Depth Map based SSS.(基于深度图的SSS。 )

Depth estimation using depth maps.(使用深度图进行深度估计。 )

One method of estimating this distance is to use depth maps,[3] in a manner similar to shadow mapping.(估计该距离的一种方法是以类似于阴影映射的方式使用深度图[3]。 ) The scene is rendered from the light's point of view into a depth map, so that the distance to the nearest surface is stored.(场景从光线的视角渲染成深度图，以便存储到最近表面的距离。 ) The depth map is then projected onto it using standard projective texture mapping and the scene re-rendered.(然后使用标准投影纹理映射将深度图投影到其上，并重新呈现场景。 ) In this pass, when shading a given point, the distance from the light at the point the ray entered the surface can be obtained by a simple texture lookup.(在这个过程中，当阴影化一个给定的点时，从光线进入表面的点到光线的距离可以通过简单的纹理查找来获得。 ) By subtracting this value from the point the ray exited the object we can gather an estimate of the distance the light has traveled through the object.(通过从光线射出物体的点减去这个值，我们可以得到光线穿过物体的距离的估计值。 )

The measure of distance obtained by this method can be used in several ways.(通过这种方法得到的距离测量可以用几种方法来实现。 ) One such way is to use it to index directly into an artist created 1D texture that falls off exponentially with distance.(一种这样的方法是使用它直接索引到美术创建的一维纹理，该纹理随距离呈指数下降。 ) This approach, combined with other more traditional lighting models, allows the creation of different materials such as marble, jade and wax.(这种方法，结合其他更传统的照明模式，允许创建不同的材料，如大理石，玉石和蜡。 ) .(通过这种方法得到的距离测量可以用几种方法来实现。 一种这样的方法是使用它直接索引到艺术家创建的一维纹理，该纹理随距离呈指数下降。 这种方法，结合其他更传统的照明模式，允许创建不同的材料，如大理石，玉石和蜡。 好吧。 )

Potentially, problems can arise if models are not convex, but depth peeling[4] can be used to avoid the issue.(如果模型不是凸的，可能会出现问题，但可以使用深度剥离[4]来避免这个问题。 ) Similarly, depth peeling can be used to account for varying densities beneath the surface, such as bone or muscle, to give a more accurate scattering model.(类似地，深度剥离可用于解释表面下的不同密度，例如骨或肌肉，以给出更精确的散射模型。 )

As can be seen in the image of the wax head to the right, light isn't diffused when passing through object using this technique; back features are clearly shown.(从右边蜡头的图像中可以看出，当使用这种技术通过物体时，光不会扩散； 背面特征清楚地显示出来。 ) One solution to this is to take multiple samples at different points on surface of the depth map.(一种解决方法是在深度图上的不同点采集多个样本。 ) Alternatively, a different approach to approximation can be used, known as texture-space diffusion.(或者，可以使用不同的近似方法，称为纹理空间扩散。 ) .(从右边蜡头的图像中可以看出，当使用这种技术通过物体时，光不会扩散； 背面特征清楚地显示出来。 一种解决方法是在深度图上的不同点采集多个样本。 或者，可以使用不同的近似方法，称为纹理空间扩散。 好吧。 )

Texture space diffusion .(纹理空间扩散 )

As noted at the start of the section, one of the more obvious effects of subsurface scattering is a general blurring of the diffuse lighting.(如本节开头所述，地下散射的一个更明显的影响是漫射照明的一般模糊。 ) Rather than arbitrarily modifying the diffuse function, diffusion can be more accurately modeled by simulating it in texture space.(通过在纹理空间中模拟扩散，可以更准确地模拟扩散，而不是任意修改扩散函数。 ) This technique was pioneered in rendering faces in The Matrix Reloaded,[5] but has recently fallen into the realm of real-time techniques.(这种技术是在矩阵重载中绘制人脸的先驱，[5]但最近已落入实时技术的范畴。 )

The method unwraps the mesh of an object using a vertex shader, first calculating the lighting based on the original vertex coordinates.(该方法使用顶点着色器展开对象的网格，首先根据原始顶点坐标计算光照。 ) The vertices are then remapped using the UV texture coordinates as the screen position of the vertex, suitable transformed from the [0, 1] range of texture coordinates to the [-1, 1] range of normalized device coordinates.(然后使用UV纹理坐标作为顶点的屏幕位置来重新映射顶点，该顶点适当地从纹理坐标的[0，1]范围转换到归一化设备坐标的[-1，1]范围。 ) By lighting the unwrapped mesh in this manner, we obtain a 2D image representing the lighting on the object, which can then be processed and reapplied to the model as a light map.(通过以这种方式对展开的网格进行照明，我们获得表示对象上的照明的2D图像，然后可以将该2D图像作为光图进行处理并重新应用于模型。 ) To simulate diffusion, the light map texture can simply be blurred.(为了模拟扩散，光图纹理可以简单地模糊。 ) Rendering the lighting to a lower-resolution texture in itself provides a certain amount of blurring.(将光照渲染为低分辨率纹理本身提供了一定程度的模糊。 ) The amount of blurring required to accurately model subsurface scattering in skin is still under active research, but performing only a single blur poorly models the true effects.(精确模拟皮肤中的次表面散射所需的模糊量仍在积极研究中，但仅执行单个模糊就不能很好地模拟真实效果。 )[6] To emulate the wavelength dependent nature of diffusion, the samples used during the (Gaussian) blur can be weighted by channel.([6]为了模拟扩散的波长依赖性，可以对（高斯）模糊期间使用的样本进行信道加权。 ) This is somewhat of an artistic process.(这多少是一个艺术的过程。 ) For human skin, the broadest scattering is in red, then green, and blue has very little scattering.(对于人的皮肤，最宽的散射是红色，然后是绿色，蓝色的散射很小。 )[citation needed].([需要引用]。 )

A major benefit of this method is its independence of screen resolution; shading is performed only once per texel in the texture map, rather than for every pixel on the object.(这种方法的一个主要优点是它与屏幕分辨率无关； 在纹理映射中，每个纹理只执行一次阴影处理，而不是对对象上的每个像素执行一次阴影处理。 ) An obvious requirement is thus that the object have a good UV mapping, in that each point on the texture must map to only one point of the object.(因此，一个明显的要求是对象具有良好的UV映射，因为纹理上的每个点必须仅映射到对象的一个点。 ) Additionally, the use of texture space diffusion provides one of the several factors that contribute to soft shadows, alleviating one cause of the realism deficiency of shadow mapping.(此外，纹理空间扩散的使用提供了导致软阴影的几个因素之一，减轻了阴影映射的真实感不足的一个原因。 )