Modelação e Visualização Tridimensional em Arquitetura

Visualização em Arquitetura

Iluminação Natural e Artificial

Victor Ferreira, Prof. Associado

Visualização em Arquitetura

Iluminação

Victor Ferreira, Prof. Associado

Architecture: Lighting

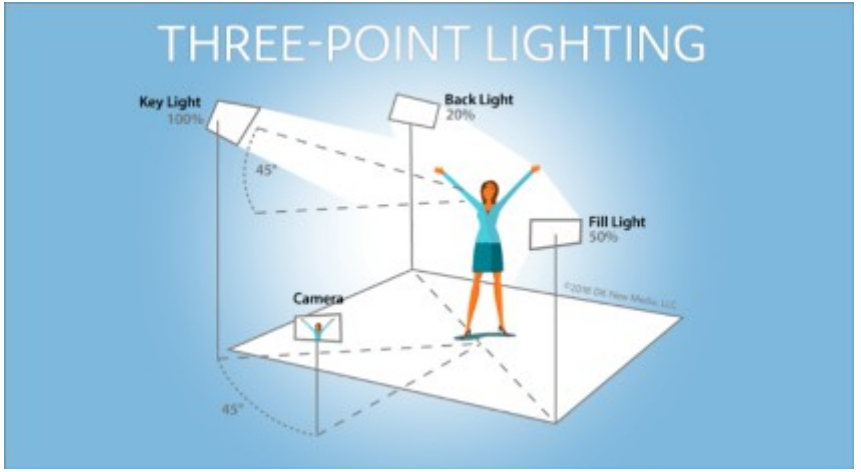
Lighting Strategies:

Three-Point Lighting: A classic setup involving a key light (main light), a fill light (softens shadows), and a backlight (separates the subject from the background).

Natural Lighting: Mimic the lighting conditions of the real world, considering the position of the sun, time of day, and environmental factors.

Global Illumination (GI): Simulates indirect lighting by considering light bounces and reflections. Techniques like ray tracing and radiosity contribute to realistic scene illumination.

HDR (High Dynamic Range) Lighting: Uses HDR images to provide a wide range of lighting intensities, capturing realistic lighting conditions.

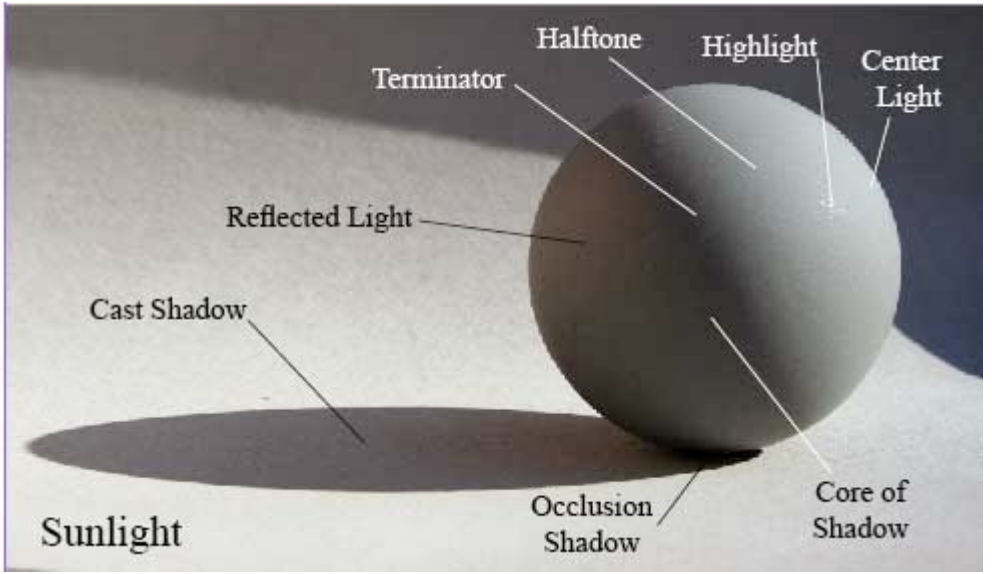


Lighting and lights in Digital Rendering:

In digital rendering, lighting plays a crucial role in creating realistic and visually appealing images. **Lights are used to simulate the behavior of light** in the real world, interacting with 3D geometry to produce the final rendered result.

Interaction with Geometry:

Lights interact with 3D geometry to create highlights, shadows, and various lighting effects. The interaction is influenced by the **material properties** of the surfaces, including reflectivity, transparency, and specularity.

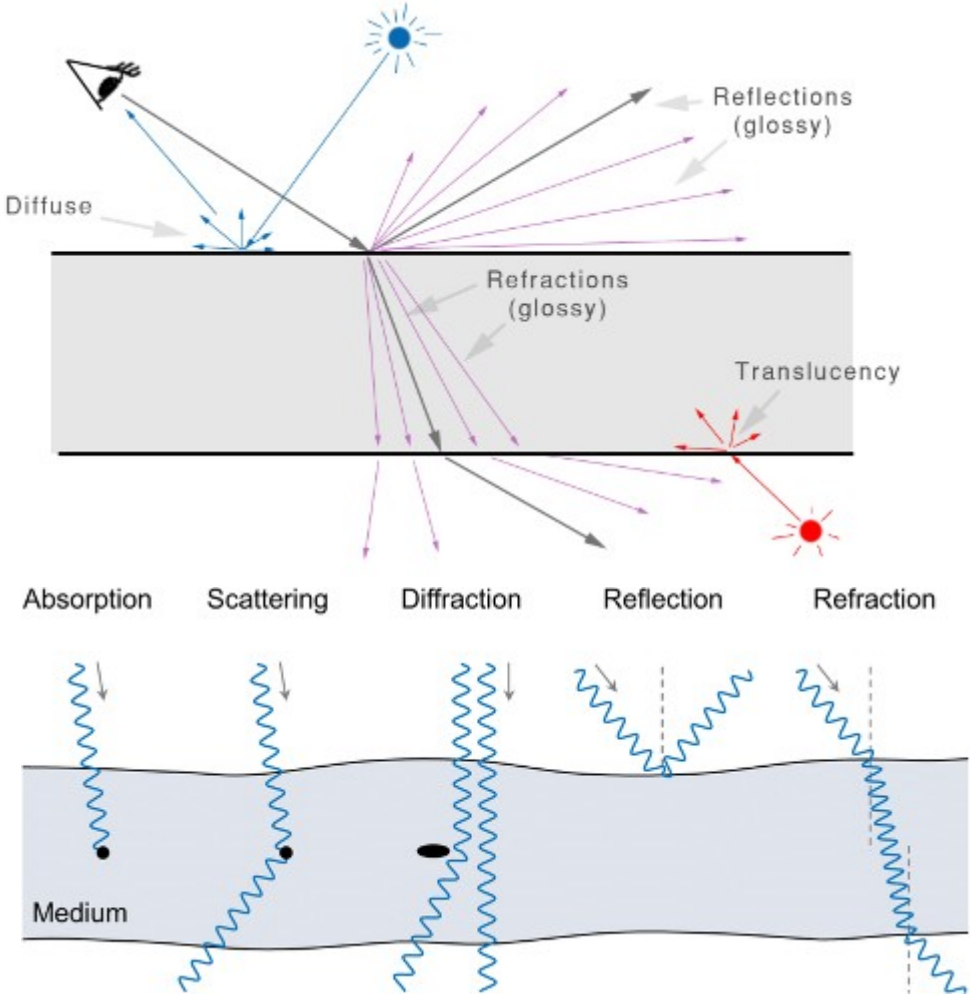


Texture and Material Interaction:

Lights interact differently with various materials.

