

Annotated References

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Elhelw, M., Darzi, A., Yang, G., 2004. *Real-time photorealistic rendering for surgical simulations with graphics hardware*

This article, Elhelw said that the patient's abdomen is complex because of the presence of various types of soft tissues, blood vessels and the dynamic glistening of the membrane under the illumination of the head light. Most previous works on the rendering of surgical simulation use the traditional shading models or video image based method.

Hoffman, N., 2010. *Background: Physically-based shading.*

In this article, mainly talk about the flexibility of those techniques are limited by the quality of the image. Due to the development of game industry, physically based rendering gradually replaced the traditional shading model and widely used in photo-realistic rendering.

Lim, Y., Jin, W., 2007. *On some recent advances in multimodal surgery simulation: A hybrid approach to surgical cutting and the use of video images for enhanced realism.*

This article mainly demonstrate that the traditional shading model needs physically plausible albedo, normal, specular and shininess (gloss) maps. There are several models of surface BRDFs. The empirical model (Blinn, Phong etc.) and microfacet model are the most widely used. The empirical model is a fast computational model adjustable by parameters, but without considering the physics behind it. The microfacet model is inspired by real

physical processes. Due to the complex anatomical structures and their glistening effect under light, our material rendering is based on the microfacet model.

Sebastian, L., 2014. *Moving frostbite to physically based rendering*.

This academic article describes that physically based rendering (PBR) refers to the concept of using realistic shading models along with measured surface values to accurately represent real-world materials. Yet, little literature focuses on PBR in surgical simulation.