Otto-von-Guericke University of Magdeburg
Faculty of Computer Science
## Department of Simulation and Graphics

Frame-Coherent Stippling

Our research goal is to produce interactive computer animations of 3D models rendered in the stippling style in a frame-coherent way.

Stippling

In Stippling, shading and texture are provided by the artist by placing points or stipples on the canvas until the desired texture or tone has been achieved.

"Southwest Pottery"
by Ron C. Guthrie
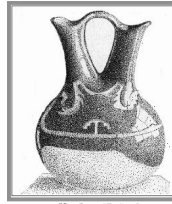
Frame-coherent Stippling

In our approach, we ensure frame-coherent animations by considering every vertex of an input model as the location for a potential stipple.
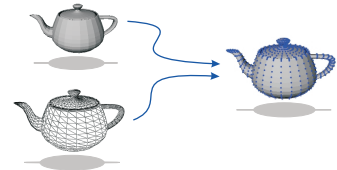
Mesh Subdivision

Since the vertices of an input model may not be enough to fill in dark areas, we perform mesh subdivision to obtain more vertices, or stipple locations.
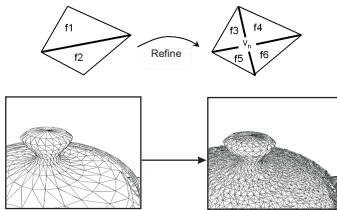
Randomize

Normally, the vertices of our input 3D meshes exhibit regularity on their distribution, generating patterns that are distracting to the human eye.

To avoid the presence of these patterns, we randomize the vertices of the input model, and then project the points back to the surface of the input mesh.
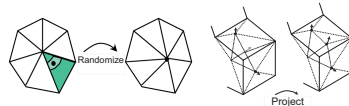
Mesh Simplification

Large models (like the Bunny) sometimes have more vertices than necessary, especially when the model is projected to a small screen area. We use mesh simplification to create a vertex hierarchy that allows us to discard some vertices.
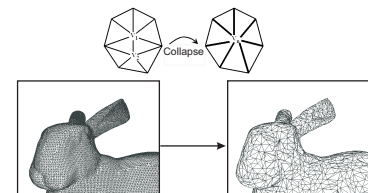
View-Dependant Rendering

When rendering, we perform a test on every potential stipple. If the screen projection length of the relevant neighbors of the potential stipple exceeds a certain screen-space threshold value, the stipple is rendered.

The relevant neighbors of a stipple are determined at the time of mesh simplification or mesh subdivision.

The threshold varies depending on the amount of illumination at the location of the stipple.

In dark regions, the threshold is small (and more stipples are rendered), and in light regions the threshold is large, so fewer stipples pass the test.

Since the threshold is tested in screen space, the stippling scales automatically when the viewport size changes or as the model gets closer to the viewer.

Otto-von-Guericke-Universität
Institut für Simulation und Graphik (ISG)
Universitätsplatz 2
39106 Magdeburg
Tel.: 0391 - 67 11349
Fax.: 0391 - 67 11164

Authors: Oscar Meruvia Pastor, Ph. D. Student.
Oscar@isg.cs.uni-magdeburg.de
Thomas Strothotte, Prof. Dr.
tstr@isg.cs.uni-magdeburg.de
Videos available at: http://wwwisg.cs.uni-magdeburg.de/~oscar
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