Specular highlights are more pronounced on reflective surfaces, while diffuse materials scatter light more evenly.

Bump maps, normal maps, and displacement maps affect how light interacts with surface details, enhancing realism.



HDRI Lighting (image based lighting): works by applying a high dinamic range image map (HDRI map) onto an environment light, surrounding the 3D scene (providing ilumination, reflections and background at the same time).

What is an HDRI Map?
https://www.lightmap.co.uk/blog/whatisanhdrimap/

How to make an HDRI Map?
https://www.lightmap.co.uk/blog/howdoyoumakeahdrimap/

Common Types of Lights:

Point Lights: Emit light uniformly in all directions from a single point. They are often used to simulate light bulbs.

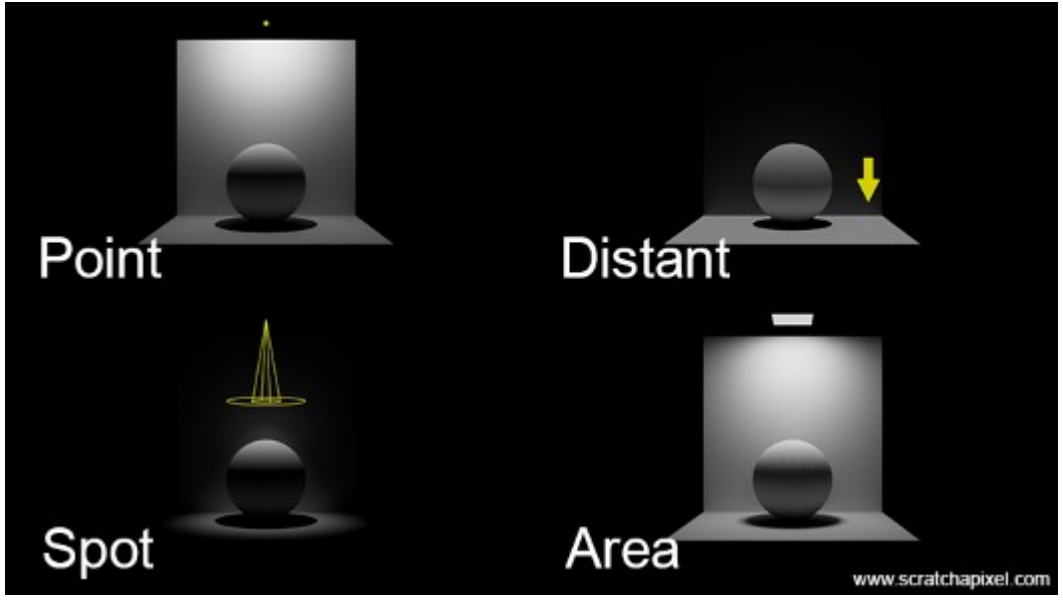
Directional Lights: Emit light in a specific direction, but the rays are parallel. They are commonly used to simulate sunlight.

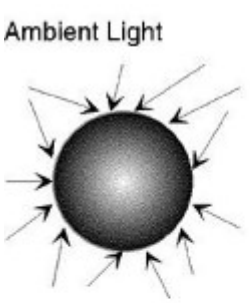
Spotlights: Emit light in a cone shape, allowing for focused illumination. Useful for creating highlights or emphasizing specific areas.

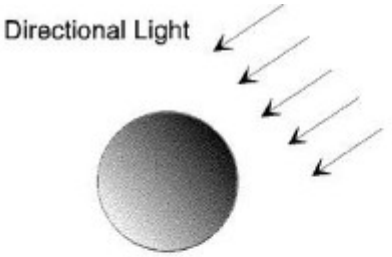
Area Lights: Represent light sources with an extended surface, providing soft and realistic shadows.

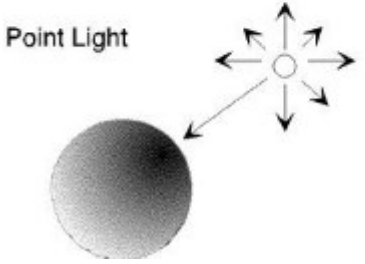
Ambient Lights: Contribute to overall scene illumination, simulating indirect lighting from surrounding surfaces.

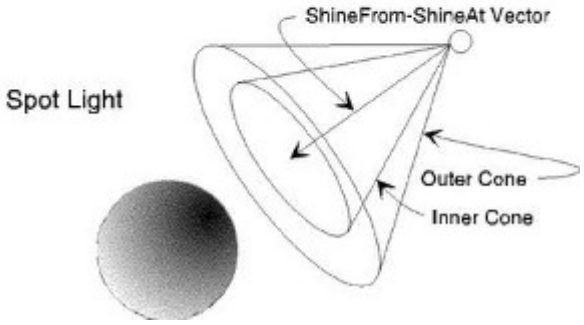
IES Lights (Photometric lights): IES stands for Illuminating Engineering Society. They are based on photometric data, which is a **detailed description of how a particular lighting fixture emits light**. This data is tipically provided by the manufacturer of the lighting fixture in the form of an IES file.


