ShapePalettes: Interactive Normal Transfer via Sketching

Review by Michael Hays

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Overview

- Provide a rapid way to create 3d figures using a 2d interface.
  - We have seen glyph based construction – Sketch ‘96
  - We have seen complete free form – Teddy ’99
    - Where are they now? FiberMesh/Plushie
- Easily add normal information to a 2D sketch by transferring normals from example 3D figures
  - Rendering 3D images from normal information came from Kovesi’s 2005 paper on “Shapelets”.

Overview (cont)

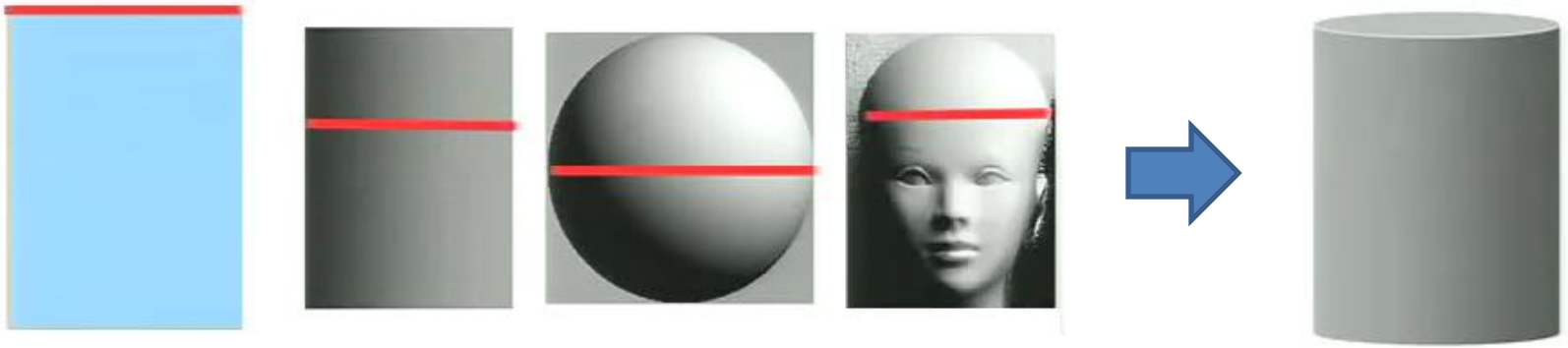
- People have a good intuition for implied 3d information in a 2d scene

Drawing the Silhouette

- The silhouette defines the zero line of the figure. No height will be applied at this point.
- The normals of a silhouette are perpendicular to the 2D sketch
- No need for a palette yet

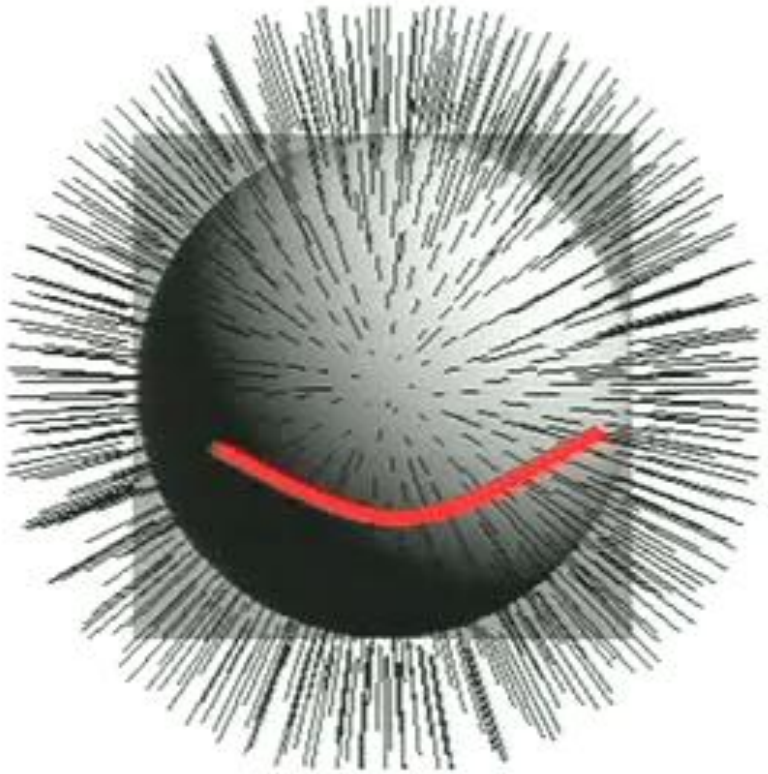
Using the Palette to Imbue Normals

- Transfer pallet by marking up our 2D figure and then drawing a corresponding mark on a shape from the palette.



