# Stylized Rendering for Multiresolution Image Representation

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By integrating stylized rendering with an efficient multiresolution image representation, we enable the user to control how compression affects the aesthetic appearance of an image. Adopting a point-based rendering approach to progressive image transmission and compression, we represent an image by a sequence of color values. To best approximate the image at progressive levels of detail, a novel, adaptive farthest point sampling algorithm balances global coverage with local precision. Without storing any spatial information apart from the aspect ratio, the spatial position of each color value is inferred from the preceding members of the sampling sequence. Keeping track of the spatial influence of each sample on the rendition, a progressively generated discrete Voronoi diagram forms the common foundation for our sampling and rendering framework. This framework allows us to extend traditional photorealistic methods of image reconstruction by scattered data interpolation to encompass non-photorealistic rendering. It supports a wide variety of artistic rendering styles based on geometric subdivision or parametric procedural textures. Genetic programming enables the user to create original rendering styles through interactive evolution by aesthetic selection. Comparing our results with JPEG, we conclude with a brief overview of the implications of using non-photorealistic representations for highly compressed imagery.

Our research is based on the observation that every image has a resolution at which stylized depiction becomes inevitable. We propose that, whenever visible distortion due to compression or interpolation cannot be avoided, its appearance should be dictated by the graphic designer and not the graphics algorithm. When image artifacts manifest intentional styling, such as an evocative or decorative motif, they may no longer be viewed as defects to be avoided. By becoming an integral part of an image's unique character, stylization helps the graphic designer to deliberately shape the viewer's impression of the image. In an efficient image representation, where some visual information needs to be implied rather than encoded, stylized rendering can make abstraction and simplification appear legitimate, encouraging the viewer's imagination to complete the picture. In the context of our implemented framework for stylized rendering from minimal image data, our talk will explore these issues of efficiency, stylization and abstraction for concise image representations.

Please note that this work was originally presented in 2005 at the Human Vision and Electronic Imaging X Conference of the Electronic Imaging Symposium (San Jose, USA) and it will appear in Proceedings of SPIE Vol. 5666. Subsequently, we were encouraged to bring this work to the Eurographics Workshop on Computational Aesthetics in Graphics, Visualization and Imaging (Girona, Spain).

Our web site includes the complete paper and the accompanying presentation as well as additional illustrations and animated figures:
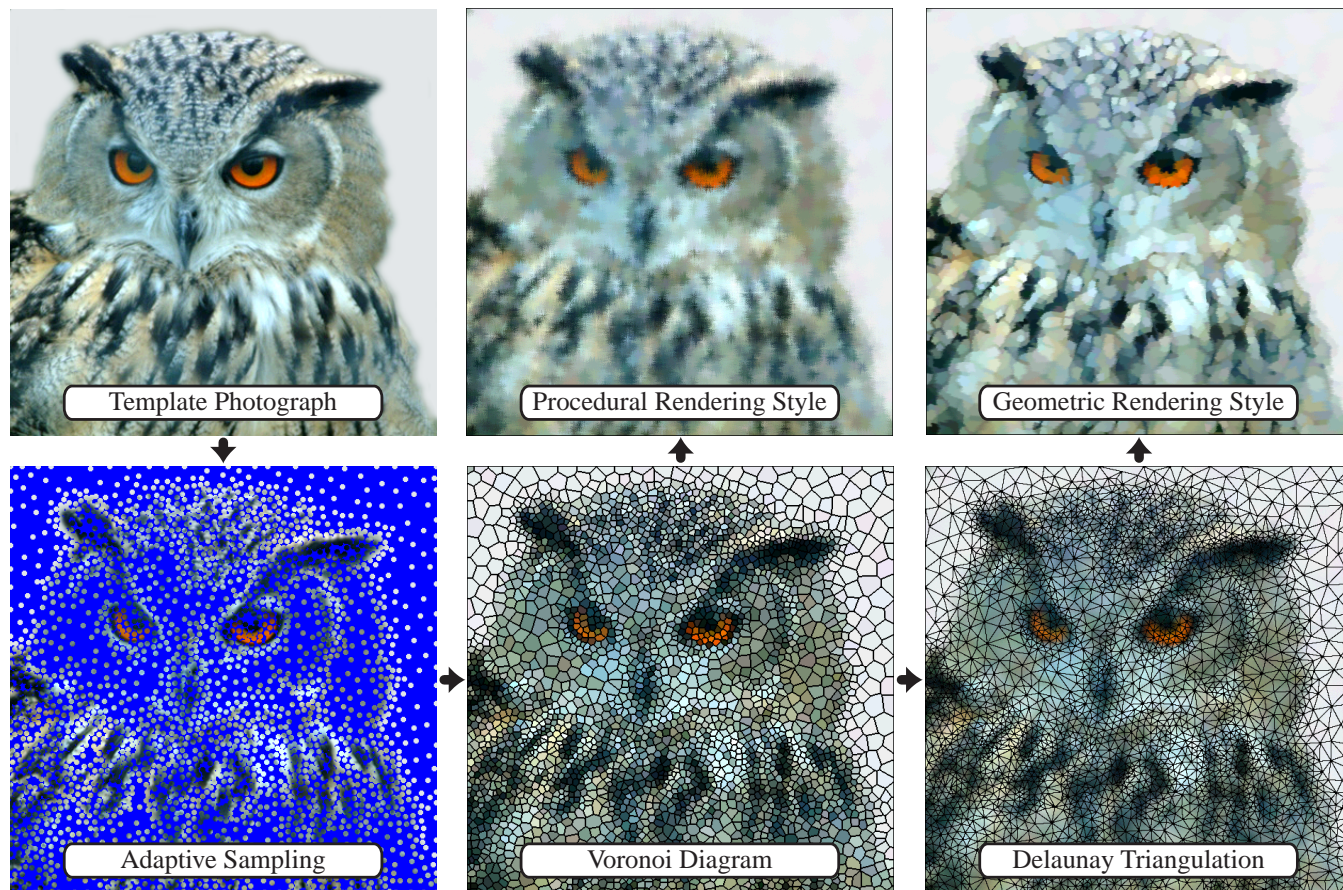http://www.eyemaginary.com/Portfolio/StylizedRendering.html



**Figure 1:** Non-photorealistic image rendering process using our adaptive sampling technique (3200 samples ≈ 2%).