Point
Distant
Spot
Area
www.scratchapixel.com

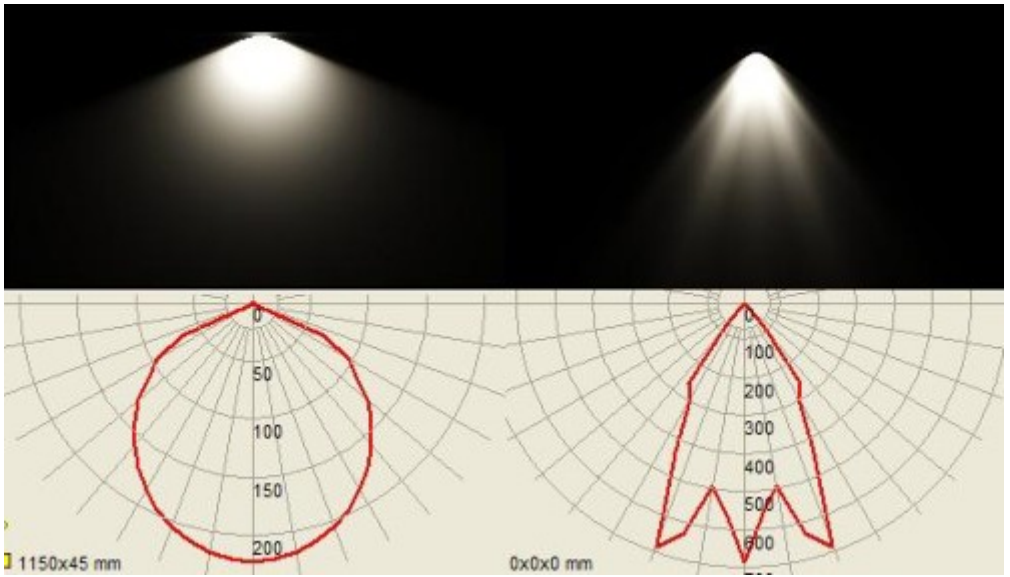

Ambient Light

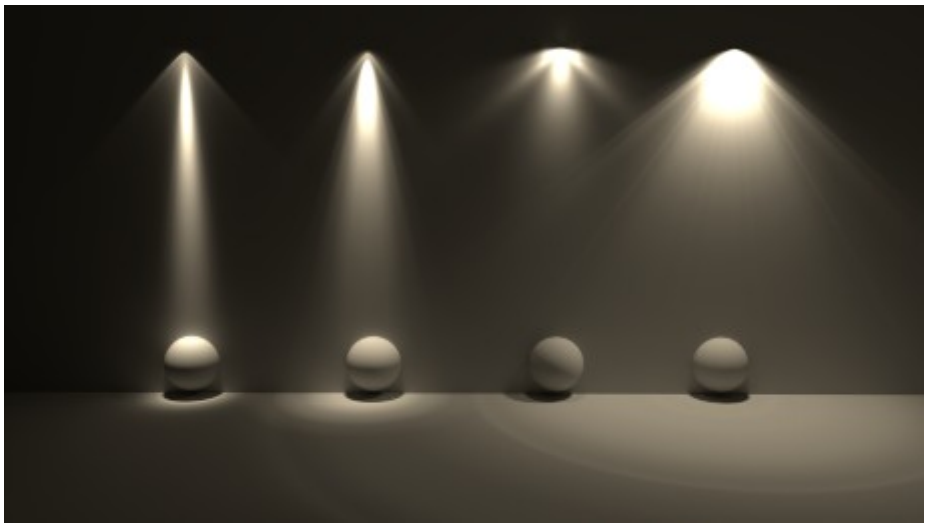

Directional Light


Point Light


Spot Light
ShineFrom-ShineAt Vector
Outer Cone
Inner Cone

IES Lights: https://www.ledyilighting.com/how-to-read-an-ies-test-report/





Iluminação:

Fluxo luminoso; Temperatura de cor;

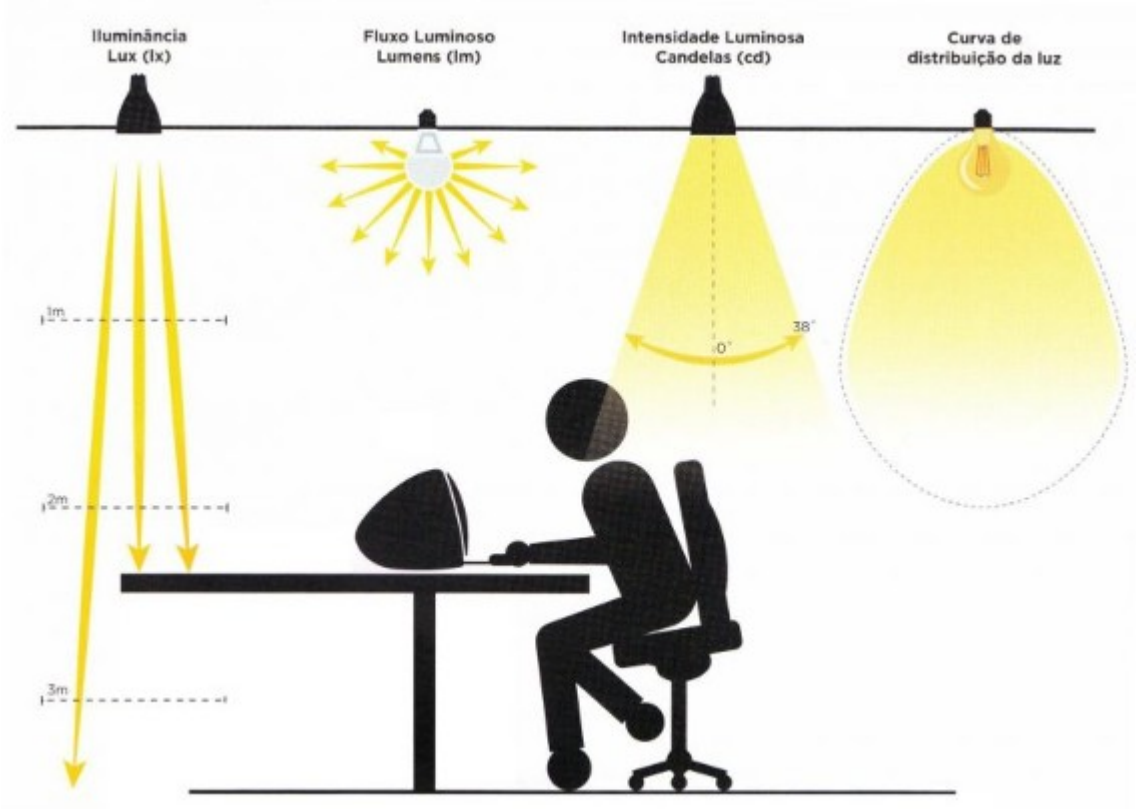
Temperatura de Cor:

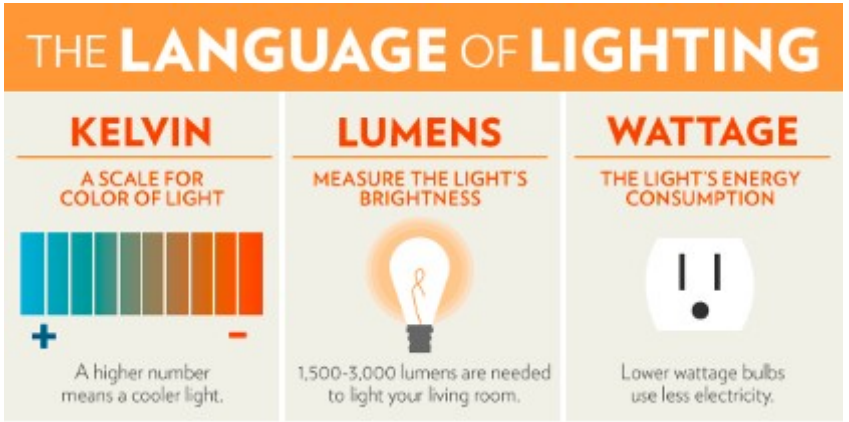
cor característica da luz, medida em graus Kelvin, tipicamente descrita em termos de tons quentes (avermelhados) ou frios (azulados), desempenha um papel vital na definição do clima e atmosfera de uma cena renderizada.
Ela ajuda a simular condições de iluminação natural, influenciando o impacto emocional e a narrativa visual dentro de uma composição digital. Compreender a temperatura de cor é crucial para alcançar efeitos visuais realistas e imersivos, permitindo que os artistas criem ambientes específicos e evoquem respostas emocionais particulares do público.

