for large objects, no need to start so close to the object==>save some calculations.

2. Size: pixels used to render the shadow

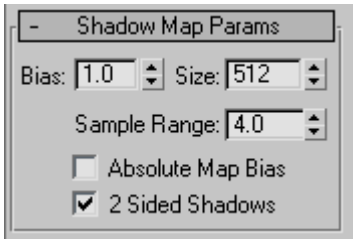
3. Sample Range: how soft the shadow is

Shadow Map Parameters Rollout

The Shadow Map Parameters rollout is displayed when you have chosen shadow mapping as the shadow-generation technique for a light. You select this in the General Parameters rollout.

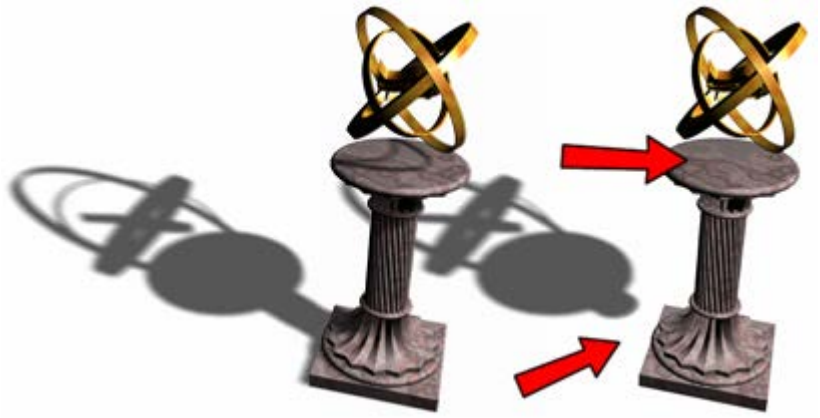
-  Create a light. > General Parameters rollout > Shadows group > Choose Shadow Map. > Shadow Map Params rollout
- Select a light. >  Modify panel > General Parameters rollout > Shadows group > Choose Shadow Map > Shadow Map Params rollout

Interface



Bias

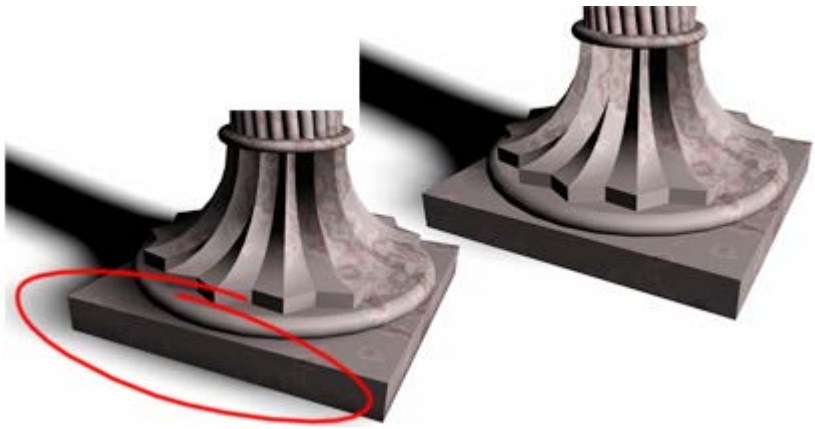
Shadow bias moves the shadow toward or away from the shadow-casting object (or objects).



Left: Default shadows

Right: Increasing the Bias value separates the shadow from the object.

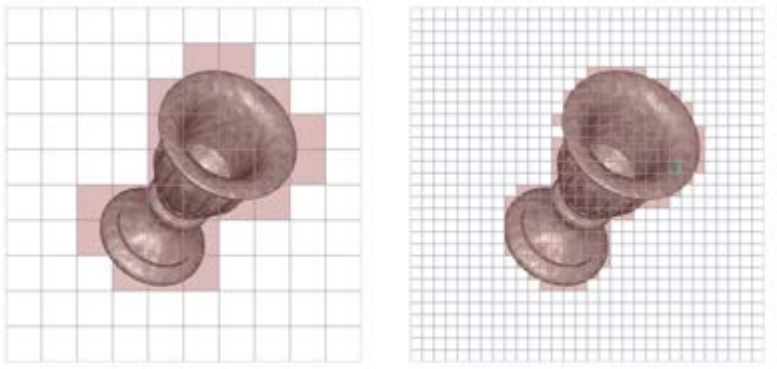
If the Bias value is too low, shadows can "leak" through places they shouldn't, produce more patterns or making out-of-place dark areas on meshes. If Bias is too high, shadows can "detach" from an object. If the Bias value is too extreme in either direction, shadows might not be rendered at all.



