



Processamento Visual e Geométrico

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ICMC-USP



The Group



L.G. Nonato



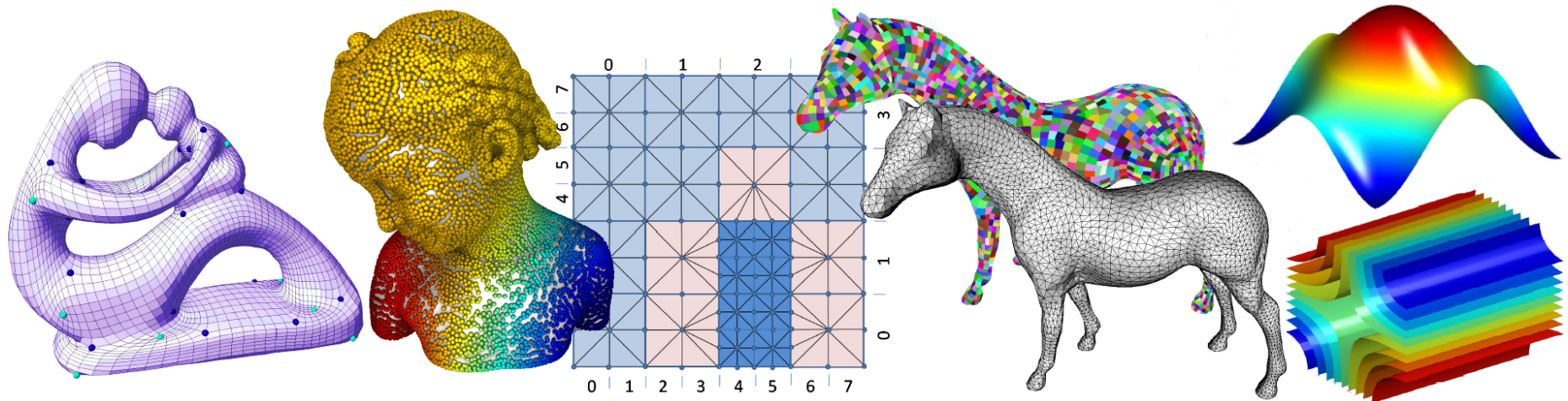
A. Paiva



A. Castelo



M. Gameiro



Graphics, Imaging and Visualization



L.G. Nonato



A. Paiva



A. Castelo



M.C. Oliveira



R. Minghim



F. Paulovich

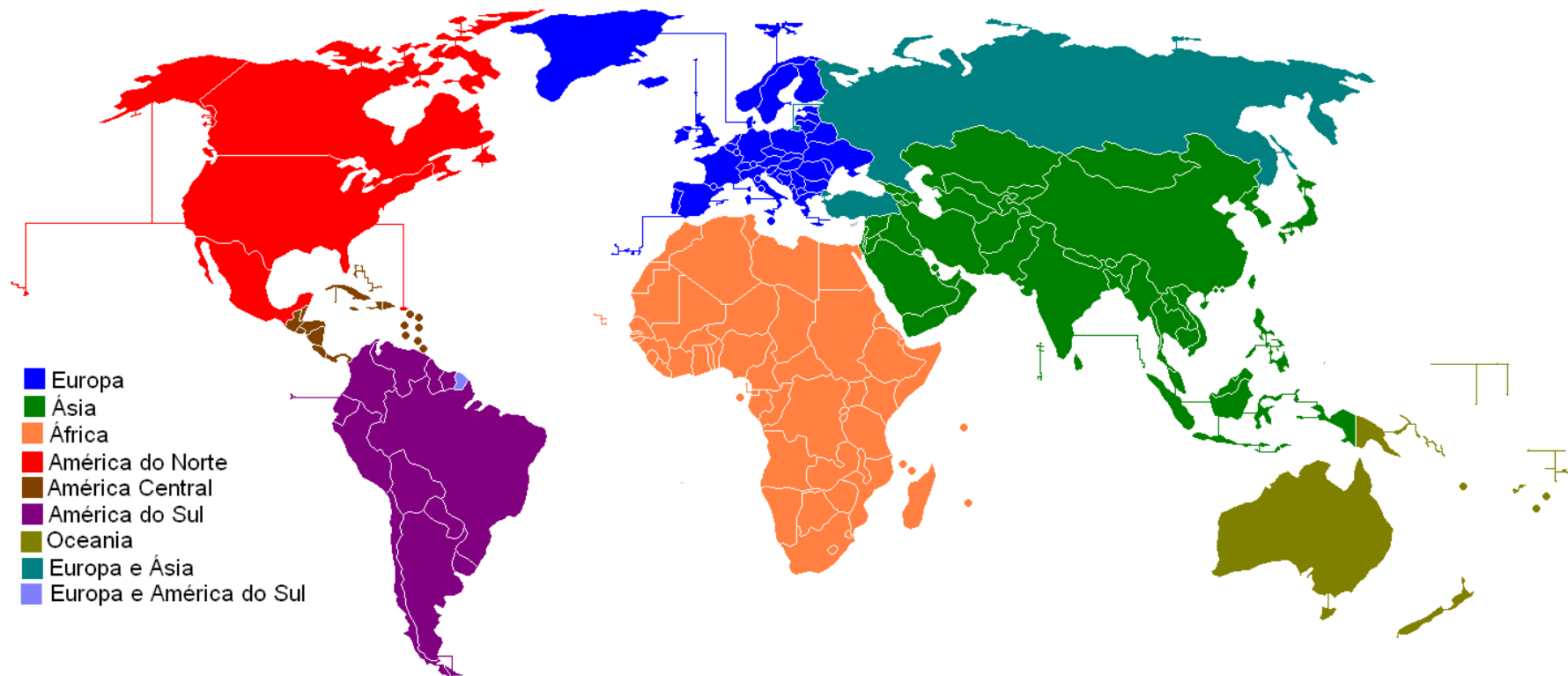


J. Batista



M. Ponti

The Grand Slam

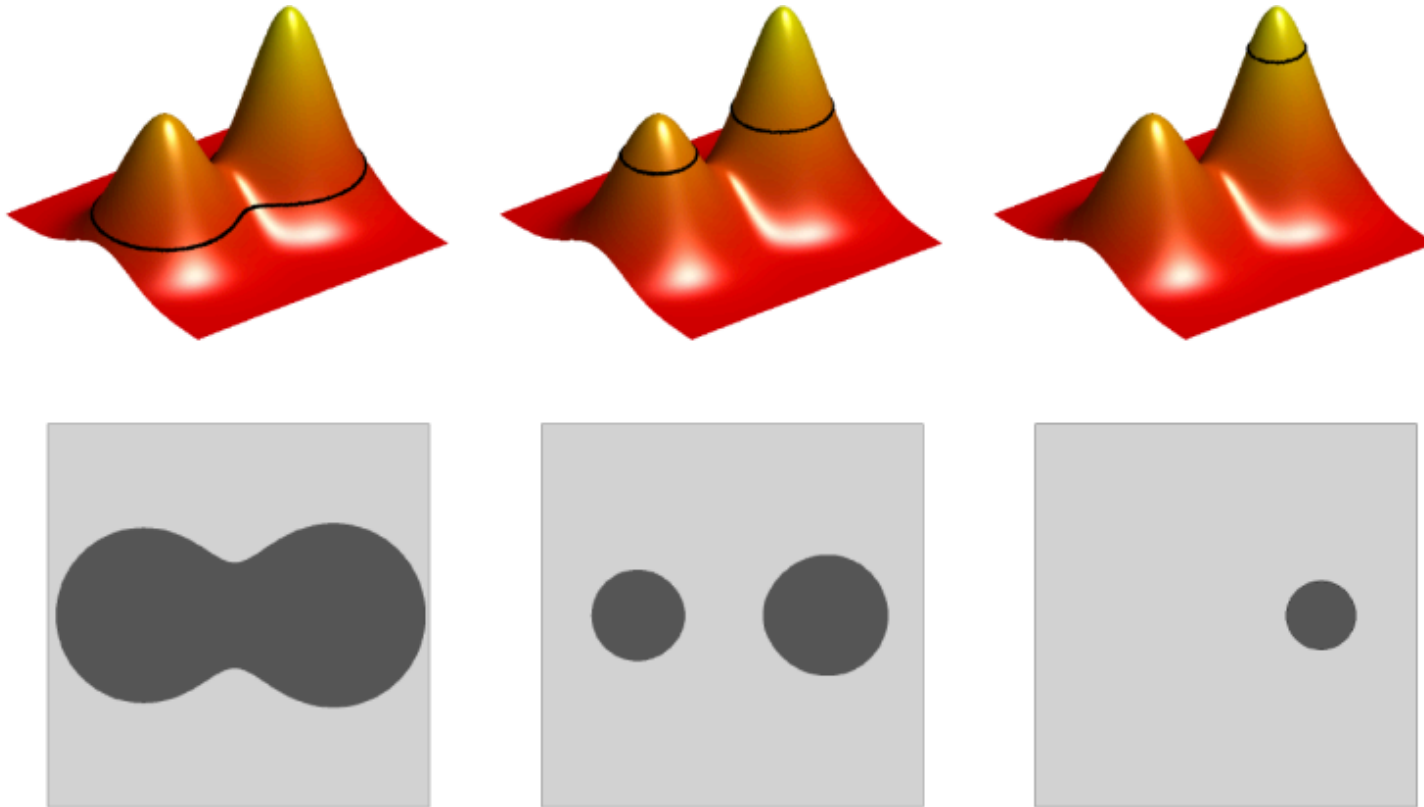




