



DCGI

DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION

APG Homework Assignment III

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Outline

- Scene setup
- Casting primary rays
- Finding intersections
- Lighting model evaluation



Ray Tracing



Scene Setup

■ Camera setup

- `sglMatrixMode(SGL_PROJECTION)`, `sgluPerspective()` (calls `sglFrustum()`)
- `sglMatrixMode(SGL_MODELVIEW)`, `sgluLookAt()` (sets up the common coordinate system (*from*, *at*, *up*))

■ Scene content specification

- `sglBeginScene()` ... `sglEndScene()`
 - `sglMaterial()`, `sglEmissiveMaterial()`
 - `sglBegin(SGL_POLYGON) + sglVertex3f() + sglEnd()`,
`sglSphere()`
 - `sglPointLight()`, `sglEnvironmentMap()`

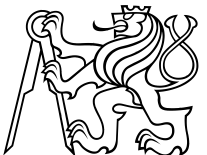
■ Rendering

- `sglRayTraceScene()`



Casting Primary Rays

- Rasterization: object \rightarrow world \rightarrow image
- Ray tracing: image \rightarrow world \rightarrow object
 - Inverse transformation matrix
 - Also swapped the order of object loop vs image loop
- Primary rays
 - Connecting the camera position with the transformed pixel position



Finding Intersections

- Sphere
 - Finding the roots of a quadratic equation
- Triangle
 - Triangle plane intersection + checking the bounds



Lighting Model Evaluation

- Phong lighting model (1973)

- Not the Blinn-Phong model!

- Surface parameters

- Color: R, G, B

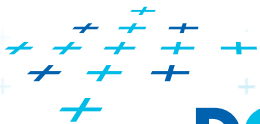
- Light distribution coeffs: k_D , k_S , T, shininess, index of refraction

- $I = I_A + I_D + I_S$

- $I_A = 0$: neglected

- I_D : not dependent on the eye position

- I_S : not dependent on the surface color



Bonus Points

- Speed competition
 - Last chance to earn the extra points!
- Adaptive antialiasing (1 point)
- Another lighting model (1 point)
 - Cook-Torrance, Ward, ...



Thank you for your attention!

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