1 Goal and Technical Contributions

Dutch and Flemish masters created a recognizable quality to their paintings, with realistic depictions of effects that computer graphics only recently started recreating. Through the use of specific blends of paint with different emulsions, painters would paint overlapping layers to create a specific quality of image.

For example, Flemish painters were able to reproduce the quality of light through skin by layering paints with different transmissive properties to control the subsurface scattering of light through the paint. Painters like Vermeer found that these techniques could incorporate a sense of serenity tempered by the delicate balance of the dramatic weather of the Netherlands. This effect was accomplished through layering paints to model the complicated diffuse scattering of light through cumulus.

Our technical contribution will be a model of the transmissive and reflective properties of layered oil-based paints. We will use this to render a geometric model of a painting consisting of specific brush strokes.

In Vermeer’s Milkmaid the delicate tone of the young women’s skin is crafted with many fine and layered paint strokes. This technique conveys an almost sculpted geometry while smoothly blending shadow and light.
2 Technical Challenges and Approach

Paintings consist of multiple layers of paint built from piecewise-continuous brush strokes. We consider these strokes to have a path in space, a radius, a thickness, a texture and a paint. Our model of a painting consists of a time-ordered list of brush strokes that the artist applied. We will be using data from the art website 2draw.net (Niels is involved with this website so we have access to the geometry data from the artists). We will build a 3D geometric model from the 2D brush information. Since this will not give us thickness information, we will also hand-build smaller models of paintings. Simulating the brush itself is beyond the scope of this project, thus we will focus on baked textures for brushes.

The primary technical contribution of this work will involve simulating light transport through these paints. We need to collect material properties of actual paints to simulate light paths moving through the paint structure. We will not model the interaction of light with the pigments in the emulsion of a layer of paint - we consider paint to be a homogenous material with specific properties. We concern ourselves with the interaction of light at each layer’s edge. We will follow a microfacet model to simulate light propagation where light interacts with the start of a layer, as shown in figure 1.

![Figure 1: Light propagation through a microfacet layer](image)

The canvas texture also plays a role in the appearance of a painting. We will start by assuming a flat surface with a texture applied to it, and possibly move to a microfacet model for the canvas as well if initial results indicate that this is an important effect.

References


Wikipedia http://wikipedia.com/

Essential Vermeer http://essentialvermeer.com/