Color Temperature:

characteristic color of light, measured in degrees Kelvin, typically described in terms of warm (reddish) or cool (bluish) tones, plays a vital role in establishing the mood and atmosphere of a rendered scene.
It helps simulate natural lighting conditions, influencing the emotional impact and visual storytelling within a digital composition. Understanding color temperature is crucial for achieving realistic and immersive visual effects, allowing artists to create specific ambiances and evoke particular emotional responses from the audience

Lux; Lumens; Candela; IES:





Lumens:

GENERAL PURPOSE BULBS

LUMEN COMPARISON

Lumens	Incandescent	HID	CFL	LED
250 lm	25W	18W	6W	2W-3W
560 lm	40W	29W	10W	3W-6W
800 lm	60W	43W	13W	7W-10W
1100 lm	75W	53W	18W	10W-15W
1600 lm	100W	72W	23W	15W-20W
2600 lm	150W	100W	42W	20W-30W

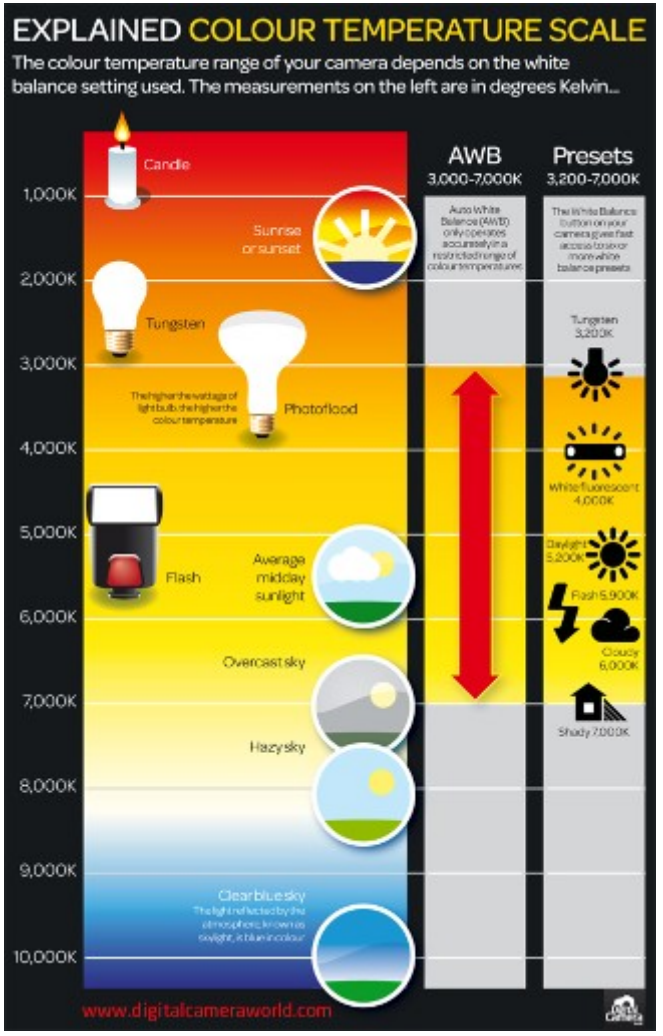
TAKE 3 LIGHTING

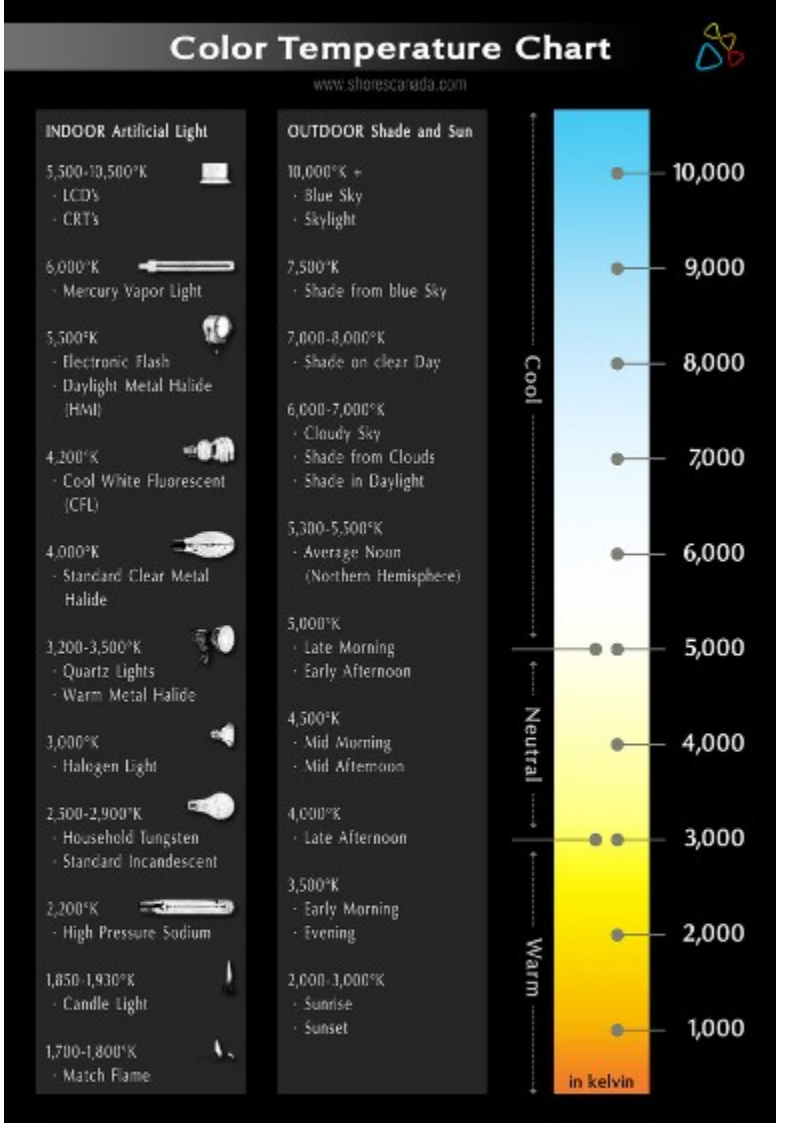
Lumens required by Room Type:

LUMENS FORMULA: general + task = LUMENS Required

ROOM TYPE	GENERAL	TASK
Kitchen	5000-10000	450 per area
Dining Room	general and task total 3000-6000	
Living Room	1500-3000	400 per area
Den/Office	3000-6000	1200
Bedroom	2000-4000	500 per area
Bathroom	4000-8000	1700 mirror
Hallway	general and task total 1200-2500	
Stairs/Entry	general and task total 1200-4000	

www.orangetreeinteriors.com


EXPLAINED COLOUR TEMPERATURE SCALE
The colour temperature range of your camera depends on the white balance setting used. The measurements on the left are in degrees Kelvin...
AWB
3,000-7,000K
Presets
3,200-7,000K
1,000K
2,000K
3,000K
4,000K
5,000K
6,000K
7,000K
8,000K
9,000K
10,000K
Candle
Sunrise or sunset
Tungsten
Photoflood
Flash
Average midday sunlight
Overcast sky
Hazy sky
Clear blue sky
Tungsten 3,200K
White fluorescent 4,000K
Daylight 5,200K
Flash 5,900K
Cloudy 6,000K
Shady 7,000K
www.digitalcameraworld.com


Color Temperature Chart
www.shorescanada.com
INDOOR Artificial Light
5,500-10,500°K
· LCD's
· CRT's
6,000°K
· Mercury Vapor Light
5,500°K
· Electronic Flash
· Daylight Metal Halide (HMI)
4,200°K
· Cool White Fluorescent (CFL)
4,000°K
· Standard Clear Metal Halide
3,200-3,500°K
· Quartz Lights
· Warm Metal Halide
3,000°K
· Halogen Light
2,500-2,900°K
· Household Tungsten
· Standard Incandescent
2,200°K
· High Pressure Sodium
1,850-1,930°K
· Candle Light
1,700-1,800°K
· Match Flame
OUTDOOR Shade and Sun
10,000°K +
· Blue Sky
· Skylight
7,500°K
· Shade from blue Sky
7,000-8,000°K
· Shade on clear Day
6,000-7,000°K
· Cloudy Sky
· Shade from Clouds
· Shade in Daylight
5,300-5,500°K
· Average Noon (Northern Hemisphere)
5,000°K
· Late Morning
· Early Afternoon
4,500°K
· Mid Morning
· Mid Afternoon
4,000°K
· Late Afternoon
3,500°K
· Early Morning
· Evening
2,000-3,000°K
· Sunrise
· Sunset
Cool
Neutral
Warm
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
in kelvin

Colour Temp.	Effects on Colours	Typical Applications
Daylight White 5000K +	– Strongly enhances blues – Flattens reds – Bluish tint to whites and greens	– Graphic Arts Studios – Winter goods shops e.g. furriers – Seasonal Affective Disorder
Cool White 4000-5000K	– Enhances blues – Flattens reds – Bluish tint to whites and greens	– Offices – Hospitals – Manufacturing
Mid Range 3500-4000K	– Neutral Appearance – Enhances most colours equally – Does not favour yellow or blue	– Retail stores – Supermarkets – Showrooms
Warm White 2700-3000K	– Enhances red & orange – Blues appear darker – Yellow tint to whites and green	– Residential lighting – Restaurants – Hotel Lobbies
Extra Warm 2000-2500K	– Strongly enhances red & orange – Blues appear almost black – Whites appear strongly orange	– Bread and meat displays – City Beautification – Not for general lighting

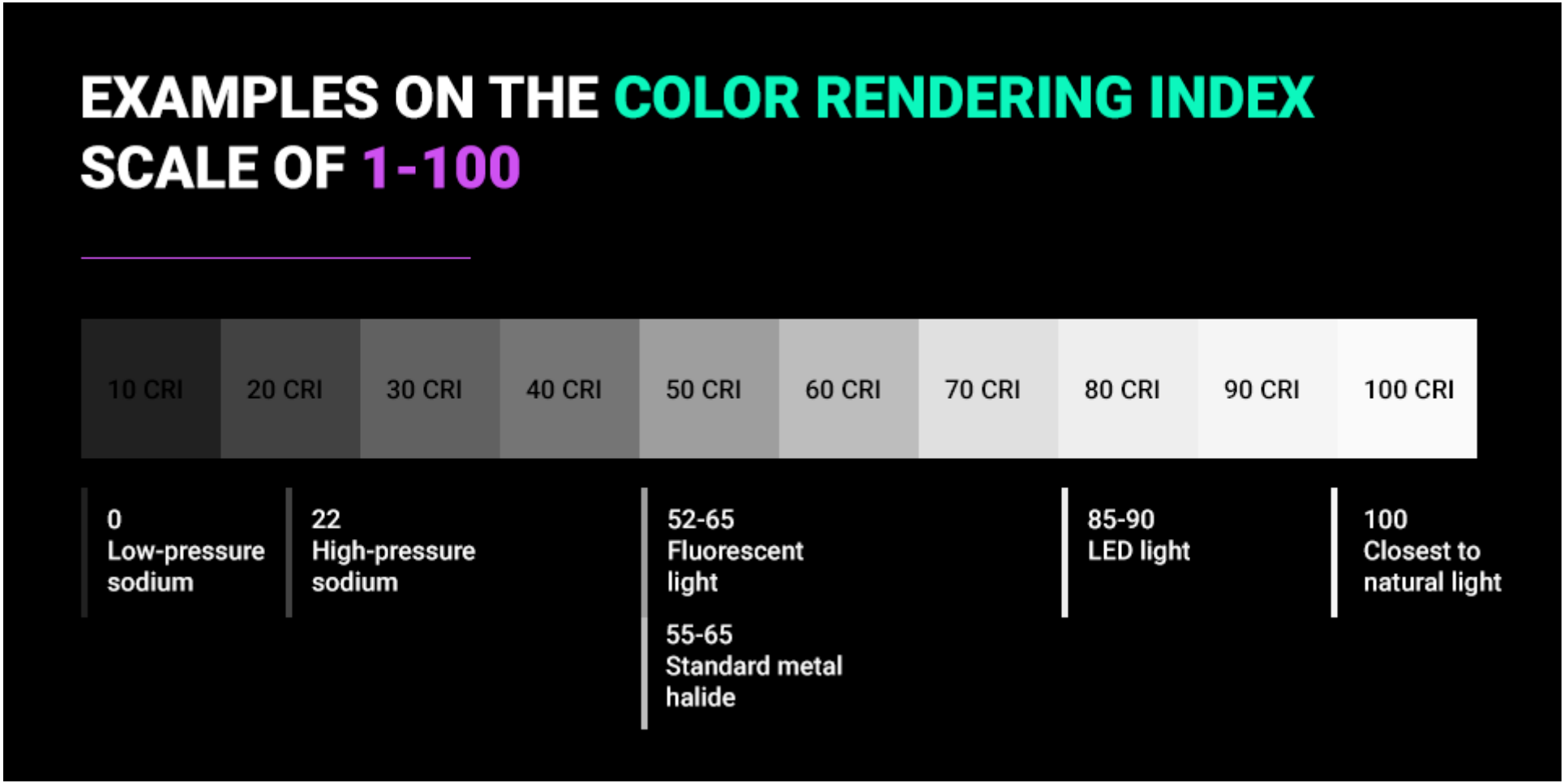
http://www.lamptech.co.uk/Documents/FL%20Colours.htm