Mesh Generation & Geometry Processing

Mesh Generation

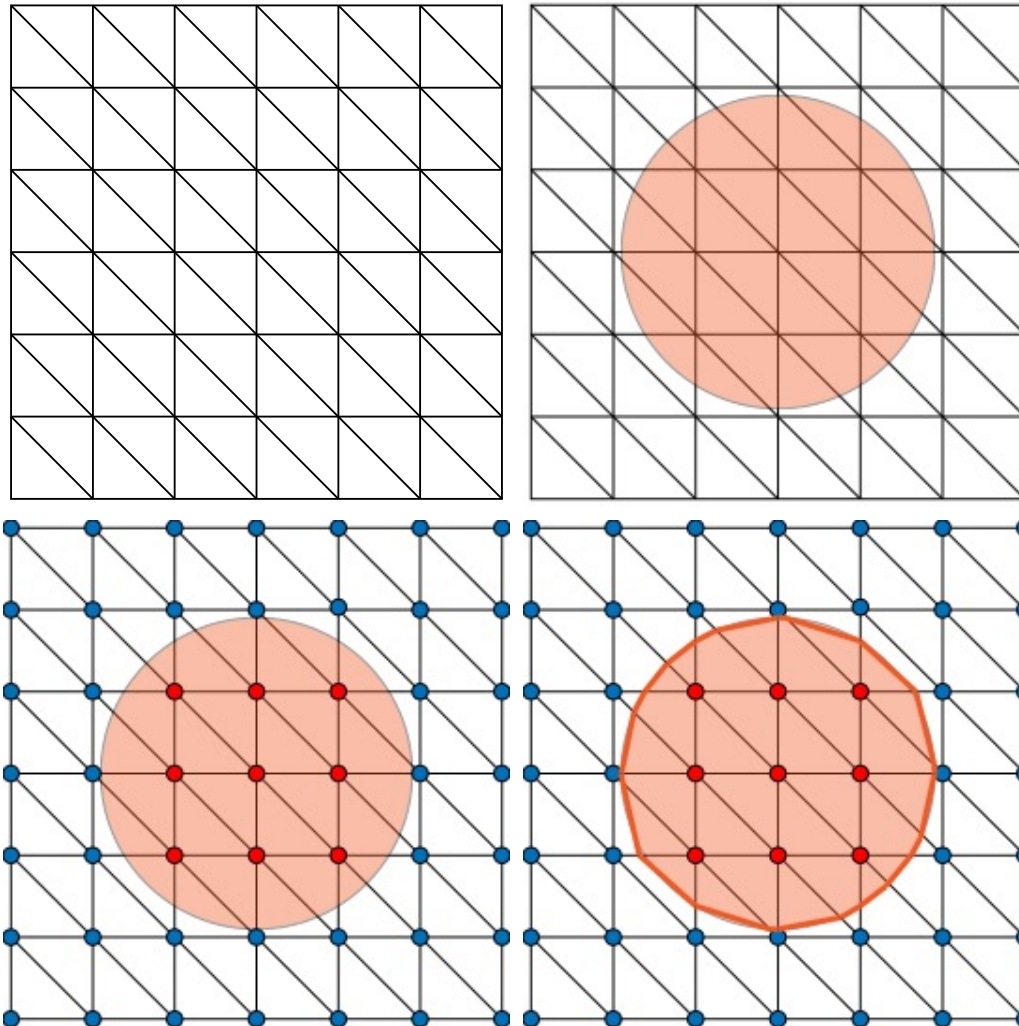
Level-Set



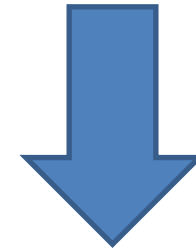
$$S = f^{-1}(c)$$

Mesh Generation

Poligonization



$$f(x) = x^2 + y^2 - 1$$

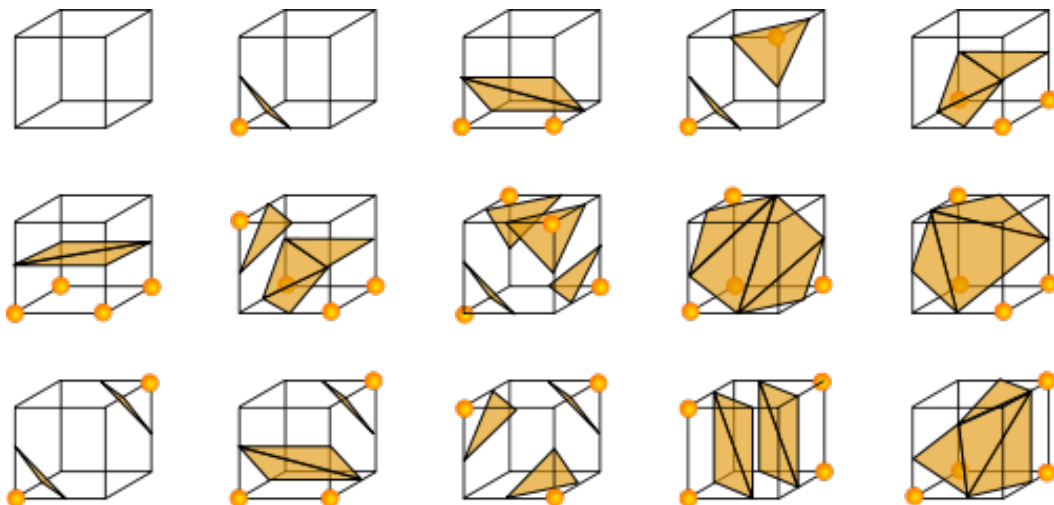
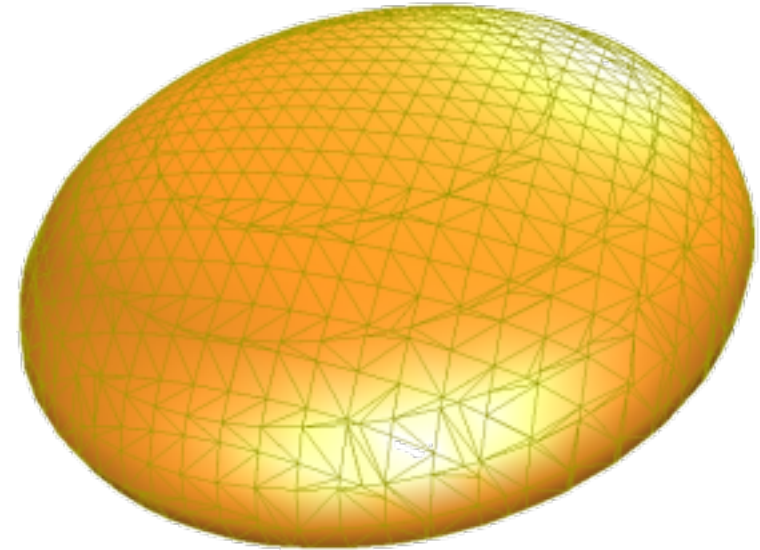


$$S = f^{-1}(0)$$

Mesh Generation

Marching Cubes

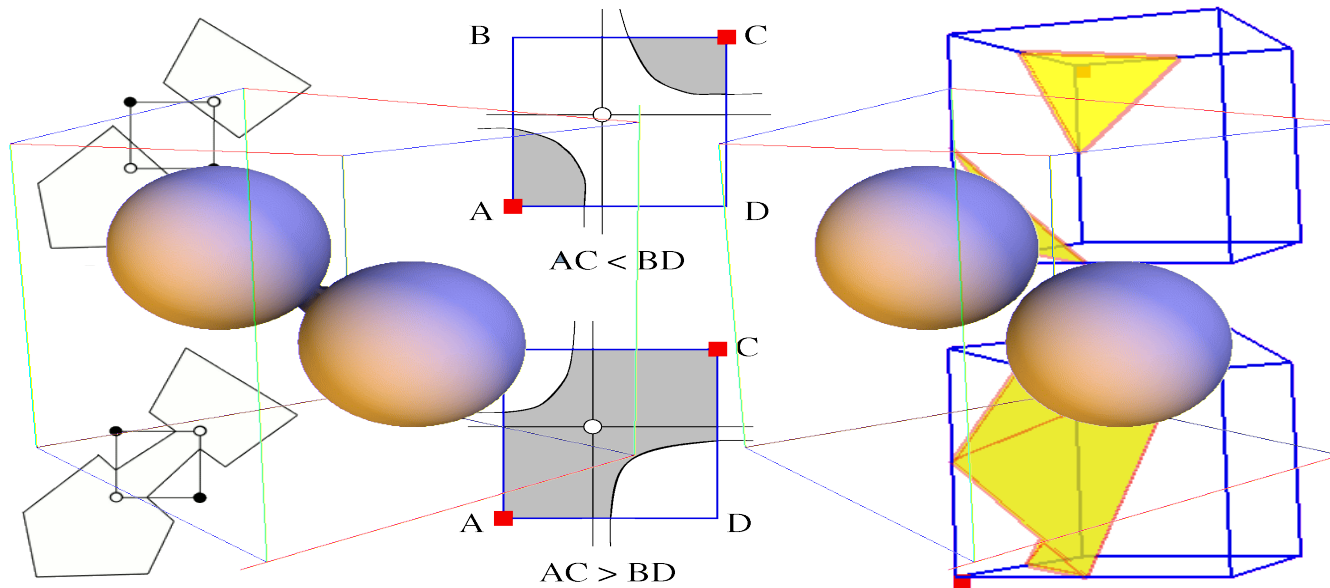
- Lorensen and Cline, 1987
- Look-up table method
- Not adaptive
- Sliver triangles



