Procedural cloud shader

Project documentation

Project 2
The goal of this project is to research and implement a procedural, volumetric cloud shader. The following document reveals the process of creating such a shader from both a technical and mathematical perspective, considering different algorithms for techniques like noise generation and raymarching.

Field of Studies:	BSc in Computer Science
Specialization:	Computer perception and virtual reality
Author:	Matthias Thomann
Supervisor:	Prof. Urs Künzler
Date:	March 28, 2020
Version:	0.1

Contents

1 General

1.1 Purpose

During this project, all gathered information and knowledge about the researched algorithms and techniques are written down in this document.

1.2 Revision History

Version	Date	Name	Comment
0.1	March 29, 2020	Matthias Thomann	Initial draft

2 Natural clouds

2.1 Formation

Clouds, as seen in nature, consist of of a visible body of tiny water droplets and frozen crystals. In their natural occurence, clouds most likely are formed from an adjacient source of moisture, usually in the form of water vapor. This composition of particles creates the pleasant look of a white-greyish fluffy mass, floating in the sky. Due to other factors, which in this matter and for simplicity are regarded as randomness, different types of cloudscapes can be formed. They vary in shape, convection, density and more. That makes differnt clouds very unique in terms of appearance.

2.2 Types of clouds

Cloudscapes are classified in multiple groups depending on their level, meaning the distance from the earth's surface to the cloud formation. In this project, we mainly focus on the following four distinctive cloudscapes.

Figure 1: Photographic reference of stratus clouds[1].

Figure 2: Photographic reference of cirrus clouds[2].

Figure 3: Photographic reference of an altocumulus cloud formation[3].

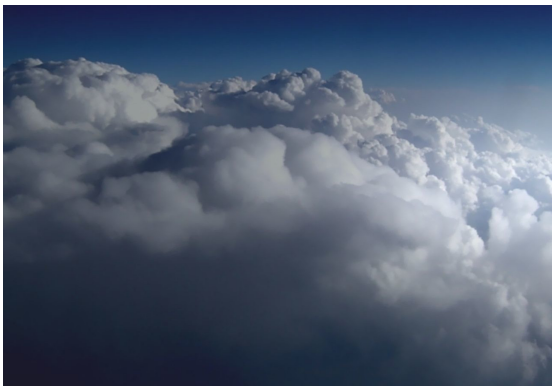

Figure 4: Photographic reference of stratocumulus cloudscape[4].

References

[1] *Photographic reference of stratus clouds.* [Online]. Available: `https://en.wikipedia.org/wiki/Stratus_cloud`.

[2] *Photographic reference of cirrus clouds.* [Online]. Available: `https://en.wikipedia.org/wiki/Cirrus_cloud`.

[3] *Photographic reference of an altocumulus cloud formation.* [Online]. Available: `https://en.wikipedia.org/wiki/Altocumulus_cloud`.

[4] *Photographic reference of stratocumulus cloudscape.* [Online]. Available: `https://en.wikipedia.org/wiki/Stratocumulus_cloud`.