Color Temperature:


1800K
1800K
10000K
WWW.DELIGHTNING.COM
1930K
candle flame
3500K
quartz lights
7500K
sky overcast
2900K
sunrise / sunset
5400K
sun direct at noon
8000K
outdoor shaded areas
3000K
6500K
sun through clouds
10000K
partly cloudy sky


3000K
5700K
Crayola
LEDLightExpert.com
Brown
Blue
Yellow
4000K
5000K

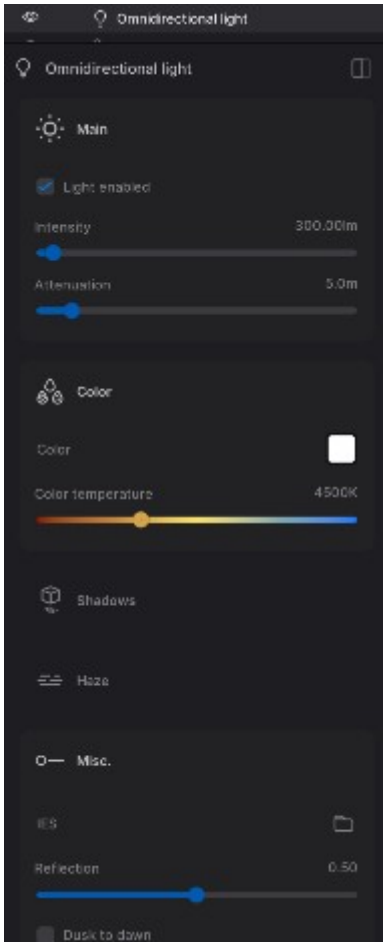
Color Rendering Index:

