Real-Time Rendering of Translucent Materials

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**The rendering of translucent materials is a complicated procedure to produce accurate results, with many techniques not suitable for real-time applications and or implementations. This report aims to cover and explore a plausible implementation of translucent materials and sub-surface scattering in a real-time implementation. [More info on implementation overview]**

## Introduction

The world is made from many different types of translucent materials, from leaves and paper to skin and milk. Translucency occurs when light enters a given object and scatters based upon the physical properties of the objects material. The technical name for this physical phenomenon is subsurface scattering.

## Existing Techniques

Multiple implementations have been used in the past to try best reproduce subsurface scattering accurately and efficiently. The bidirectional reflection distribution function (BRDF) introduced by Nicodemus, considers the case where light striking a surface point gets reflected at the same point. Since, Henrik Wann Jensen proposed the use of the more generic bidirectional surface scattering distribution function (BSSRDF).

Current graphical hardware does not meet the standard required for highly computational implementations. Thus, for a real-time implementation approximations must be made. A simple approximation of light scattering comes in the form of wrap lighting, which is a somewhat crude approximation of the Oren-Nayar lighting model. However, these results are not accurate.

Jorge Jimenez proposed that to develop a practical model, the algorithm should be calculated in screen space rather than the traditional texture space. This therefore reduces the complications caused by translucently not being a post-process. However, calculations within screen space are hindered by not attaining the same amount of information found within traditional 3d and texture space algorithms.

## The bidirectional surface scattering distribution function

Henrik Wann Jensen, commonly attributed to the advances in using BSSRDF in the field of translucency, taking the lead in the field over the traditionally used bidirectional reflectance distribution function (BRDF).