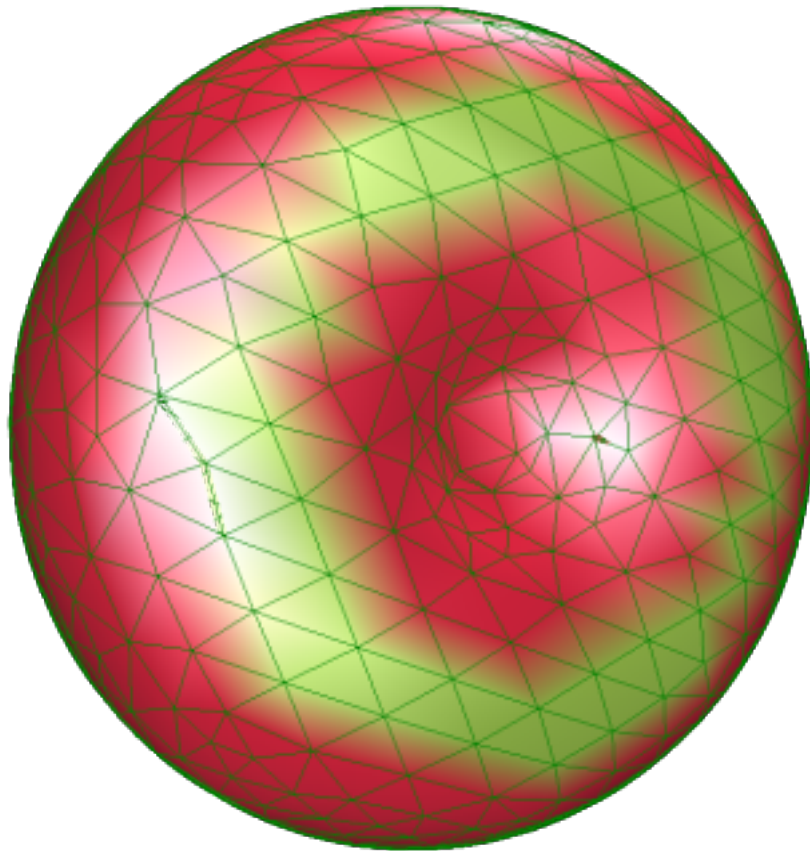
Mesh Generation

Ambiguities of Marching Cubes :

tri-linear topology = original topology ?



Mesh Generation



level 3

Torus

$$\left(1.5 - \sqrt{(x^2 + y^2)}\right)^2 + z^2 - (1.35)^2 = 0$$

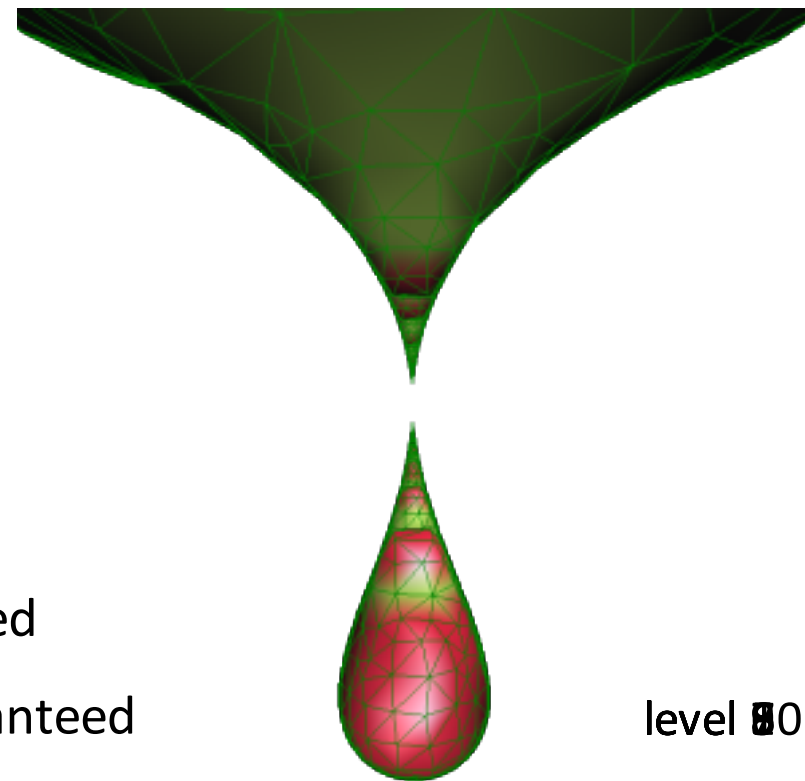
- Guaranteed
- Not Guaranteed

Mesh Generation

– Teardrop surface

$$0.5(x^5 + x^4) - y^2 - z^2 = 0$$

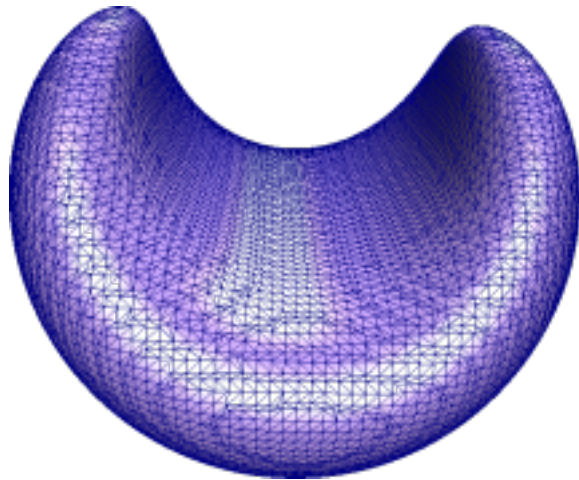
■ Guaranteed
■ Not Guaranteed



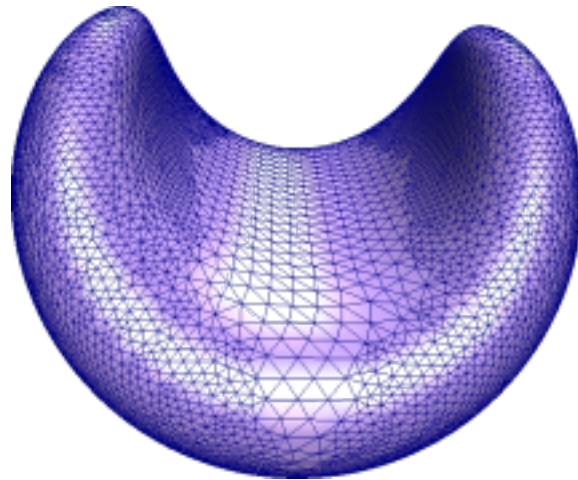
Mesh Generation

The effect of geometry criterion

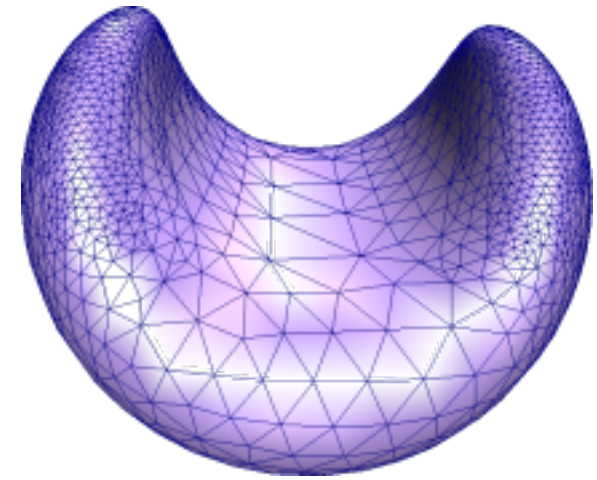
$$(y - x^2 - y^2 + 1)^4 + (x^2 + y^2 + z^2)^4 - 1 = 0$$