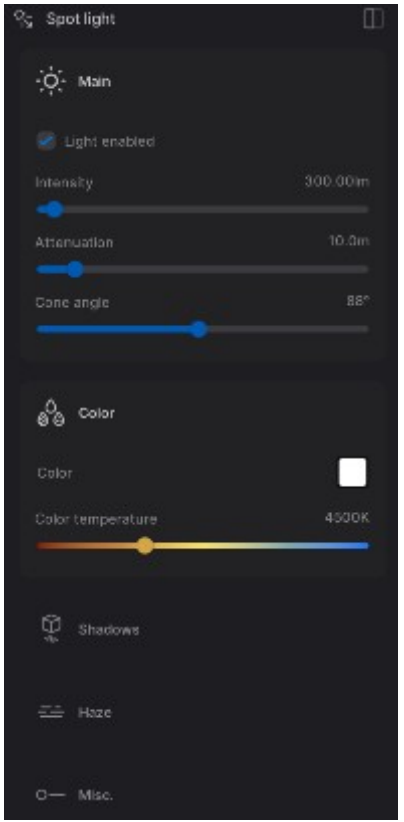


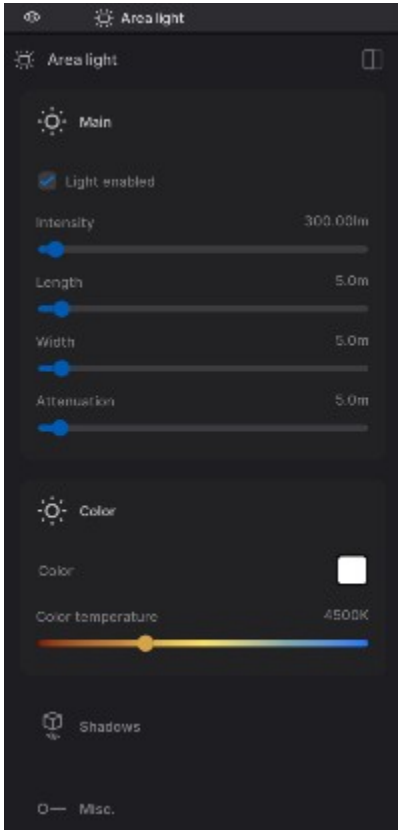
Twinmotion

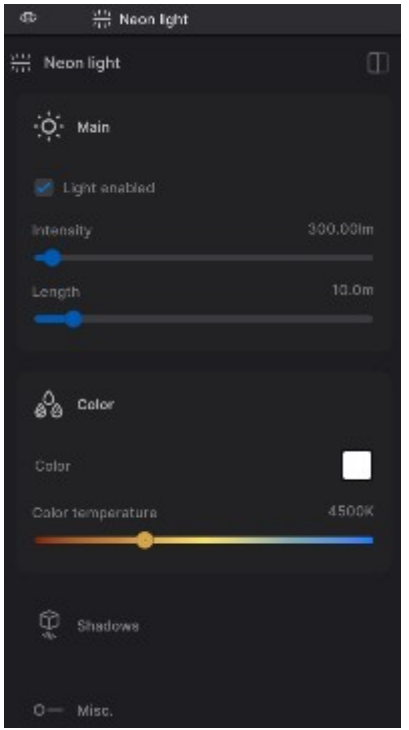
Iluminação

Twinmotion Lights: Omnidirectional; Spot light; Area light; Neon light

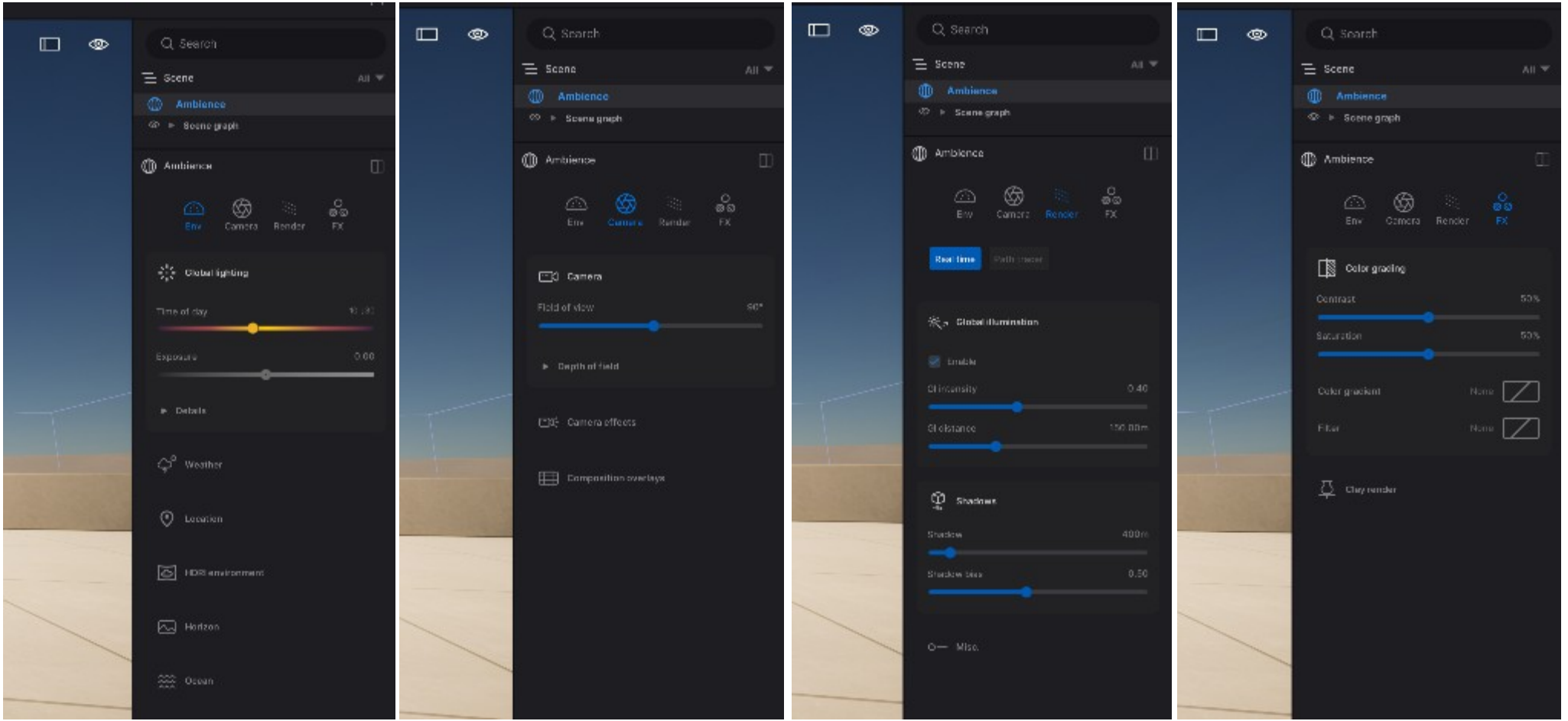




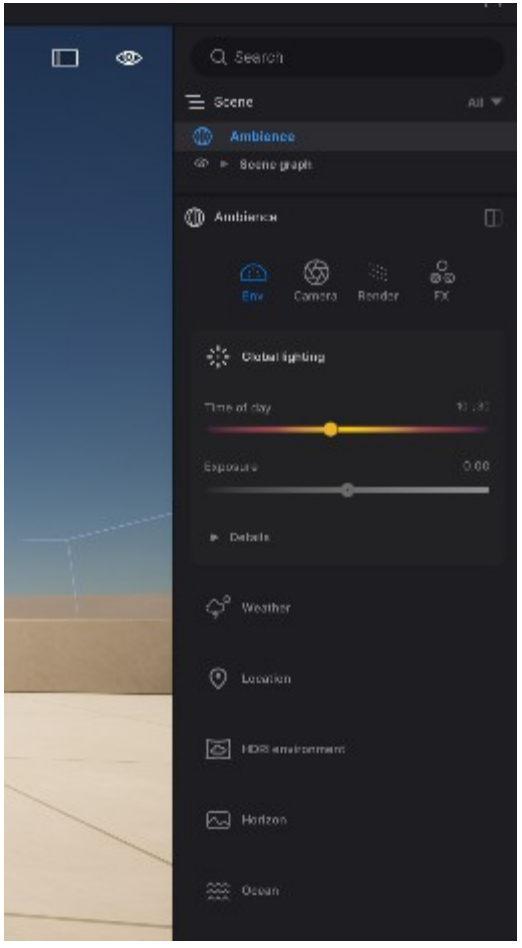


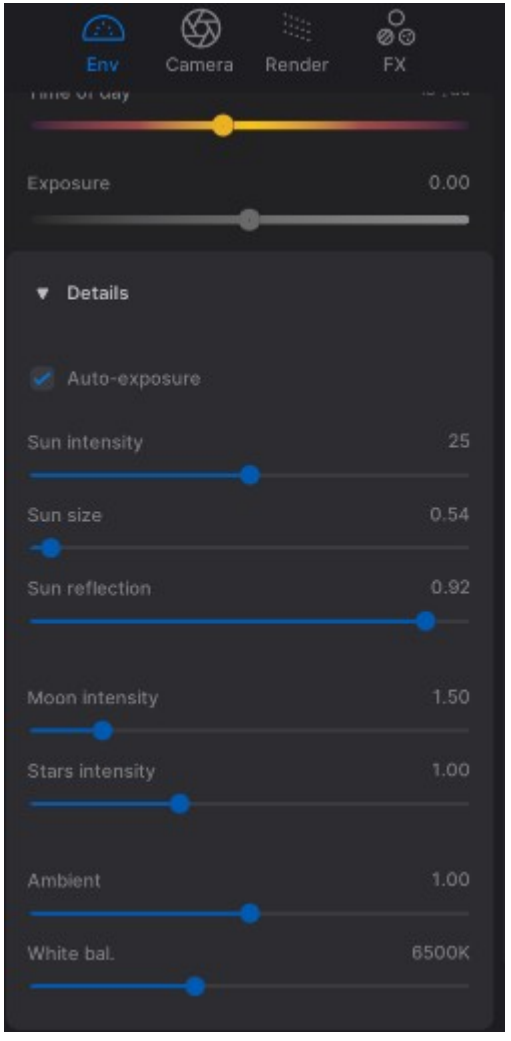


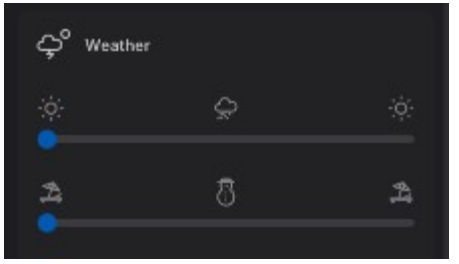
Twinmotion Ambience: Environment; Camera; Render; FX

