Computer Graphics

Lecture 2: Imaging, Radiometry, Photometry

Kartic Subr
The big picture!

Real

photography

Virtual

rendering

scene

camera

image manipulation

display

Human visual system
Energy in the scene
Energy in the scene -- Light

- Flux
- Irradiance
- Radiance

Flux: $\frac{\text{W}}{\text{m}^2}$

Irradiance: $\frac{\text{W}}{\text{m}^2}$

Radiance: $\frac{\text{W}}{\text{m}^2 \text{sr}}$

Watt: Energy per second

Solid angle: $\text{unit} \times \text{Solid angle}$

Steradian: $\text{std}$
Energy in the scene -- Radiometry

Radiance: key

\[ \frac{W}{m^2 \cdot sr} \]
Energy in the scene -- colour

\[ \lambda \quad \text{(wavelength)} \]

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This slide illustrates the energy distribution in the scene, focusing on colour. The graph shows peaks at specific wavelengths, indicating the intensity of energy at those wavelengths. The ordinate axis likely represents energy or another quantitative measure, while the abscissa axis represents the wavelength of light. The peaks suggest that certain wavelengths are more prominent or significant in the scene's energy spectrum.
The big picture!
Cameras
Cameras – thin lens

https://graphics.stanford.edu/courses/cs178-10/applets/thinlens.html
Cameras – sensors

The big picture!
Displays
Displays

Radiance

1e6

16bit

8 bits

 Tone mapping
Human vision -- optics
Human vision -- perception

http://persci.mit.edu/people/adelson/checkershadow_proof
Human vision -- perception

http://persci.mit.edu/people/adelson/checkershadow_proof
Perceived energy -- photometry

https://www.photonics.com/Articles/Photometry_The_Answer_to_How_Light_Is_Perceived/a25119
https://graphics.stanford.edu/courses/cs178-10/applets/colormatching.html
CG – account for all factors!