

Title: Continuous Transitions between Photorealistic and Expressive Renderings for Buildings

Masters or Engineering Internship (6 months)

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Objectives

There has been recent interest in “expressive” renderings for map-like views of cities in the context of the multiple virtual tourist applications such as GoogleMaps/GoogleEarth or VirtualEarth (e.g., [Grabler08]). In this internship we will investigate how to achieve smooth and meaningful transitions between photorealistic illumination, including global illumination effects and expressive rendering styles, such as the Gooch NPR lighting model ([Gooch98]) or pen-and-ink styles (e.g., [Coconu06]).



Left: Realistic (direct lighting only) rendering and Right: pen-and-ink rendering (from [Coconu06])

We will determine how to use various local and global illumination effects such as direct and indirect shadows, indirect illumination etc, to guide the various parameters of the expressive styles (stroke width and style, NPR shading model parameters etc.). We will also investigate how to perform transitions between an expressive style and a realistic style, providing appropriate hybrid renderings at intermediate stages of the transition. We will use criteria for facade saliency as outlined in [Grabler08] to determine appropriate transitions, as well as other measure of salient features in the geometry and lighting used for realistic renderings. We will also investigate changes in illumination conditions (sunny sky, overcast sky), different materials (glossy materials creating significant indirect lighting effects, etc), where the importance of global illumination is paramount.

As a first step, in the context of this internship we will consider static scenes, and we will use PBRT (<http://www.pbrt.org/>) to render global illumination of building models. For NPR, we will use “toon”, “Gooch” or “pen-and-ink” renderers as a starting point for our investigations. Time and resources permitting, we will also investigate the use of real-time global illumination approaches, such as [Ritschel08] or [Dacshbacher 07].

Requirements

The successful candidate should have 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.

INRIA provides a student stipend for living expenses.

References

[Coconu06] Liviu Coconu, Oliver Deussen, Hans-Christian Hege *Real-time pen-and-ink illustration of landscapes*, NPAR 2006. <http://graphics.uni-konstanz.de/publikationen/index.php?language=english#2006>

[Grabler08] Floraine Grabler, Maneesh Agrawala, Robert W. Sumner, Mark Pauly *Automatic Generation of Tourist Maps*, SIGGRAPH 2008
<http://www.floraine.ch/berkeley%20site/Automatic%20Generation%20of%20Tourist%20Maps.htm>

[Ritschel08] Tobias Ritschel, Thorsten Grosch, Min H. Kim, Hans-Peter Seidel, Carsten Dachsbacher, Jan Kautz, *Imperfect Shadow Maps for Efficient Computation of Indirect Illumination*, ACM Trans. on Graphics (Proceedings SIGGRAPH Asia 2008), 27(5), 2008.
<http://www.uni-koblenz.de/~ritschel/>

[Gooch98] Amy Gooch, Bruce Gooch, Peter Shirley and Elaine Cohen , *A Non-Photorealistic Lighting Model For Automatic Technical Illustration* (SIGGRAPH 1998).
<http://www.siggraph.org/publications/bibliography/index.php?detail=11591>

[Dachsbacher 07] Carsten Dachsbacher, Marc Stamminger, George Drettakis, Frédo Durand *Implicit Visibility and Antiradiance for Interactive Global Illumination* ACM Transactions on Graphics (SIGGRAPH Conference Proceedings), Volume 26, Number 3 - August 2007