Miss Shaders and Sky Models

CS 481/681 Computer Graphics Rendering

University of Alaska Fairbanks

Project Pitch

- Exciting Ideas
- Realtime Ray Tracing
- Virtual Reality Experiences
- Comparing Renderer Results
- Applying Machine Learning to CG

Miss Shaders and Sky Models

- Ray Tracing Pipeline
- Miss Shaders
- Sky Models
- Astronomical Calculations

Ray Tracing Pipeline

- Ray Generation
- Ray Traversal Acceleration Structure
- Intersection Shader
- Any Hit Shader
- Miss Shader
- Closest Hit Shader

Ray Tracing Pipeline

Miss Shaders

- If we have no hits, we need to do something
- A good candidate is a sky model
- What about the ground?

Sky Models
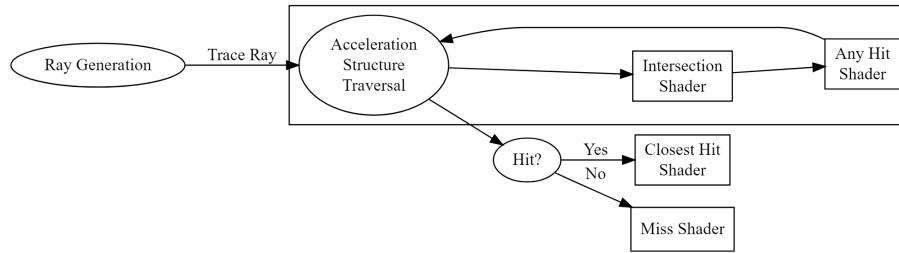
- CIE Clear Sky and Overcast Sky

Figure 1: Ray Tracing Pipeline

- Preetham et al. (1999)
- Hosek-Wilkie (2012)
- Bruneton-Neyret (2008)
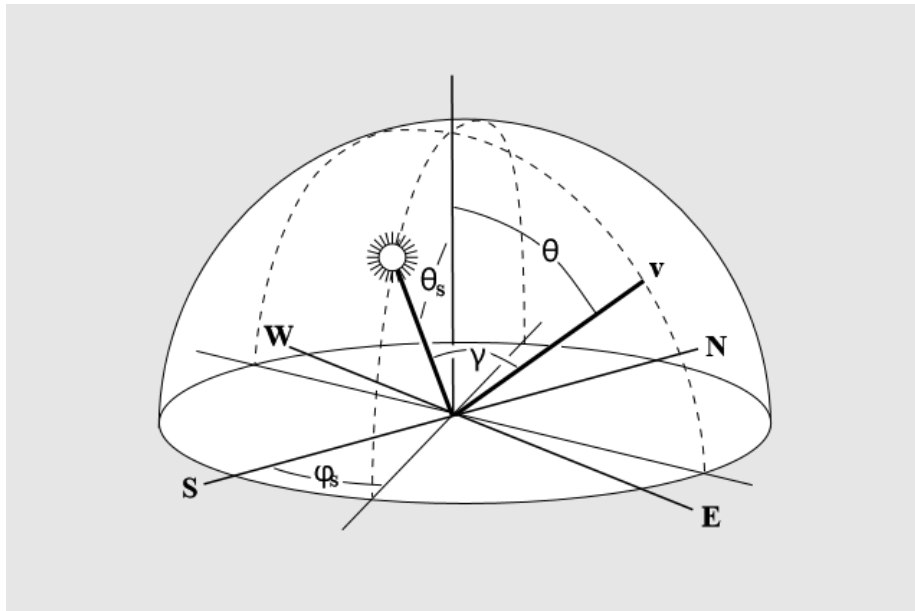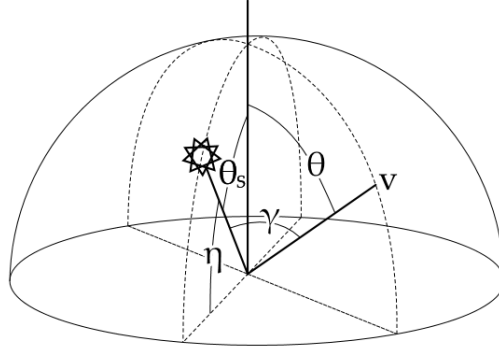- DIHARAW's port