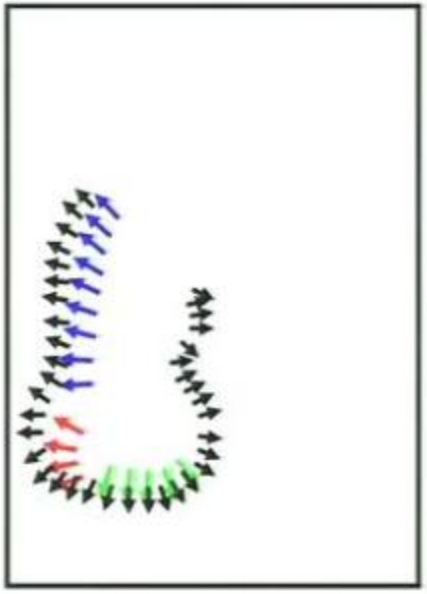
What is being transferred?

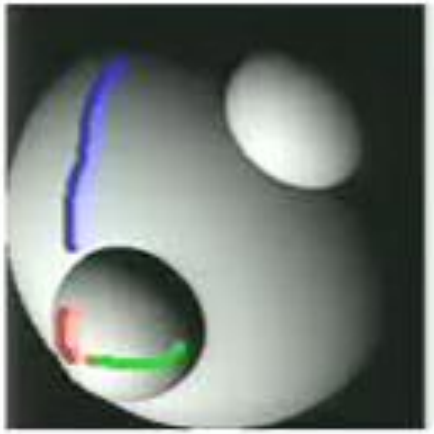
- 3D Normals are copied onto the 2D image