$k_{\max} = \emptyset$
triang = 25172



$k_{\max} = 0.5$
triang = 22408

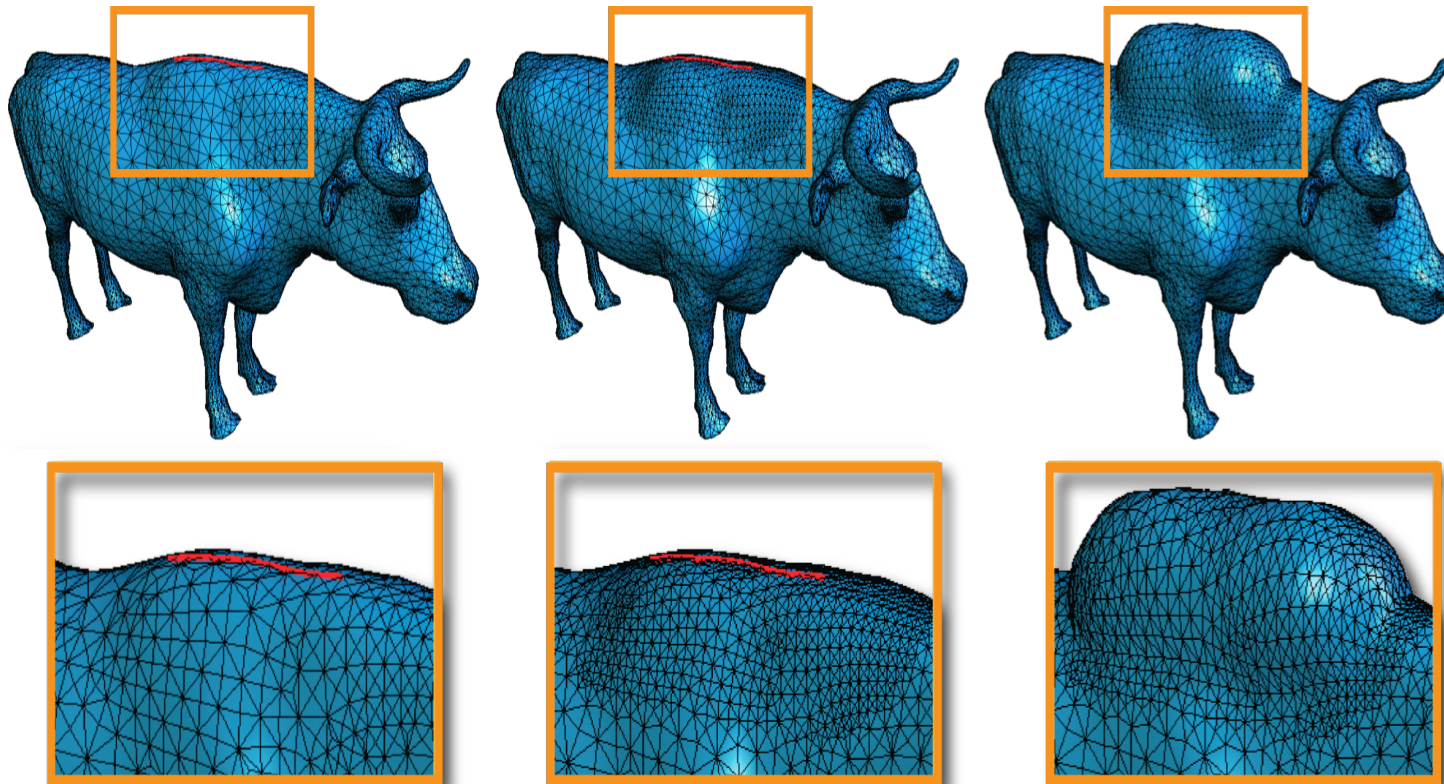


$k_{\max} = 0.95$
triang = 4948

Sketching

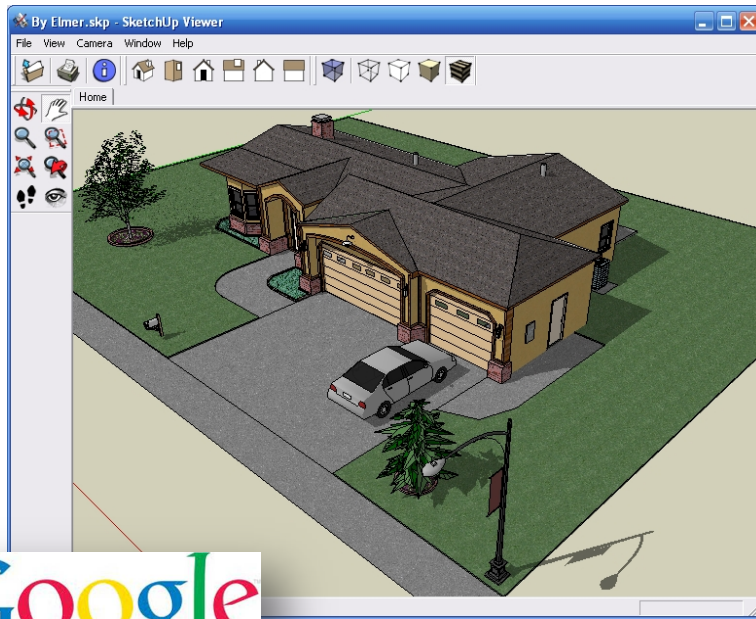


How to sketch a mesh?