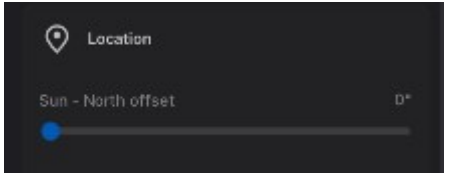


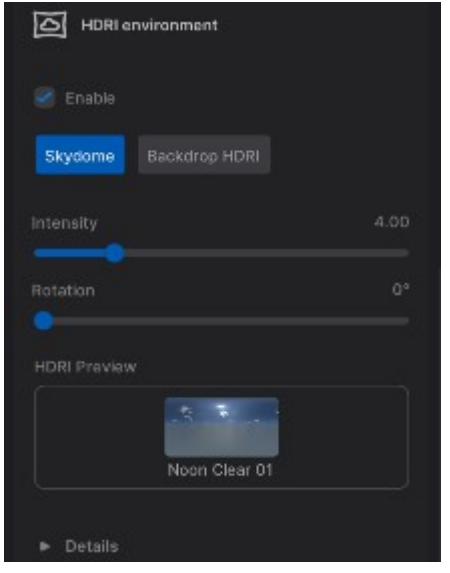
Twinmotion Ambience: Environment



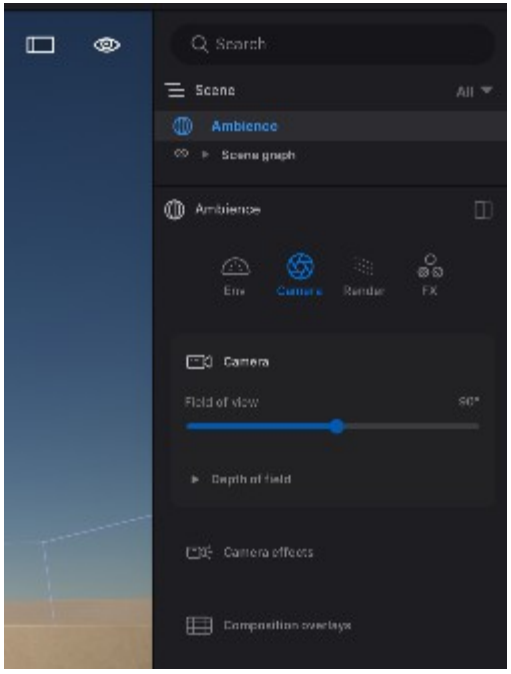


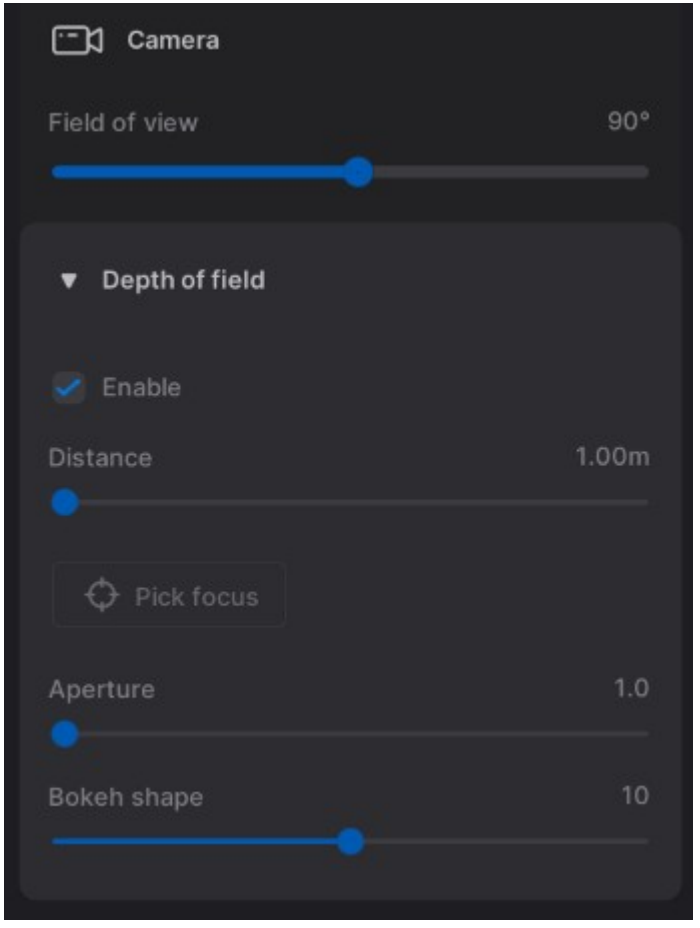


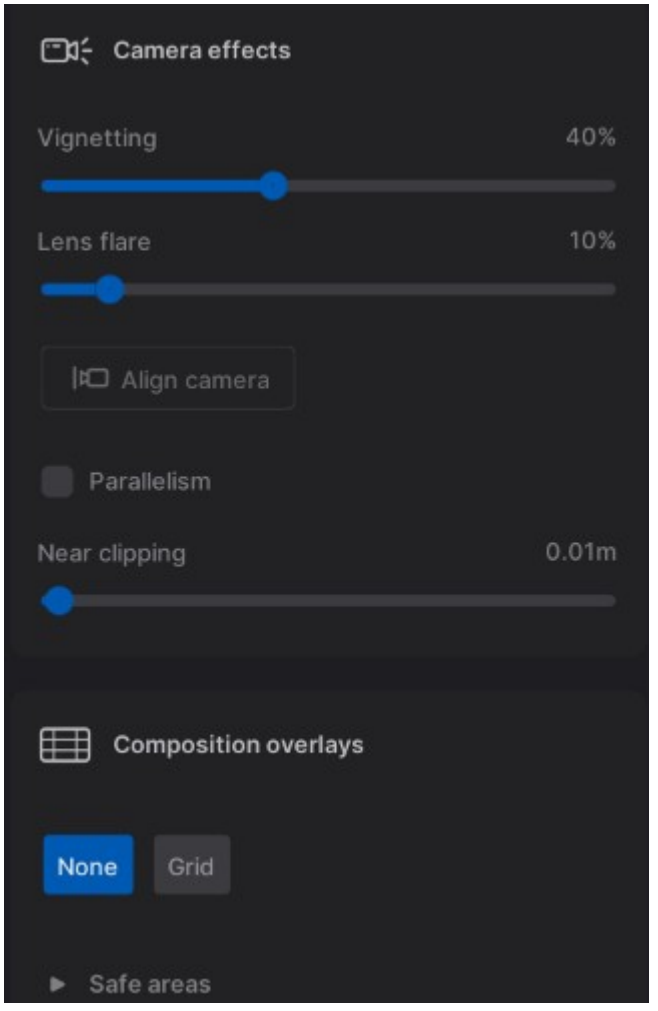




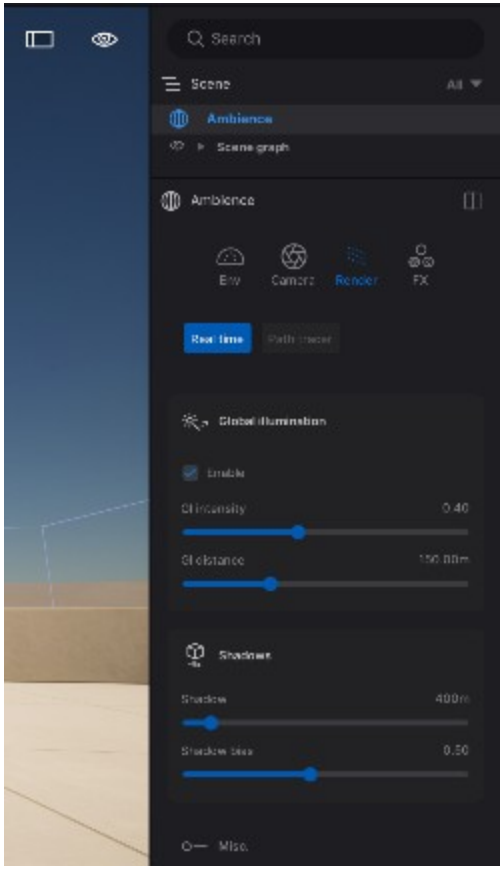
Twinmotion Ambience: Camera







Twinmotion Ambience: Render



Twinmotion Ambience: FX (Special Effects)