

Pre-Optimized Compatible Triangulations of Simple Polygons

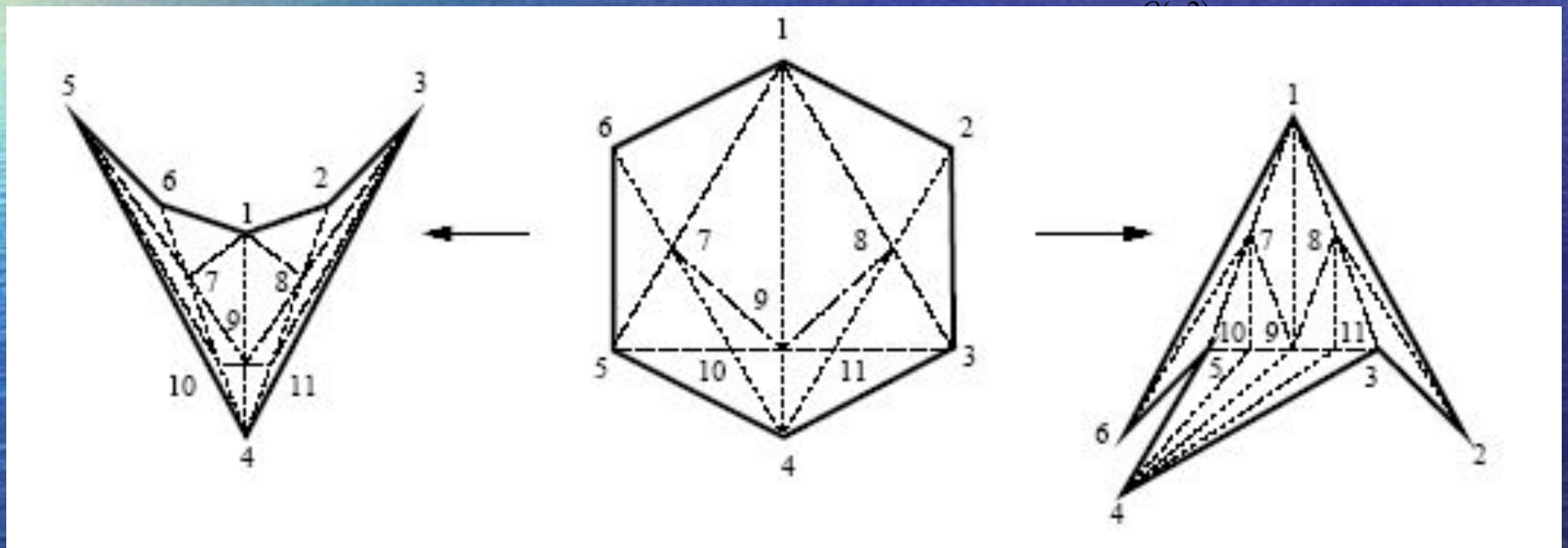
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Important Techniques !

- Graphics Deformation
- Texture Warping
- As-Rigid-As-Possible Shape Interpolation!
(SIGGRAPH 2000)

