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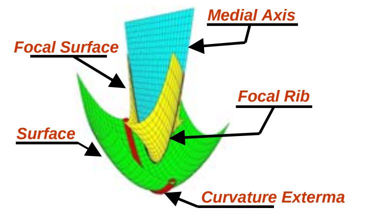
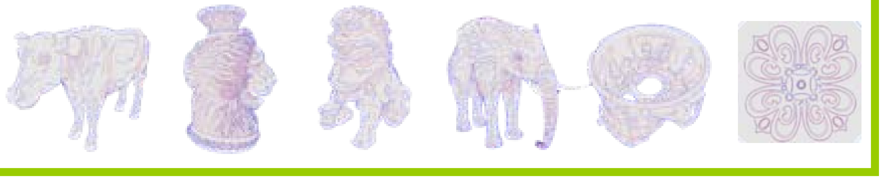
S. Yoshizawa, **A. Belyaev**, H. Yokota, and H.-P. Seidel, “Fast, robust, and faithful methods for detecting crest lines on meshes”, Computer Aided Geometric Design, 25(8), 545-560, 2008.



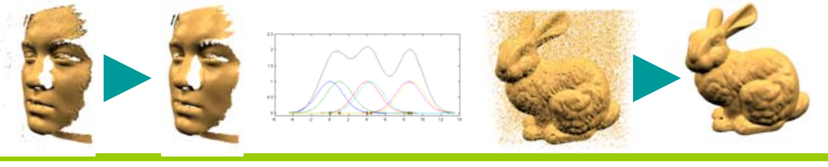
Main ideas:

1. Exploiting geometric relationships between curvature extrema on a smooth surface and singularities of corresponding focal set (the loci of the principal curvature centres).
2. A novel filtering scheme which take into account invariance properties of the extrema of the principal curvatures along their corresponding curvature directions.

Up to date, the fastest method to detect curvature extrema an meshes: 1-1.2 million triangles per sec. on a standard PC.



O. Schall, **A. Belyaev**, and H.-P. Seidel, “Adaptive feature-preserving non-local denoising of static and time-varying range data”, Computer-Aided Design, 40(6), June 2008, pp. 701-707. (This is an extended journal version of an earlier conference paper which got **the best paper award** from ACM Symposium on Solid and Physical Modeling 2007.)

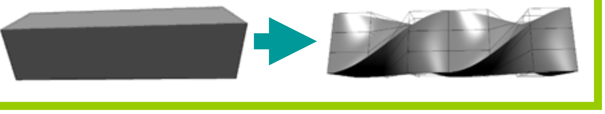


Main ideas:

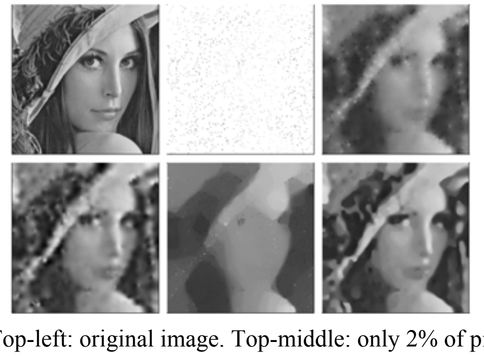
1. Kernel-based clustering with anisotropic kernels.
2. Taking into account spatial and temporal coherence (can be considered as a generalization of the popular bilateral filtering approach)

T. Langer, **A. Belyaev**, and H.-P. Seidel, “Mean Value Bézier Maps”, Geometric Modeling and Processing (GMP 2008), Hangzhou, China, April 2008. Springer Lecture Notes in Computer Science (LNCS), Vol. 4975, 2008, pp. 231-243. **The best paper award.**

Combining generalized barycentyric coordinates with standard Bezier subdivision process. Besides theoretical contributions, the paper presents a powerful feature-preserving free-form shape deformation technique.



I. Galić, J. Weickert, M. Welk, M. Bruhn, **A. Belyaev**, H.-P. Seidel: “Image compression with anisotropic diffusion”. Journal of Mathematical Imaging and Vision. 31(2-3), July 2008, pp. 255-269.



A PDE-driven data interpolation technique for image reconstruction from sparse scattered data. A second-order anisotropic nonlinear diffusion is used. It shows a much better performance than isotropic nonlinear diffusion and fourth-order PDEs.

$$Lu := \operatorname{div}\left(g\left(\nabla u_\sigma \nabla u_\sigma^{\,T}\right)\nabla u\right)$$

$$u_\sigma = u \otimes G_\sigma, \quad g\left(s^2\right) = 1\Big/\sqrt{1+s^2/\lambda^2}$$

$$\partial_t u = [1-c(x)]Lu - c(x)(u-f), \quad u(x,0) = f(x)$$

Top-left: original image. Top-middle: only 2% of pixels (chosen randomly) are kept. Top-right: linear diffusion interpolation. Bottom-left: biharmonic interpolation. Bottom-middle: nonlinear isotropic diffusion is used for interpolation. Bottom-right: the best reconstruction is achieved with anisotropic nonlinear diffusion with a pixel confidence term.

S. Hahmann, **A. Belyaev**, L. Busé, G. Elber, B. Mourrain and C. Rössl, “Shape Interrogation”, in Shape Analysis and Structuring, L. De Floriani and M. Spagnuolo (Eds.), Springer, 2008, pp. 1-51. Just a book chapter on classical and modern shape interrogation techniques.

Research in Progess. (1) Fast bilateral filtering via fast Gauss transfrom, with S. Yoshizawa (RIKEN); (2) Shape Complexity from View Similarity, with Waqar Saleem (MPII); (3) Feature-sensitive bas-relief generation, with J. Kerber (MPII) and R. Zayer (LORIA/INRIA); (4) Geometric image processing with mesh parameterization, with H. Yamauchi (Mental Images / NVIDIA).