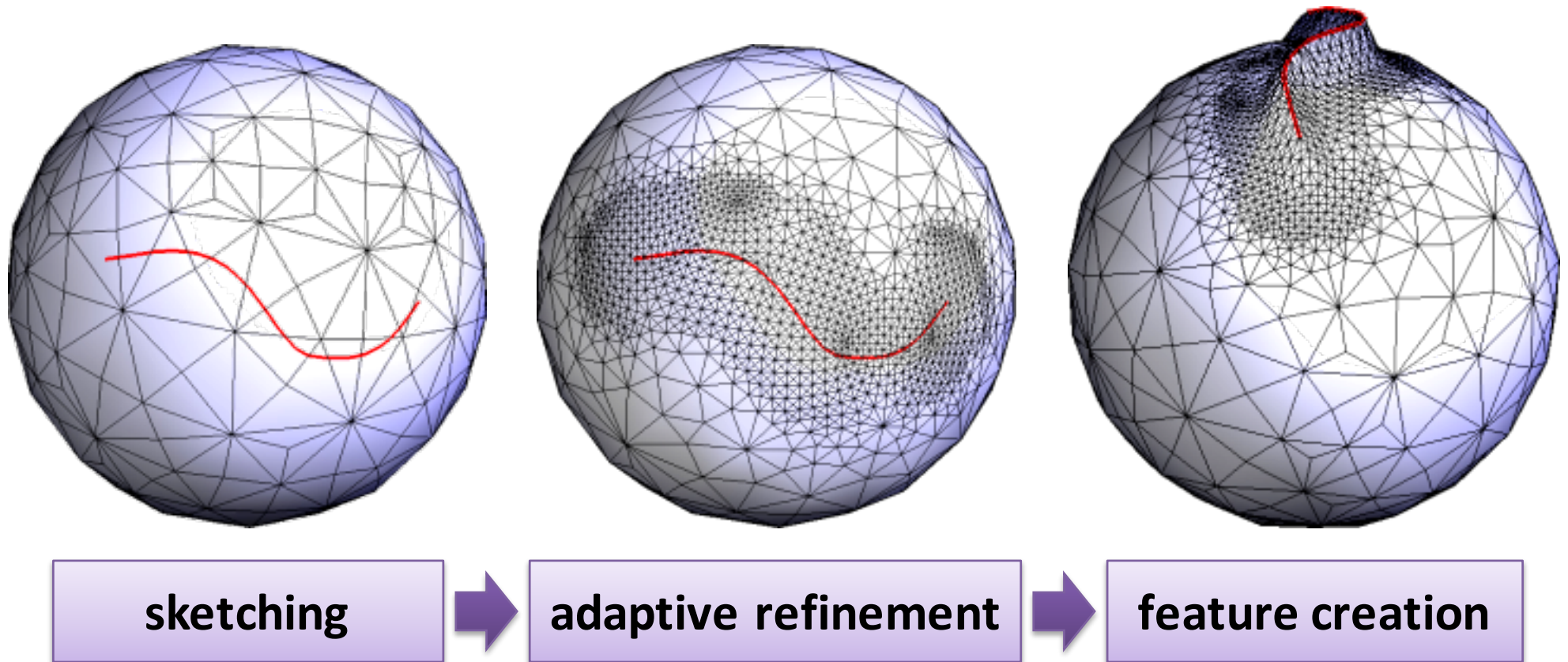


We want to create/modify a feature around the sketch

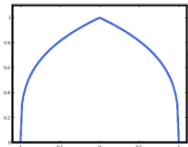
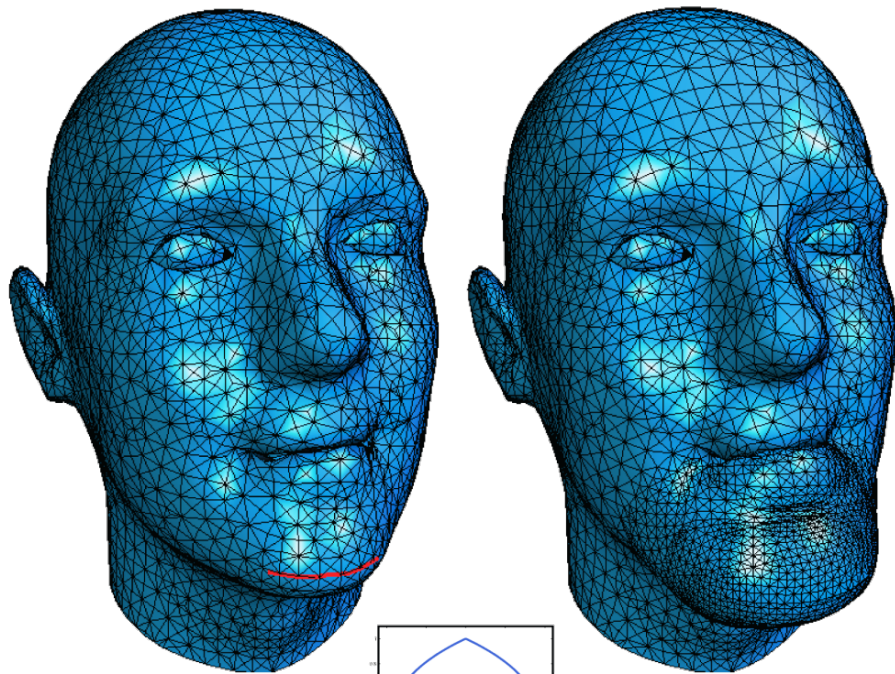
Sketch-based Systems in Industry



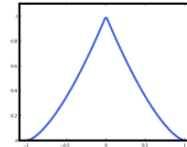
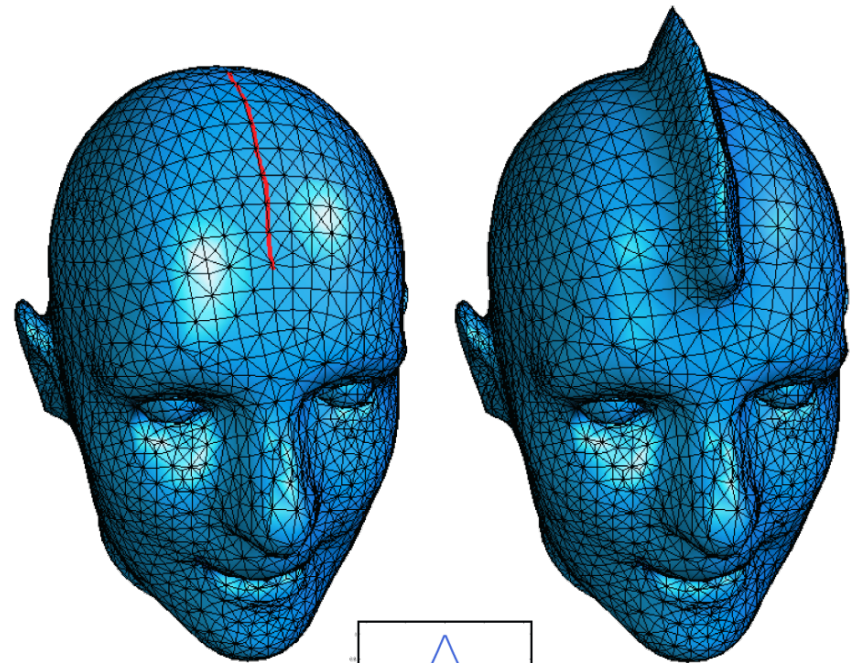
Sketch-based Mesh Augmentation



Feature Generation: *vertex displacement*

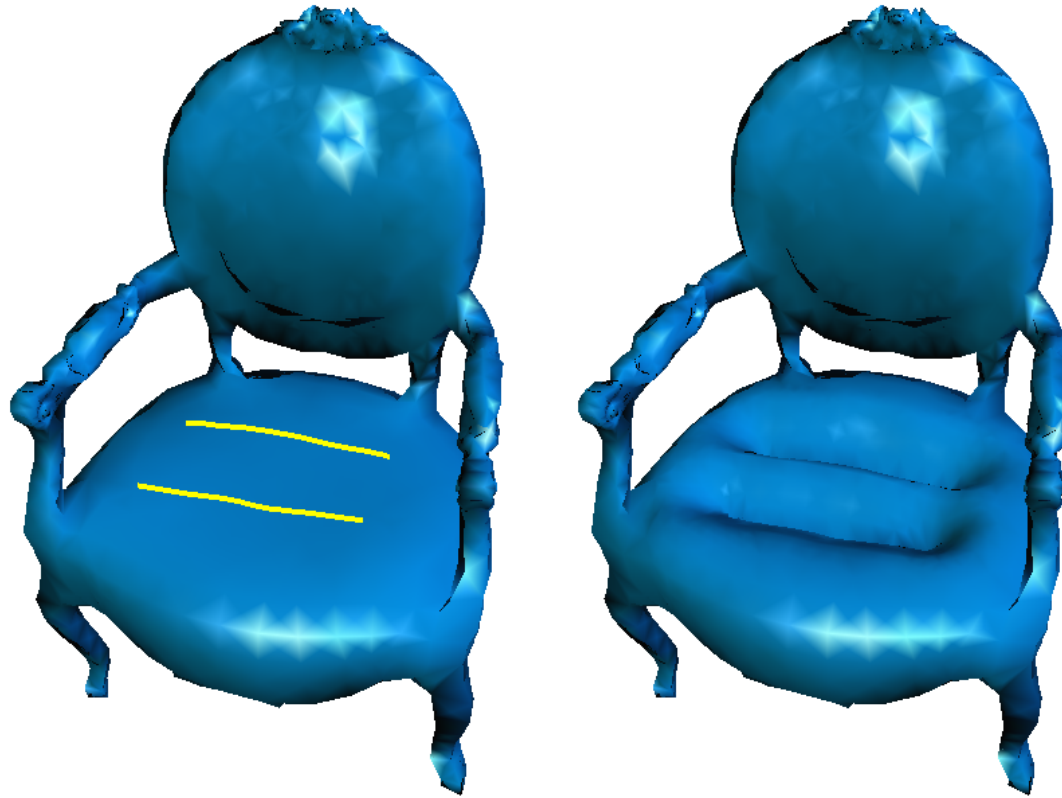


$s = 0.3$



$s = 1.5$

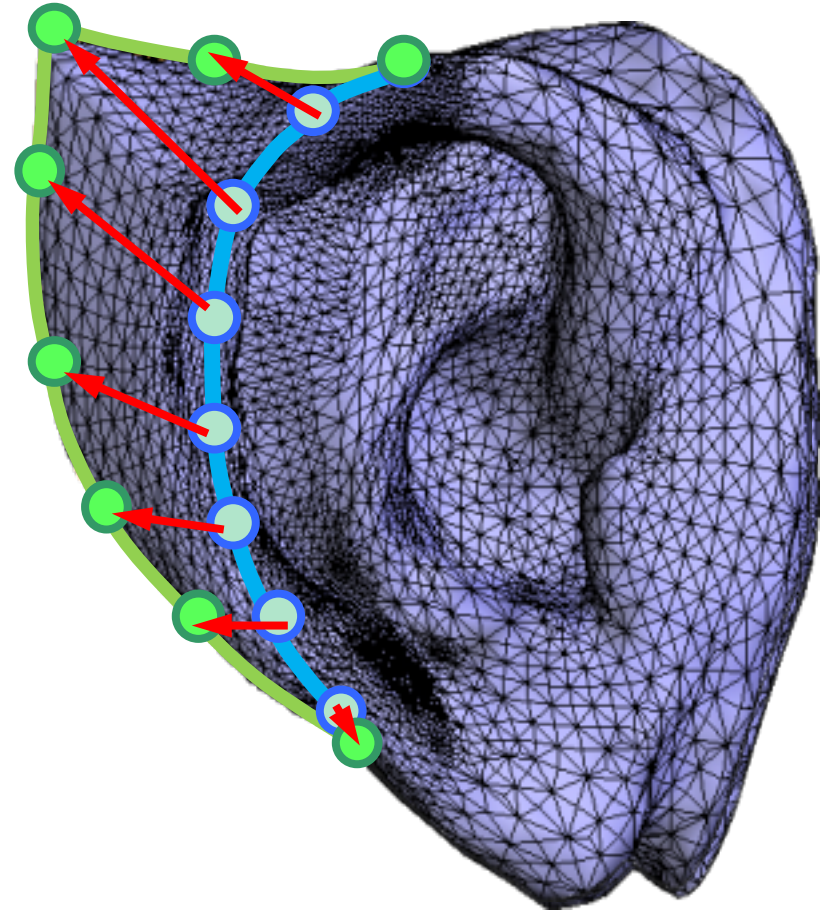
Surficial Displacement



inward surface displacement

Silhouette Sketching

- parametrize sketch
- silhouette detection
- parametrize silhouette
- find correspondences
- mesh refinement
- mesh augmentation



