Computer-assisted Realistic Drawing

Adrien Bousseau, REVES – INRIA Sophia Antiopolis
adrien.bousseau@inria.fr, **http://www-sop.inria.fr/members/Adrien.Bousseau/**

Drawing is a powerful support for creation and communication but requires significant artistic and technical skills to achieve convincing results. The goal of this PhD is to facilitate and accelerate drawing for amateurs as well as for expert designers and illustrators, with a particular emphasis on drawing plausible material and lighting effects.

The first part of the PhD will be to observe how people draw with existing tools. To do so we will conduct an observational study where we will interview designers and illustrators and collect data by videotaping drawing sessions and by recording drawings with digital pens. This study will be performed in collaboration with researchers in human-computer interaction.
In the second part of the PhD, we will deduce from our observations new user interfaces and rendering algorithms that automate part of the drawing process and enrich 2D drawings with realistic rendering capabilities. We will combine computer vision and computer graphics techniques to estimate geometric information from sketches. We will then use this information to guide rendering algorithms that generate plausible depictions of material and lighting over the drawing.
In the third part of the PhD, we plan to develop computer-assisted drawing lessons to teach amateurs to draw from photographs and 3D models. We will apply image analysis algorithms to estimate the structure of a photograph and use that structure as guidance for drawing.

To summarize, the goal of this PhD is to make amateurs more confident in their drawing skills and to allow expert designers to produce complex illustrations more effectively.

Requirements:
The successful candidate should have taken courses in computer graphics and/or computer vision and have experience in computer graphics programming, with knowledge of OpenGL or DirectX, and some experience with shading languages such as GLSL/HLSL/Cg.

Related work:

[1] Where Do People Draw Lines? Forrester Cole, Aleksey Golovinskiy, Alex Limpaecher, Heather Stoddart Barros, Adam Finkelstein, Thomas Funkhouser, Szymon Rusinkiewicz. ACM Transactions on Graphics 27, Proceedings of SIGGRAPH. 2008
http://gfx.cs.princeton.edu/pubs/Cole_2008_WDP/index.php

[2] Diffusion Curves: A Vector Representation for Smooth-Shaded Images. Alexandrina Orzan, Adrien Bousseau, Holger Winnemöller, Pascal Barla, Joëlle Thollot, David Salesin. ACM Transactions on Graphics 27, Proceedings of SIGGRAPH. 2008
http://maverick.inria.fr/Publications/2008/OBWBTS08/

[3] ShadowDraw: Real-Time User Guidance for Freehand Drawing. Yong Jae Lee, Larry Zitnick, and Michael Cohen. ACM Transactions on Graphics (Proceedings of SIGGRAPH). 2011
https://webspace.utexas.edu/yl3663/~ylee/shadowdraw/shadowdraw.html

[4] Sketching : Drawing Techniques for Product Designers. Koos Eissen, Roselien Steur.

[5] Keys to Drawing. Bert Dodson.