Skin Rendering for Personalized and Digital Cosmetics

Supervisor: TRAN Loïc (contact : ltran@rd.loreal.com) in the Applied Optics and Algorithms team (R&I)

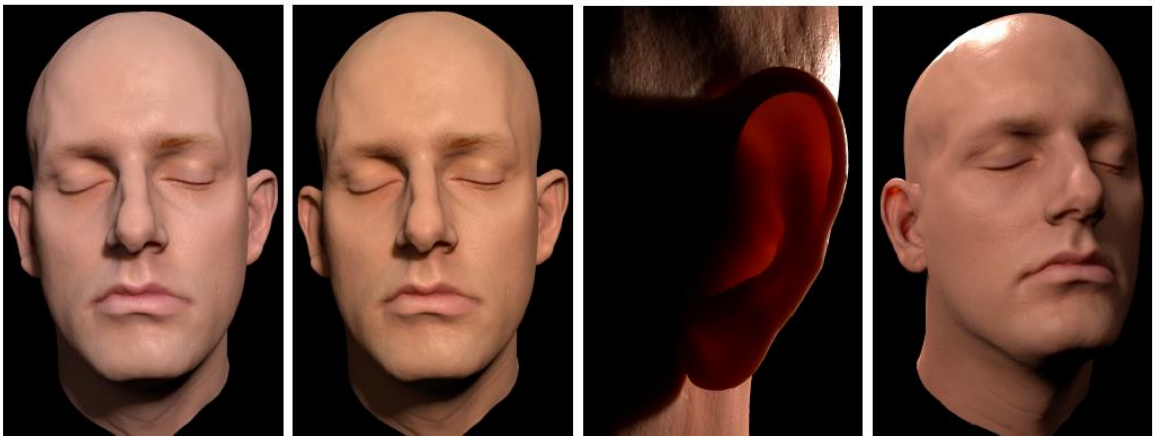
Period: February/March 2018 to August/September 2018 (flexible)

Location : 9, rue Pierre Dreyfus, 92110, Clichy, France (Paris area)

Short Description :

The Applied Optics and Algorithms team is working on topics linked to personalized and digital cosmetics at the boundary between physics and computer science. We are interested in developing new methods to measure optical properties of the face or cosmetics, to model the light/skin interaction and finally to render it on a virtual avatar or as a physical product (ex: Le Teint Particulier)

In order to have more accurate results on the prediction of the applied cosmetics color or of its optical effects, we are interested in physically based rendering of the light/skin interaction.



(Donner and Jensen, 2006)

Objectives:

During this internship, you will work on the following topics:

- Study state-of-the-art computer graphics methods in the literature to model light-skin interaction (BSSRDF, skin shading, etc.)
- Implement these techniques for personalized cosmetics projects (for example: foundation, lipsticks, eyeshadows, etc.) to predict the color or other optical effects
- Test current software (commercial and/or open source) to model the light reflection on skin (such as Renderman, NVidia FaceWorks, PBRT, Arnold/Maya, ...)
- Make recommendations for the choices of technical solutions (hardware, software or academic partnerships)
- Explore how these technologies can be used in AR/VR domain both for internal use and for external consumers

Through this work, you will be able to:

- Discover the beauty universe and be a part of the new personalized cosmetics trend.
- Enhance your knowledge in computer graphics, optics and applied color science
- Learn how to manage an innovative multidisciplinary project at the interface between Optics and computer science

Apart from the supervisor, you will also be encouraged to collaborate with R&I Makeup Labs, other members of the Applied Optics team (with expertise in Physics, AR/VR, Color, Data Science, etc.) and the Artificial Intelligence team. You can also have the opportunity to work with external partners both in the academic and industrial fields on topics linked to the skin digitalization.

Candidate's profile:

Main technical skills desired: Image Processing/Synthesis, Computer Graphics, Color Science, Optics/Physics, computer science

You shall have a solid background in Optics or Physics and computer science. Previous knowledge on light-matter interaction is appreciated (examples of current studies: Supoptique, Telecom, ENSIMAG, Master COSI, etc.)

Working Language: English and/or French (not Mandatory)

Software skills: C++, High Performance Graphics, OpenGL, Blender, rendering engines (such as NVidia FaceWorks/OptiX, PBRT, Renderman, …)

This master thesis internship lies at the boundary between physics and computer simulation on the challenging subject of **"Physically-based rendering of skin for personalized cosmetics projects"**

Literature:

[1] Donner and Jensen, "A Spectral BSSRDF for shading Human Skin ", Eurographics 2006.

[2] Jimenez, Sundstedt, Gutierrez, "Screen Space perceptual rendering of human skin", 2009

[3] Phar, Jakob, Humphreys, Physically Based Rendering: From Theory to Implementation, 2016

[4] d'Eon, Luebke, Endorton, "Efficient Rendering of Human Skin" (NVidia), Eurographics 2007