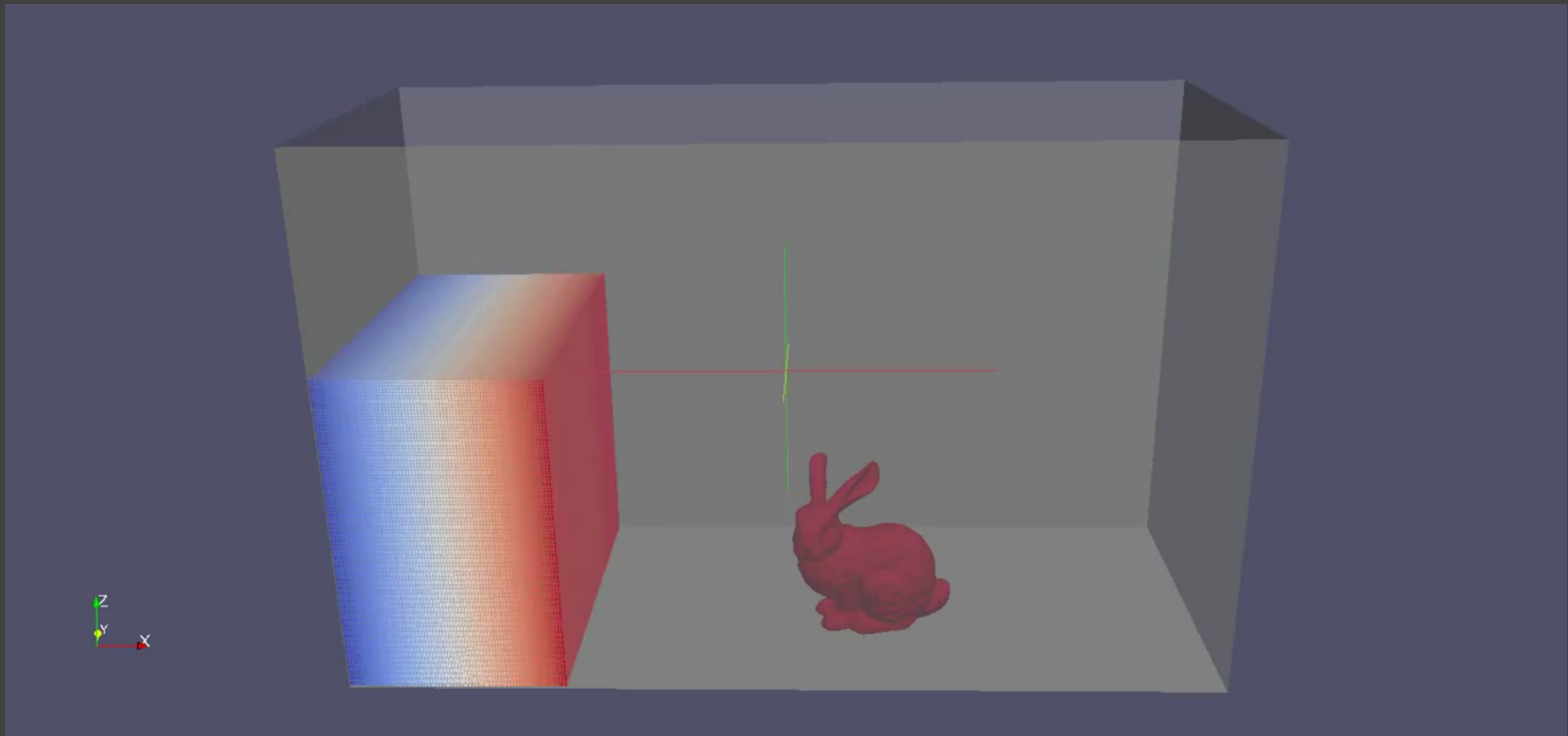
A high-quality computer-generated splash of water, rendered in various shades of light blue and white. The water forms a complex, swirling shape with a central void, surrounded by smaller droplets and bubbles. The background is a soft, light blue gradient. The text "Computer Animation" is centered over the water splash in a bold, dark blue font.

Computer Animation

Physics in Graphics



SPH Fluids

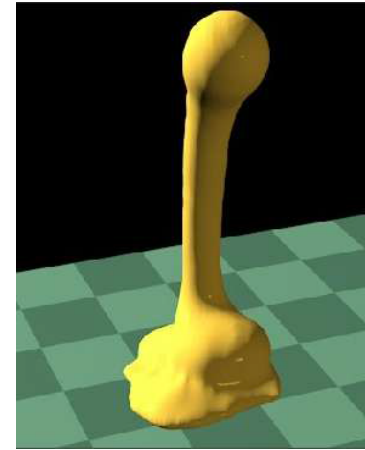


Jet Buckling



Liquid Rope Coiling Effect

Jet Buckling in Special FX



non-physical model

**BEE
MOVIE**

IN THEATERS NOVEMBER 2ND



A. Ruilova, *Creating Realistic CG Honey*, ACM SIGGRAPH 2007 (posters)

COMPUTERS & GRAPHICS



ELSEVIER

Particle-based Fluids for Viscous Jet Buckling

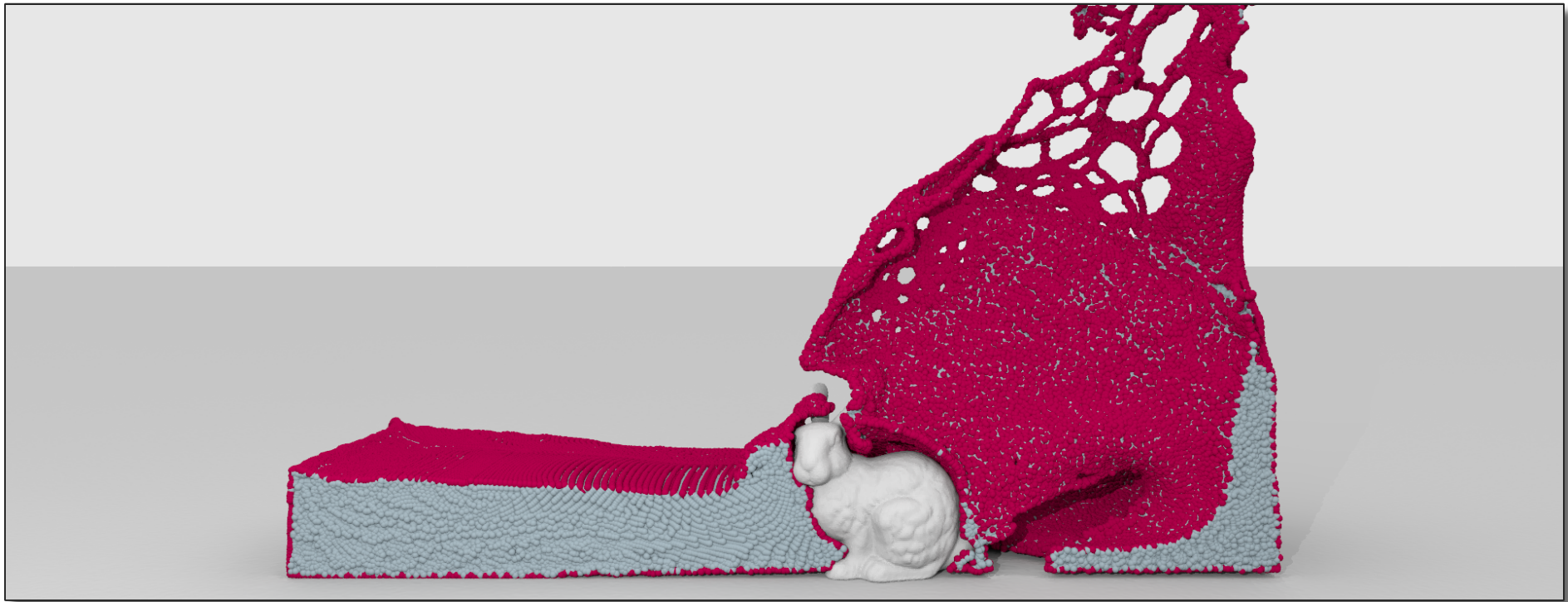
Luiz Fernando de Souza Andrade¹, Marcos Sandim¹,
Fabiano Petronetto², Paulo Pagliosa³, and Afonso Paiva¹