Returning to our Silhouette

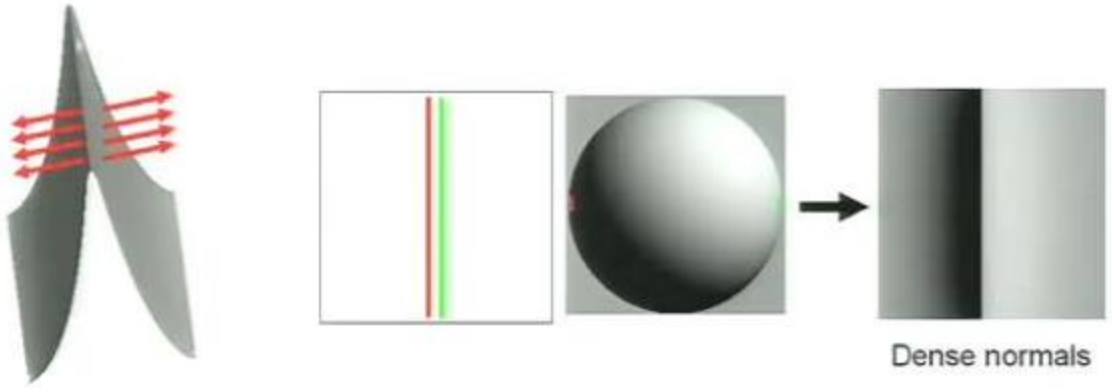
- More Interesting Palettes



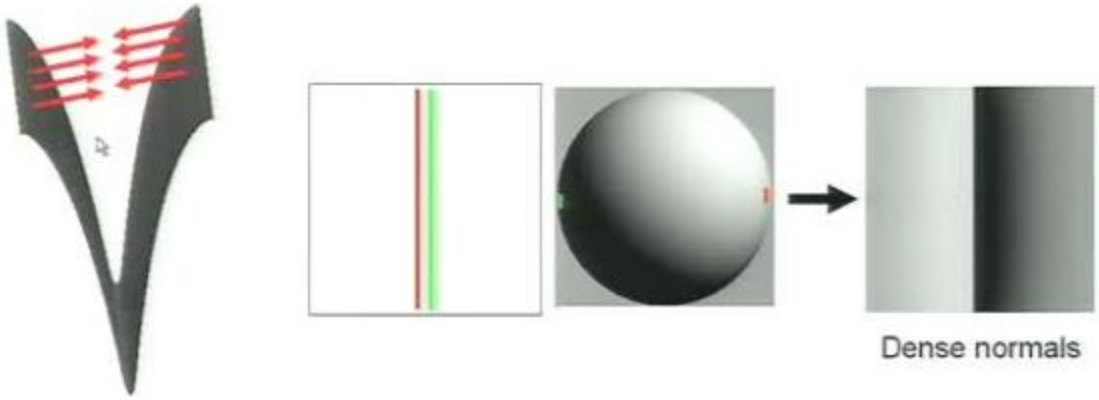


Interesting Shapes

- Ridges



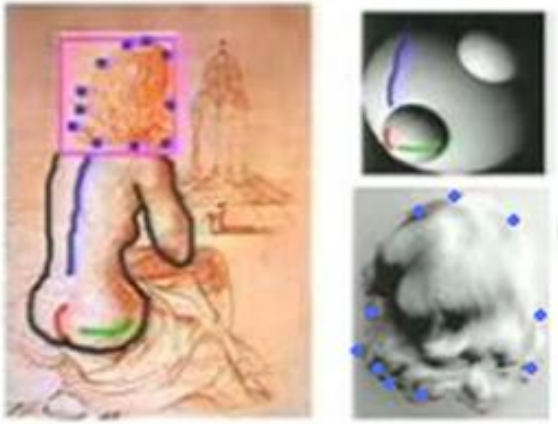
- Valleys



Patches

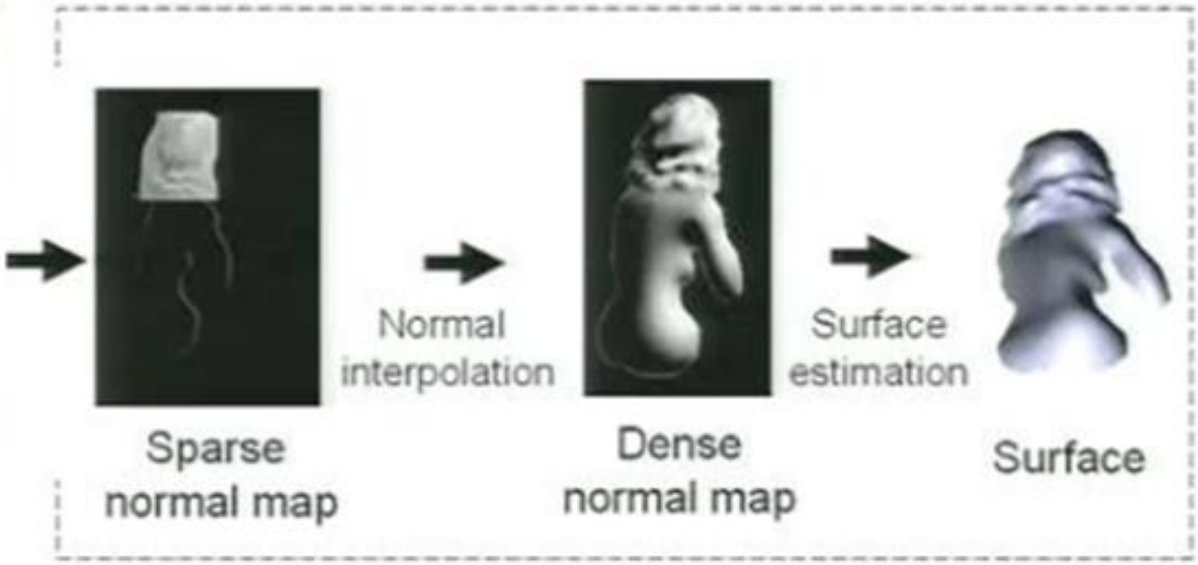
- Morph a set of points to communicate complex 3D texture