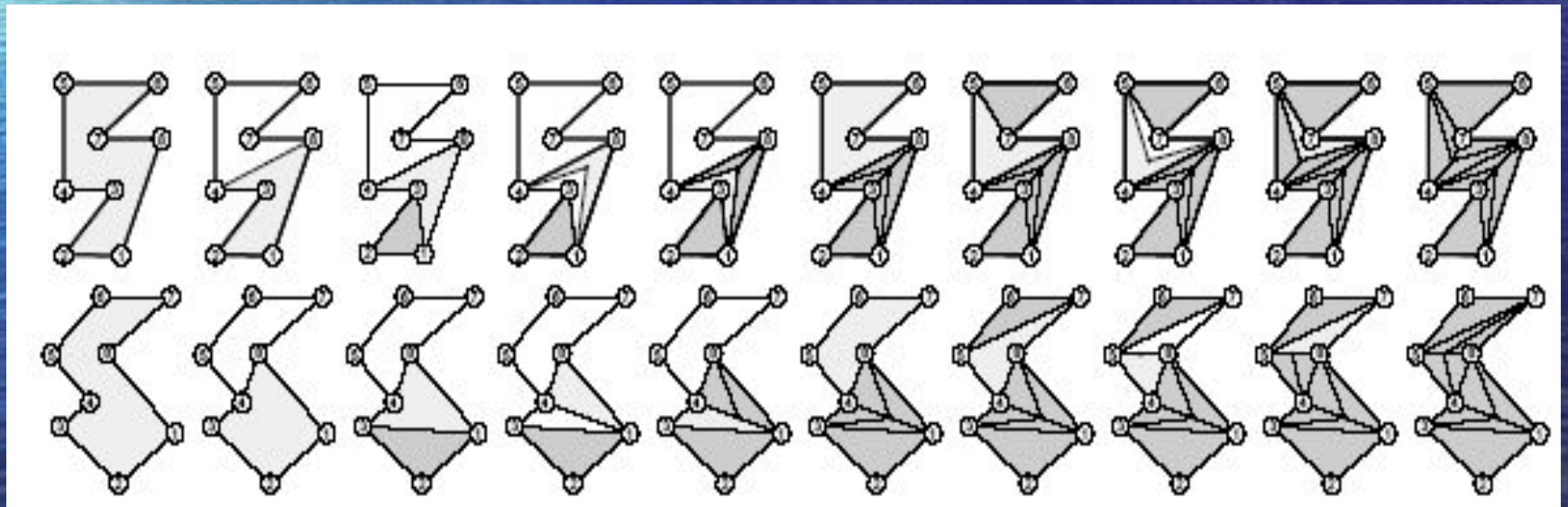
A Simple Construction [1]

- Additional $O(n^2)$ Steiner Points



High Quality Com. Triangulations[2]

- Calculate minimum-link
- Create link-paths (Costly act!)



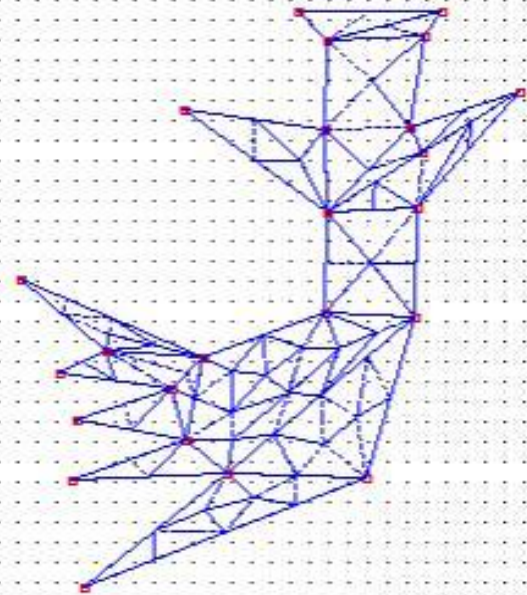
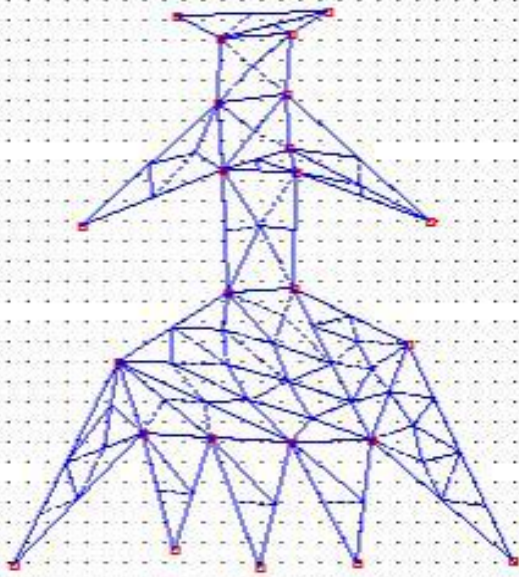
The Problems