¹ICMC-USP

²Dept. of Mathematics-UFES

³FACOM-UFMS

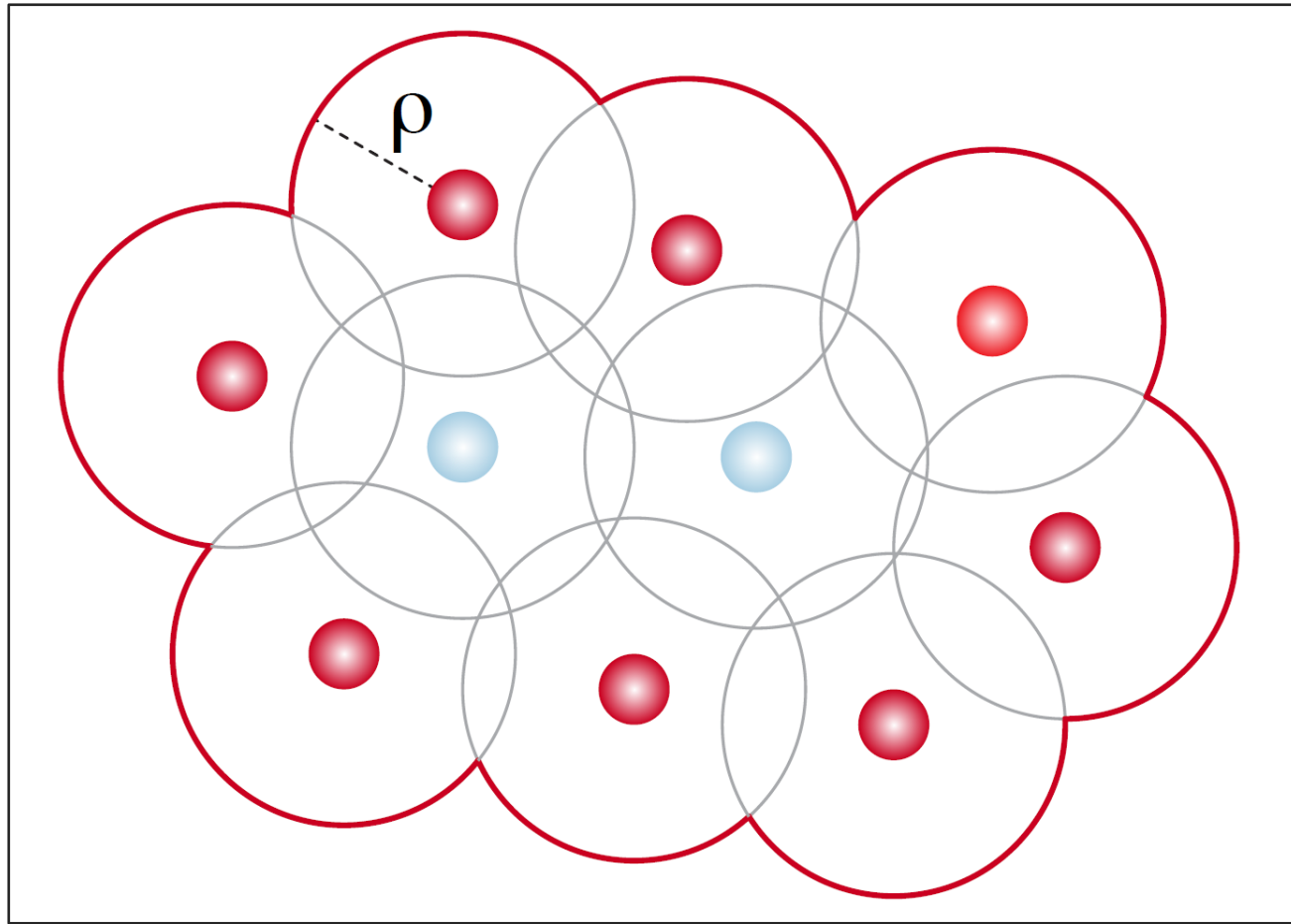
Boundary Particle Detection



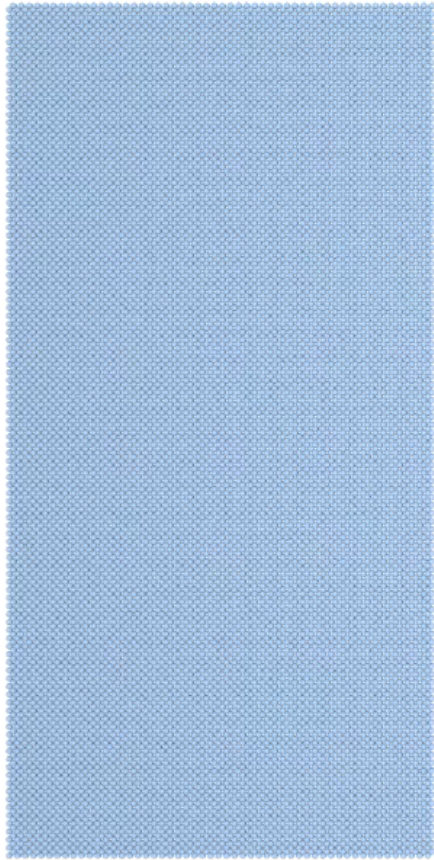
$$p = 0$$



A definition for boundary particles

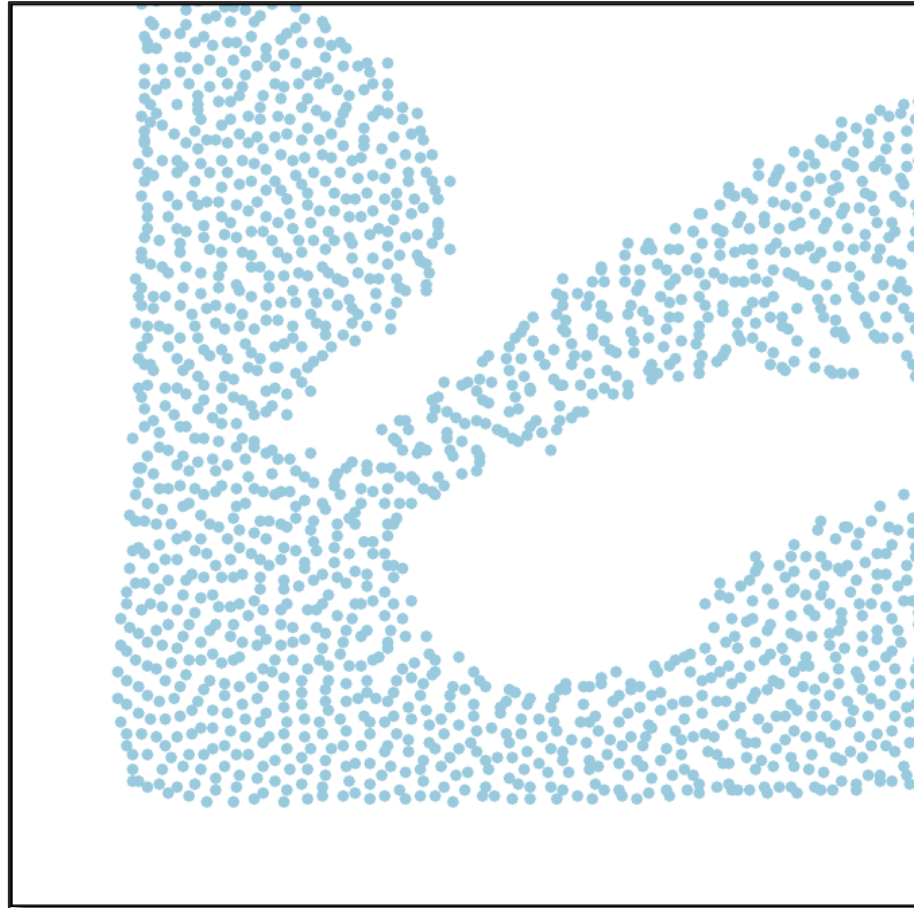


The Method