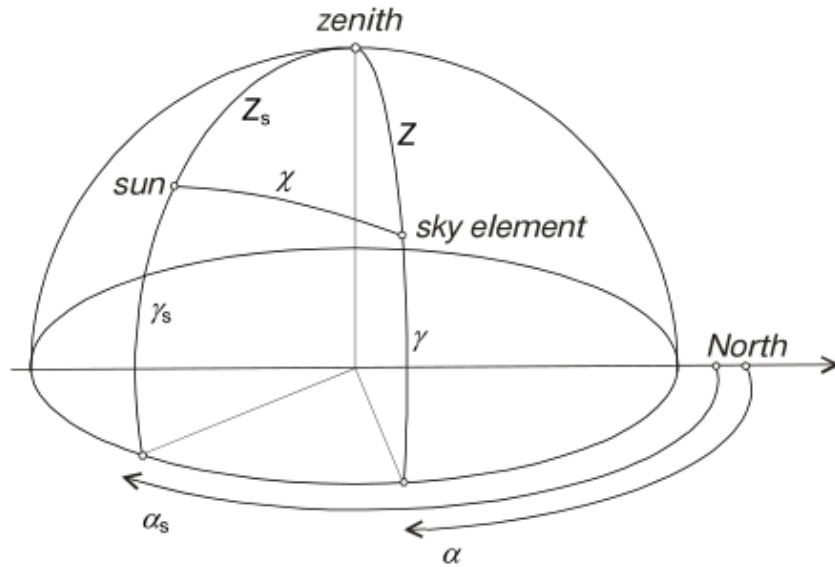## Preetham et al Frame of Reference

Figure 2: Preetham et al. Sun Sky

Figure 5: *The coordinate system used in the model.*

Figure 3: Hosek-Wilkie Sun Sky

Figure 1. Angles defining the position of the sun and a sky element.

Figure 4: CIE ISO 15469:2004

Hosek-Wilkie Frame of Reference

CIE Model Frame of Reference

Parameters

- Turbidity T
- Ground Albedo α
- Sun inclination or declination?
- Gamma γ is measurement from sky position to sun position
- Think about it: which way is north or west?

Ground Albedo

Turbidity

Astronomical Calculations

- Video: Carla's Island (1981)
- Video: NASA Voyager 2 Flyby (1981)
- Use astronomical calculations to determine animation parameters

Implementation

- Example 6

Hybrid Topics and Activity Worksheet

- Any Hit Shaders and Shadows

(a) $\alpha = 0$ *(black)*
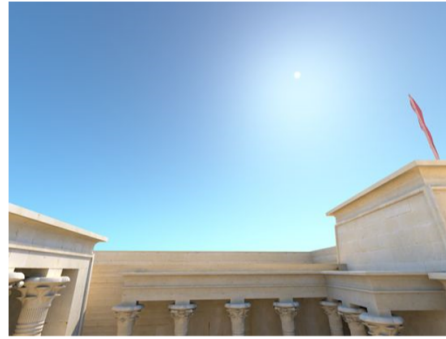
(b) $\alpha = 1$ *(white)*

(c) 10GY 3/6 *(forest green)*

(d) 2.5Y 8.5/4 *(desert yellow)*

(e) 7.5R 4/16 *(intense pink)*

(f) 1B 5/10 *(water blue)*

Figure 10: *The influence of ground albedo on sky appearance for turbidity 5. The world outside the temple walls is assumed to be either achromatic with the given albedo, or of the specified Munsell colour. Reflectance data measured from a glossy Munsell Book of Color. Temple of Kalabsha model courtesy of Veronica Sundstedt.*
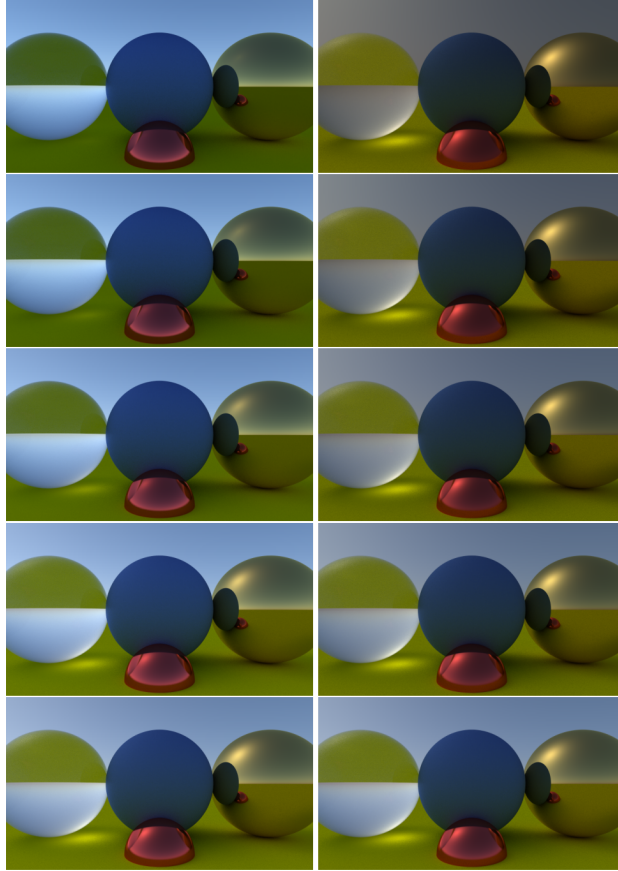
Figure 5: Hosek-Wilkie Ground Albedo

Figure 3.12: Comparison of different turbidity levels for the physically based sky model. Counterclockwise from upper left, turbidity goes from 1 to 10.

Figure 6: Metzgar Turbidity