- Can this be fast? (Real-time perform?)
- How to get better result?
(Regular triangles and better shape)

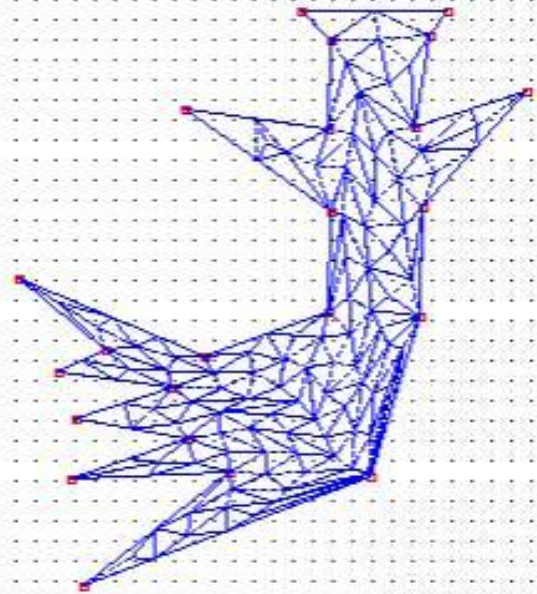
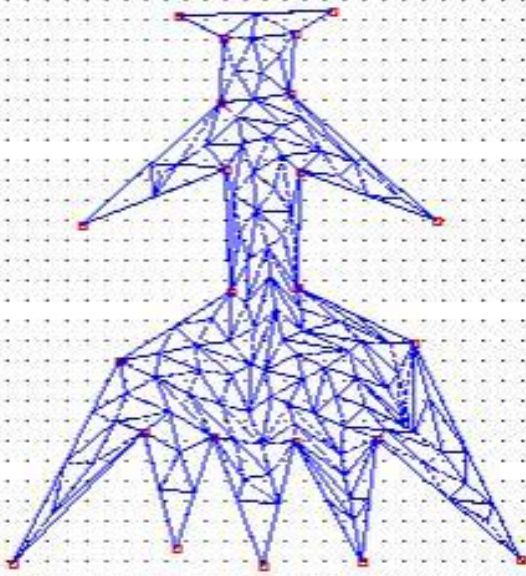
Our Algorithm

- 1) Create Compatible Polygons
(Force Target Sub-Polygons to be Convex)
- 2) Triangulate Source Sub-Polygons
- 3) **Pre – Optimize!**
- 4) Smooth Surface Fitting
- 5) Combine the Pieces of Meshes

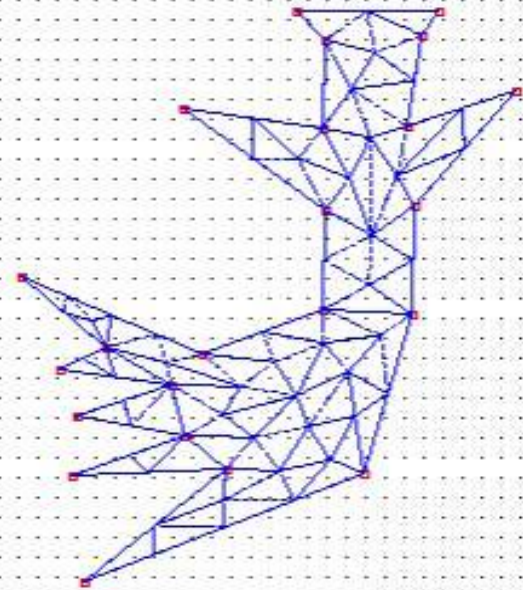
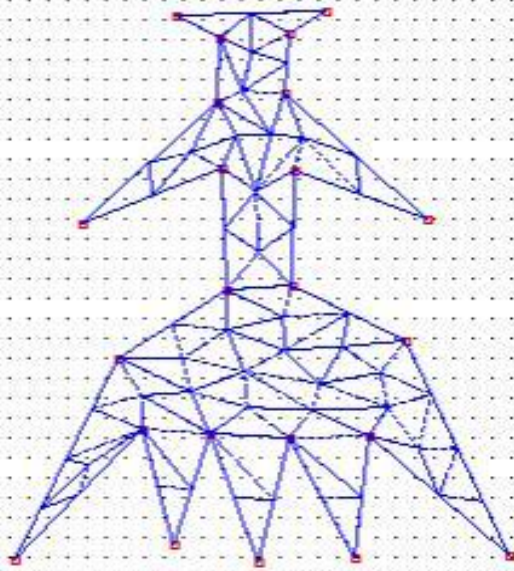
Performance — Our Algorithm



