

# Coding and Interactive techniques for manipulation of appearance in Computer Graphics

Doctoral Thesis Topic

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In this thesis we will develop ways to represent variations in appearance (texture, BRDF's) which are compact and have intuitive parameters.

In current state of the art, despite compact representations such as procedural models, and -- for some classes of algorithms -- neighborhood-based techniques, their expressivity may be limited, or the parameters required may be hard to control.

In this thesis, we will investigate include procedural representations, or neighborhood-based texture-synthesis methods which can encode large varieties of texture or lighting conditions. We will also investigate sparse coding techniques for the representation of texture and materials. We will investigate different types of noise functions, as well as optimization/neighborhood search based techniques and new and efficient ways to store and evaluate them.

Once we have defined these representations, we will investigate novel interaction techniques, with a dual goal in mind: (a) allow the user to create desired appearances more easily and (b) optimize the storage and computational cost of the representation by indicating which part is required and which is redundant, thus guiding the optimizations used for the coding. This will also involve using perceptual principles to determine appropriate parameterizations for appearance. This thesis will be in collaboration with partners working on interactive techniques and on perceptual principles for graphics.

The first goal of this thesis is thus to develop compact and effective codings for appearance, permitting easy manipulation to create variety. The second goal is to develop appropriate interfaces to (a) allow these codings to be easily manipulated, (b) develop more efficient representations.

More details and references for this topic will be presented later.

## Requirements

The successful candidate should have a Masters degree in Computer Science, and have preferably taken courses in computer graphics and have experience in computer graphics programming, with knowledge of OpenGL or DirectX, and some experience with shading languages such as GLSL/HLSL/Cg.