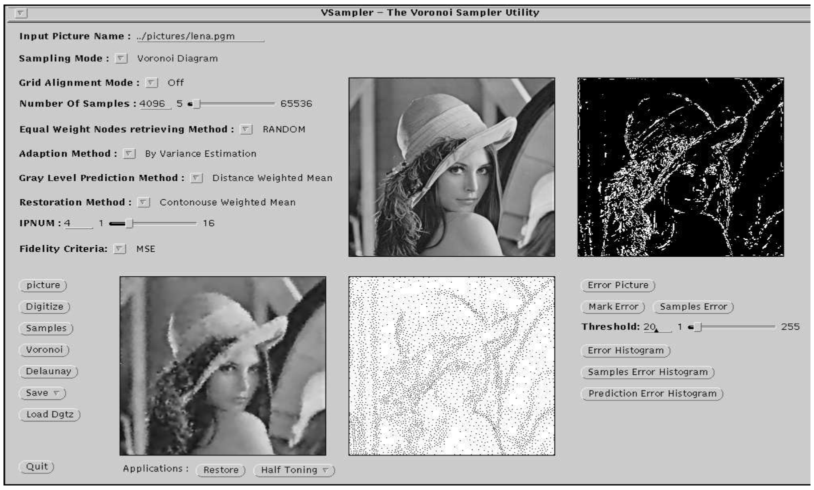
Voronoi Diagram Based Image Sampling and Interpolation

CIS Project

Ohad Ben Shahar
Supervisor: Dr. M. Lindenbaum

Based on a novel method of "Farthest Point Strategy" [1], a general purpose tool for image sampling, compression and interpolation is developed. The algorithm, which uses the Voronoi diagram, achieves a deterministic progressive image acquisition that retains uniformity with the increased density. The uniformity metric can be either image-independent or image-dependent so an adaptive sampling scheme can be derived too. The samples are irregularly spaced, providing excellent antialiasing properties. The sampled gray levels subset can serve as a compressed representation of the image, and various interpolation techniques were tested and evaluated for the image reconstruction. The developed tool, *Vsampler*, can be used for various applications and was already used as part of a ray-tracing process ([2]).



Example of adaptive sampling pattern and interpolation results produced by Vsampler (original picture, reconstructed picture, samples pattern and error picture are presented counterclockwise).

References

[1] Y. Eldar, M. Lindenbaum, M. Porat and Y. Y. Zeevi, "The Farthest Point Strategy for Progressive Image Sampling", ICPR-1994, Vol. III, pp. 93-97.
[2] I. Notkin and C. Gotsman, "Parallel Adaptive Ray-Tracing", CIS Report No. 9416, Technion - IIT, Israel, 1994.