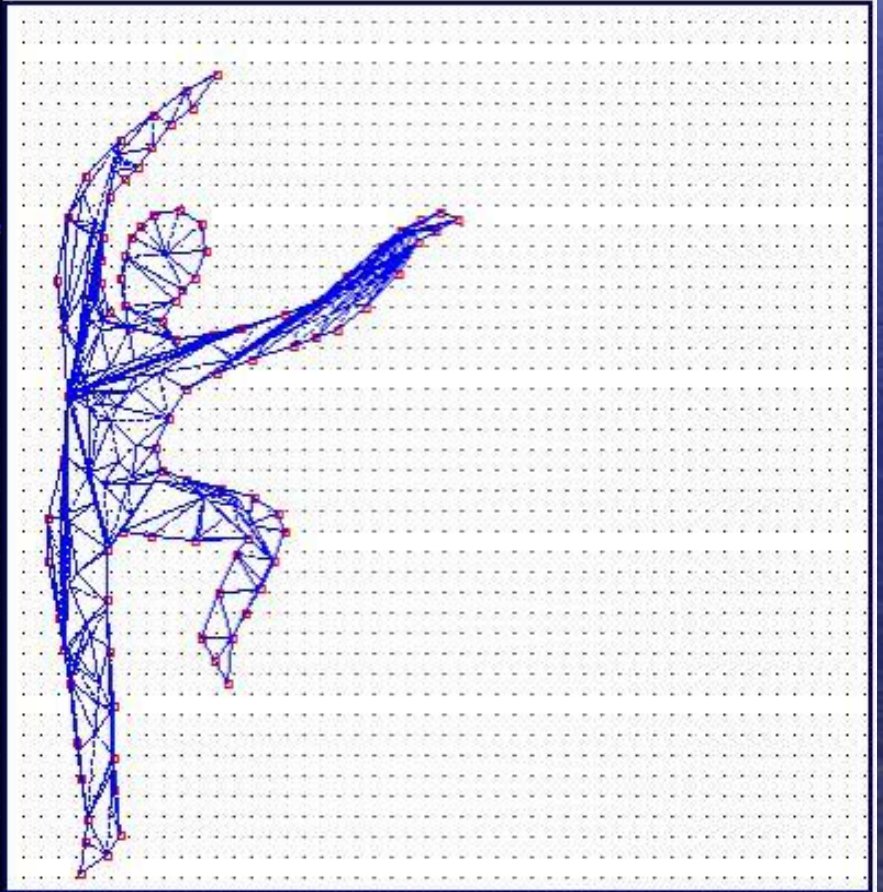
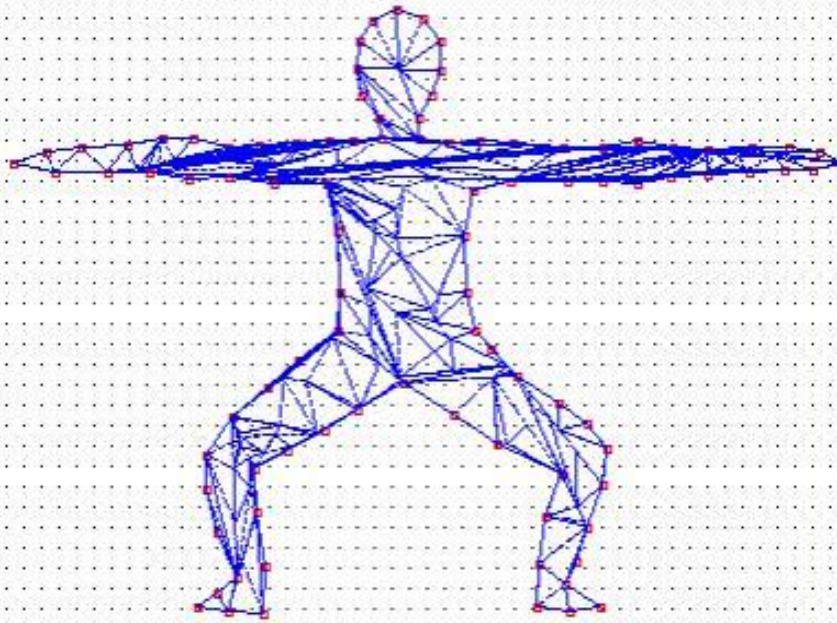
Performance [1]



