Interactive Sky Rendering

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Introduction

I have long been fascinated by the beauty of the sky and present a program that duplicates it algorithmically.

Problem Summary

Simulate photorealistic skies interactively. This is a significant challenge in that photorealism and interactivity are opposing engineering goals; one is usually traded for the other. There is a finite amount computing resources and photorealism intrinsically requires a large share of them. Interactivity means that users will be able to interrupt lengthy calculations and modify variables that affect the simulation.

Project Objectives

Produce an interactive application that renders photo-realistic skies.

Several well known techniques will be used to make the program interactive yet still provide realism:
- Preview Rendering
- Progressive Refinement
- Concurrent Computation

Project Activities

Research and answer the following open questions:
- What rendering algorithms will be used?
- How will clouds be modeled?
- How will the sky be modeled?
- What environment will the program operate in?
    - IPython Notebook + WebGL
    - Python
    - C++
    - OpenVDB
- Implement algorithms using OpenGL programmable shaders.
- Implement a simple user interface that exposes variables for controlling:
- Time of Day
- Atmospheric Quality
- Position on Earth (including elevation)
- Cloud related variables (morphology, density, color)
- Wind direction and strength

Project Results

- An application binary deliverable for OS X
- Documentation
- Sample data
- Paper

Project Schedule

This project is a single semester of four months and approximately 200 hours in length. This breaks down to approximately 12 hours a week at 16 weeks.

Week	Hours	Task
1	10	Read all papers, select sky and cloud models.
2	10	Select or build OpenGL framework for shader development.
3	10	Select development environment
4	10	Select UI framework.
5	10	V.1: render sky, bare UI
6	10	V.2.1: sky model experimentation, UI
7	10	V.2.2: sky model experimentation, UI
8	10	V.3.1: cloud model experimentation
9	10	V.3.2: cloud model experimentation
10	10	V.3.3: cloud model experimentation
11	10	V.4: cloud model UI
12	10	Testing, improvements, documentation
13	10	Documentation
14	10	Contingency Reserve
15	10	Contingency Reserve
16	10	Contingency Reserve

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