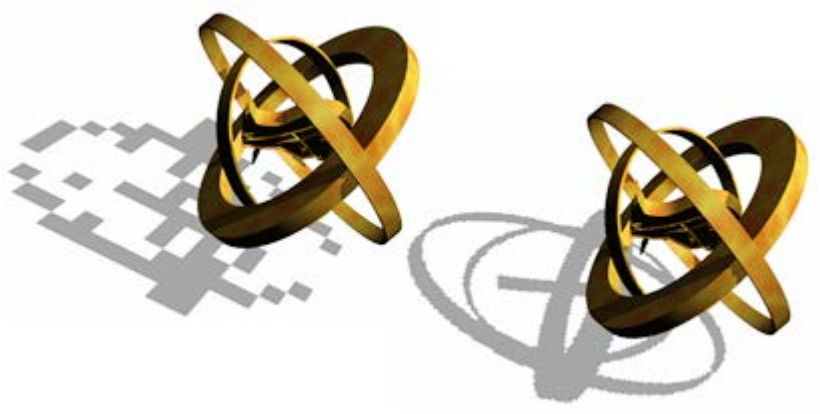
Left: Too small a Bias value causes shadow “leaks.”
Right: Increasing the Bias value fixes the problem.

Size

Sets the size (in pixels squared) of the shadow map that's computed for the light.



The shadow map size specifies the amount of subdivisions for the map. The greater the value, the more detailed the map will be.

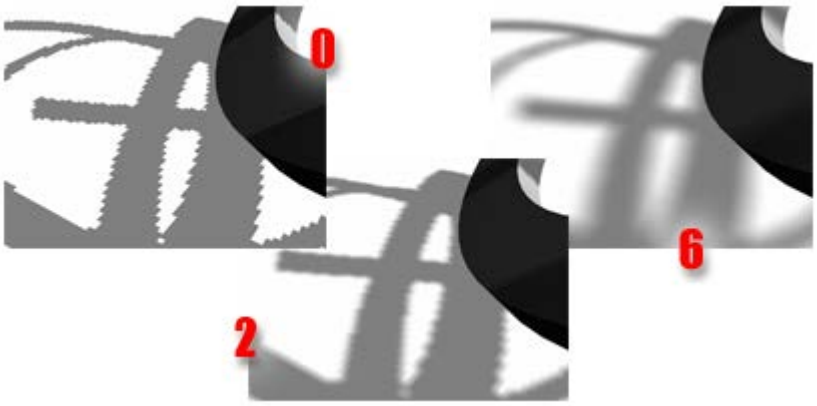


Left: Size set to 32.

Right: Size set to 256.

Sample Range

The sample range determines how much area within the shadow is averaged. This affects how soft the edge of the shadow is. Range=0.01 to 50.0.



Increasing the Sample Range blends the shadow edges and creates a smooth effect, hiding the granularity of the map.