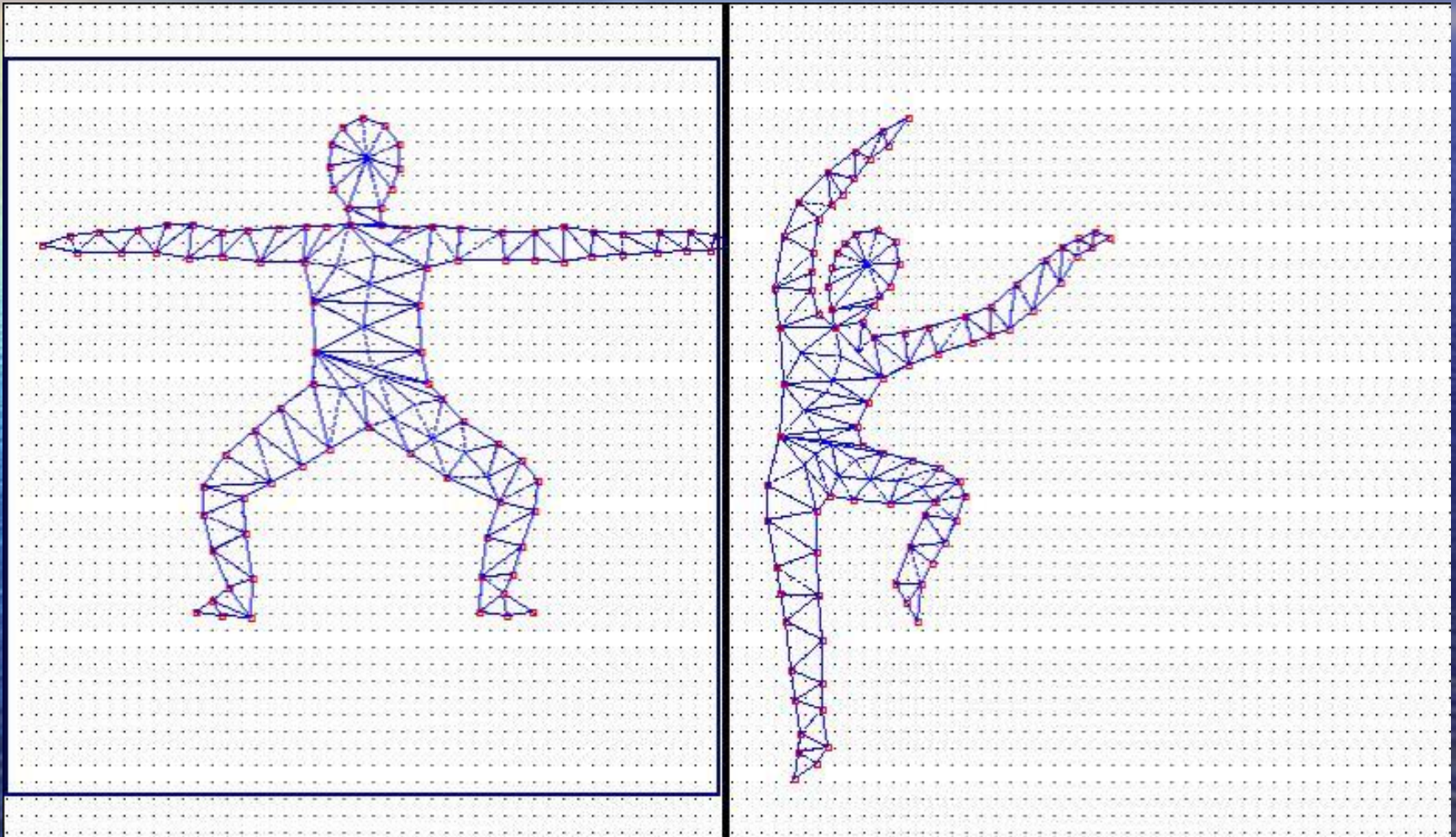
Performance [2]



