Directional Dipole Model for Subsurface Scattering

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1 Introduction

Jensen et al. proposed a method for rendering the effects of subsurface scattering by using the Bidirectional Surface Scattering Reflectance Distribution Function (BSSRDF). Subsurface scatter- ing is caused when light scatters one to multiple times in a semi-translucent object, and is very important in a variety of different objects, such as milk or jade. Without this effect, rendered objects have a rough and hard computer generated feel to them.

This effect is simulated in a ray tracer by casting samples over the surface of the object and into the object. Original BSSRDF renders translucent

materials using Monte Carlo ray tracing is computationally expensive due to a large number of subsurface scattering events.

This report is the implementation of an analytical model for subsurface scattering which captures translucency effects that are present in the reference solutions but remain absent with existing models. The idea is that a ray source corresponds better to the light that refracts through the surface of a translucent material.

This model is as time efficient as

2 Related Work

Subsurface scattering(SSS), is an optical physics based machanism describing the process of light penetrating translucent materials. Different models have been proposed in order to produce artifitial images of real life materials. Bidirectional reflectance distribution [] function was introduced as a simple but efficient model for reflection of light at the surface of objects. Jensen et. al. [] introduced an improved model: bidirectional subsurface scattering reflection distribution function(BSSRDF).

A list of some physical caracteristics of different materials has been measured in Jensen's work. Gkioulekas et. al. [] studied on the physical characteristics of daily materials. Gkioulekas et. al. used a series of techniques and algorithms in order to achieve a set of data for daily materials such as wine, milk, coffee etc. Based on their analysis we are able to achieve a better result in multimedia rendering.

3 Platform and Frameworks

My code is running on my personal computer, the specifications is listed:

Hardware	Params	Additional
CPU	i7	
GPU	NVIDIA	GTX 780m
RAM	16GB	
DRAM	3GB	

Upenn(University of Pennsylvania) has open sourced one of their framework for global illumination and rendering. My project is based on the ray tracing framework of Upenn.

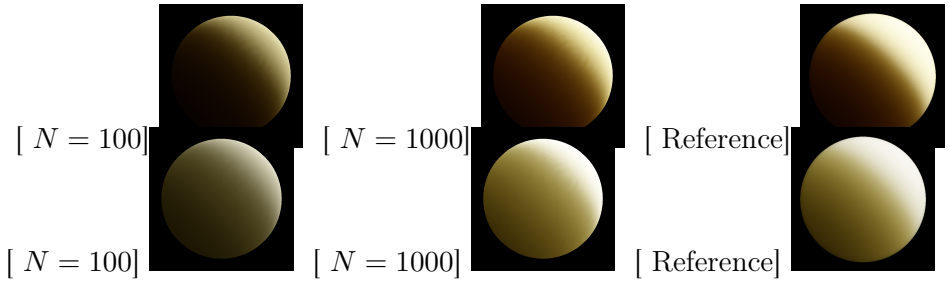

Figure 1: Comparazione dei risultati per patata e succo d'uva.

4 Algorithm/Implementation

4.1 Ray Tracer

Basic ray tracer model is used

4.2 Antialising

4.3

5 Results

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6 Acknowledgements

7 References