Exercise 1 (Apartment)

Open “Apartment - Start.max”

1. Create mr Area Omni (Create->Lights->Standard Lights), move to the center rooftop of the apartment.

2. Go to Modifier panel -> Area Light Parameters, change the radius to 20cm (larger size)

3. Under Intensity/Color/Attenuation rollout, Multiplier->10.0, Decay Type->Inverse Square

4. Under General Parameters->Shadows, click "Exclude...", select Roof to be excluded

5. Create mr Area Spot (Create->Lights->Standard Lights), move to shine on the kitchen from the dining room

6. Under Intensity/Color/Attenuation rollout, Multiplier->0.2

7. Under Spotlight Parameter, Hotspot/Beam->smaller (8.5), Falloff/Field->larger (37.5)

8. Under General Parameters->Shadows, untick "On" so that no shadow will be casted (perfect for indirect lighting)

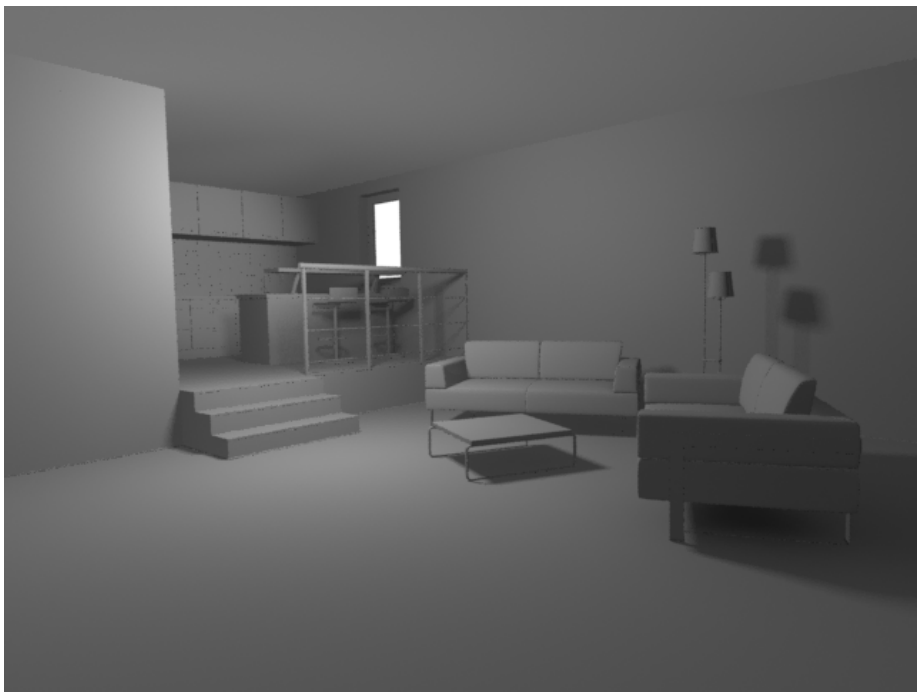
9. Create another mr Area Omni, move to the center floor (for lighting up the roof)

10. Go to Modifier panel, under General Parameters->Shadows, untick "On" so that no shadow will be casted (No Shadow)

11. Select "None" for Decay Type (Under Intensity/Color/Attenuation).

12. General Parameters->Shadows->Exclude..., choose "Include", select "Roof" to be included

13. Click “Render Production” for the Camera view to see the effect. Your result should look like the figure below.

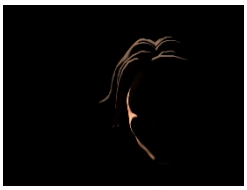


Exercise 2 (Maxine Three Point Lighting):

Follow the steps to create Key light, Fill light and Back light for the girl.

1. Key Light

2. Fill Light



3. Back Light

4. All together

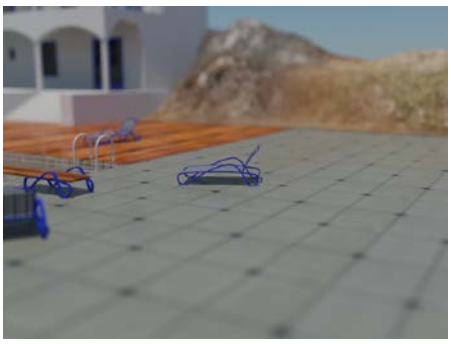
The Safe Frame provides a guide to help avoid rendering portions of your image that might be blocked in the final output.

Safe frame borders show which portions of a viewport will be visible when rendered to video.

Exercise 3 (Depth of Field):

Follow the steps to render a picture with depth of field.

1. Rendered without Depth of Field applied



2. Rendered with Depth of Field applied