Performance [1]

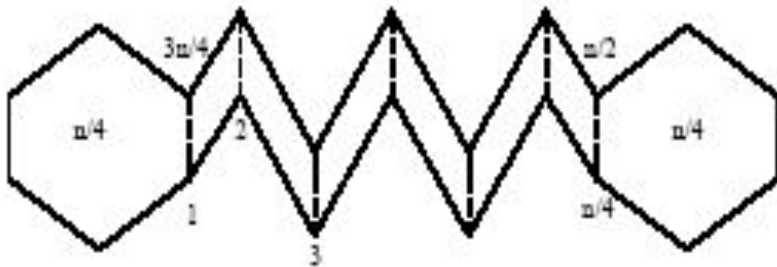


Performance — Our Algorithm



A Lower Bound

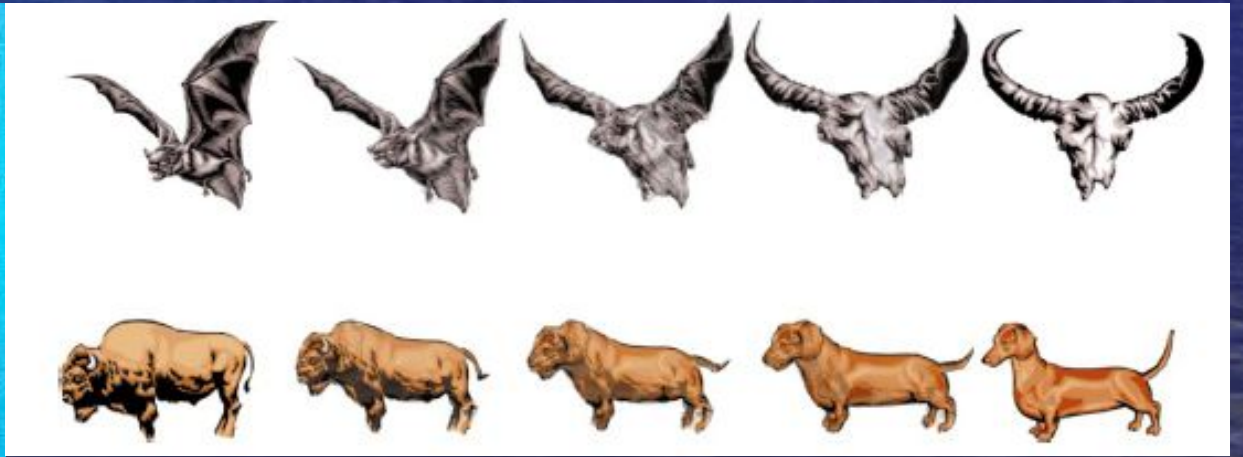
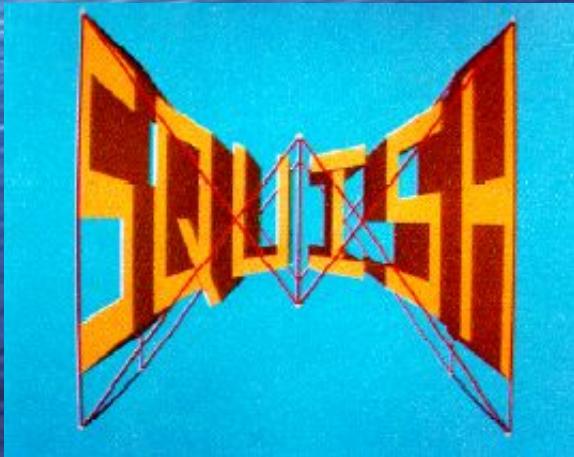
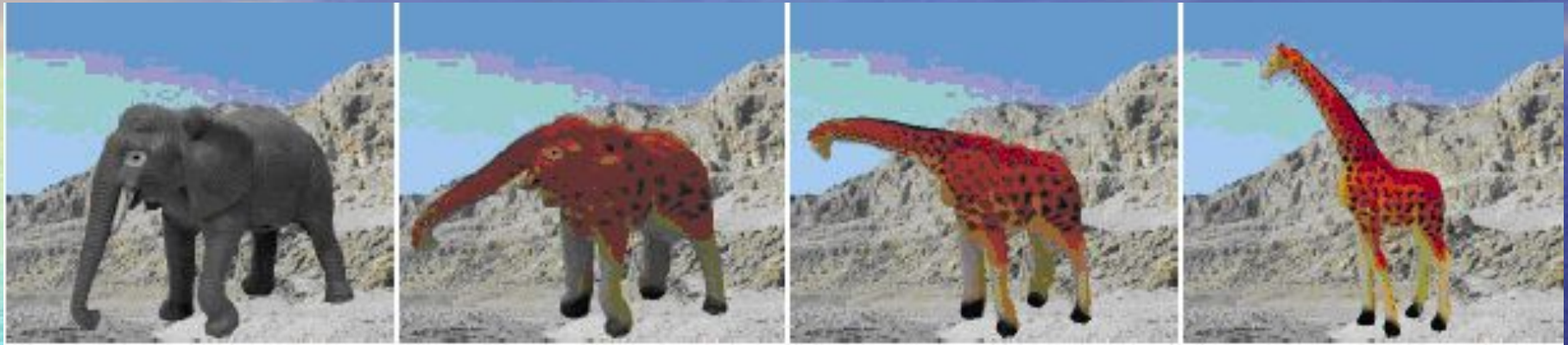
$$\frac{\left(\frac{n}{2}-2\right)^3}{3} + \left(\frac{n}{2}-2\right)^2 - \frac{\left(\frac{n}{2}-2\right)}{3}$$



Contrasts

	Const. Speed	Opt. Speed	Extra Points	Mesh Quality
SCT [1]	—	×	×	×
HQCT[2]	×	—	○	—
POCT	○	○	—	○

The Future!



References

- [1] Boris Aronov, Raimund Seidel, Diane Souvaine. On Compatible Triangulations of Simple Polygons. *Computational Geometry: Theory and Application*, 3:27-35, 1993.
- [2] Vitaly Surazhsky, Craig Gotsman. High Quality Compatible Triangulations. 11th International Meshing Roundtable, Ithaca, NY, September 2002, pages 183-192.
- [3] Michael S. Floater. *Parametrization and smooth approximation of surface triangulations*. Elsevier Science B. V. 1997.
- [4] Vitaly Surazhsky, Craig Gotsman. Morphing Stick Figures Using Optimized Compatible Triangulations. *Pacific Graphics* 2001.
- [5] Craig Gotsman, Vitaly Surazhsky. Guaranteed intersection-free polygon morphing. *Computers & Graphics* 2001.

A photograph of a sunset over the ocean. The sky is a deep blue with wispy white clouds. The sun is low on the horizon, creating a bright glow and a rainbow-like spectrum of colors (yellow, green, blue) on the left side of the image. The water is dark blue with gentle ripples. The text "Thank you!" is written in a large, white, sans-serif font across the middle of the image.

Thank you !