Overall Framework

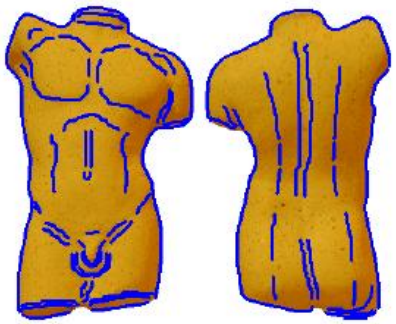


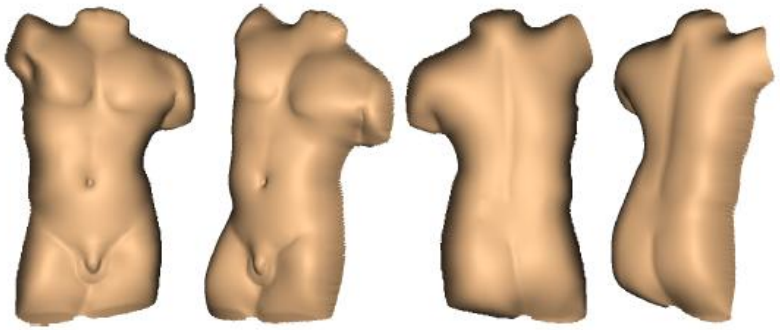
Normal transfer via sketching

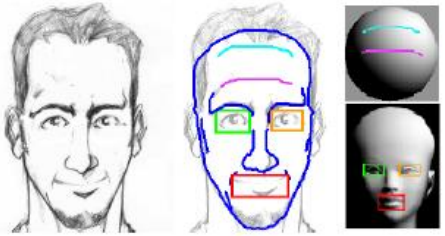
- Sparse normal map contains only the lines drawn by the user
- Must be converted to a dense normal map so that it can be turned into a 3D surface.

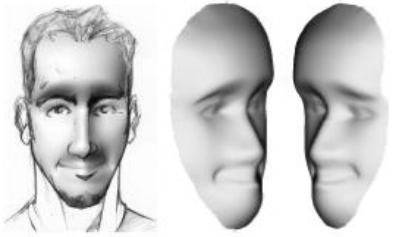


Examples









Strengths

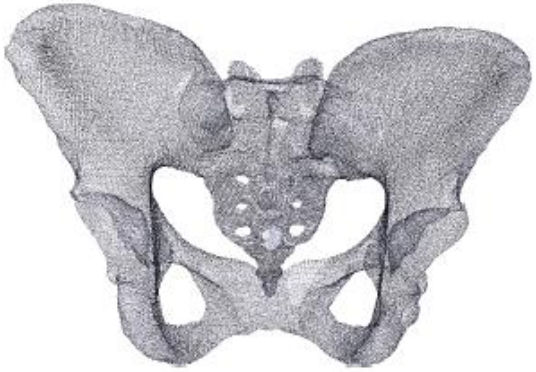
- This approach seems very intuitive
  - Pen only works in a couple of ways
  - Almost completely modeless interface
- Seems simple to implement
  - The challenge seems to be computing the interpolated, dense, normals from the sparse normals, and the math is all laid out in the paper.

Limitations (read: Paper Ideas)

- The authors were using menus and buttons to control function.
- Height field is arbitrary
- No ability to work with occluded surfaces
- Interpolation of lines results in a “soft” model
- Cannot handle perspectives in the 2D image

Know thy enemy

- The strength of this interface is that it is easy and intuitive – can it be used for real work?
- At the same convention, another surface reconstruction paper was presented that seems to deal with the occlusion and detail problem – and is almost completely automated (supervised).



References

- Wu, Tai-Pang, Chi-Keung Tang, Michael Brown, Heung-Yeung Shum. “ShapePalettes: Interactive Normal Transfer via Sketching.” ACM Transactions, July 2007. Article 44.
- Andrei Sharf, Thomas Lewiner, Gil Shklarski, Sivan Toledo, Daniel Cohen-Or. “Interactive topology-aware surface reconstruction.” ACM Transactions, July 2007. Article 43.