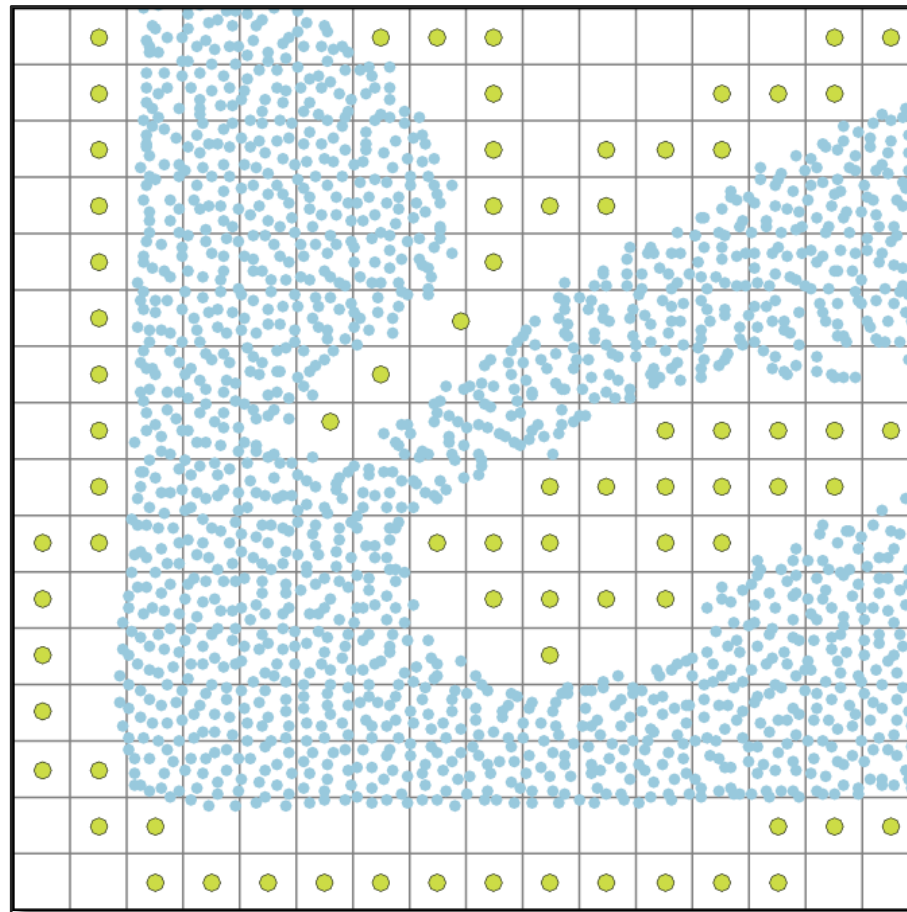
Pipeline

Input



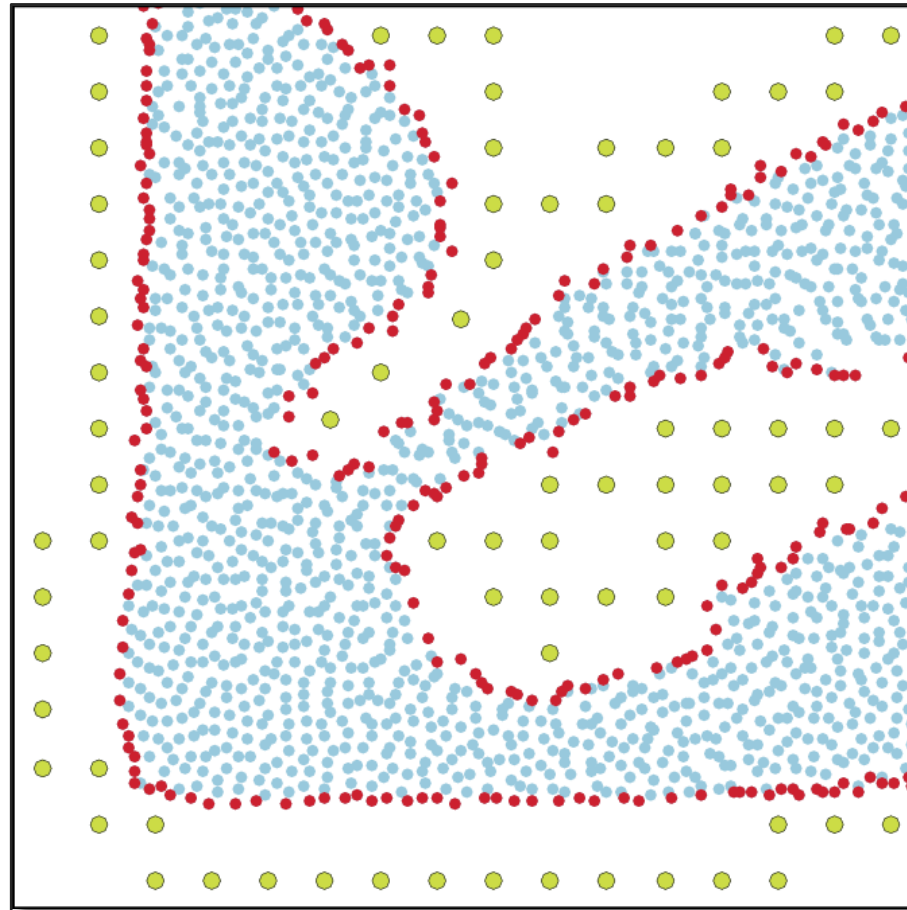
Pipeline

Auxiliary grid and viewpoints generation



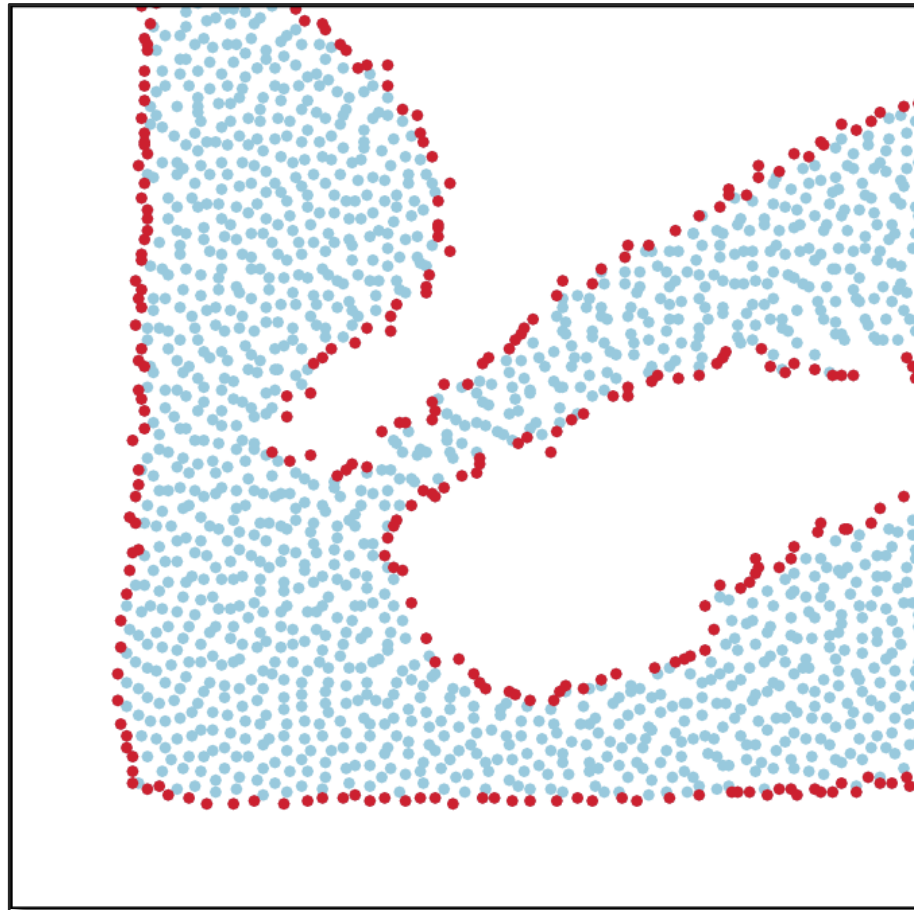
Pipeline

Visibility test

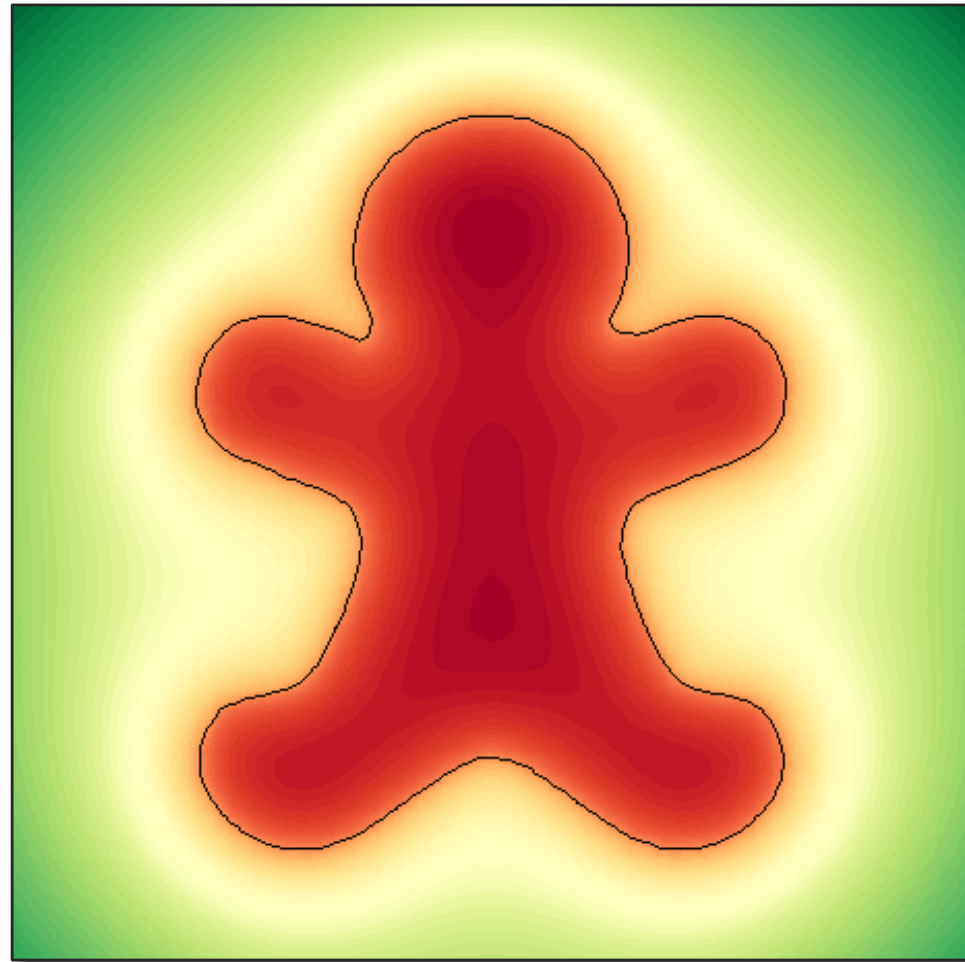


Pipeline

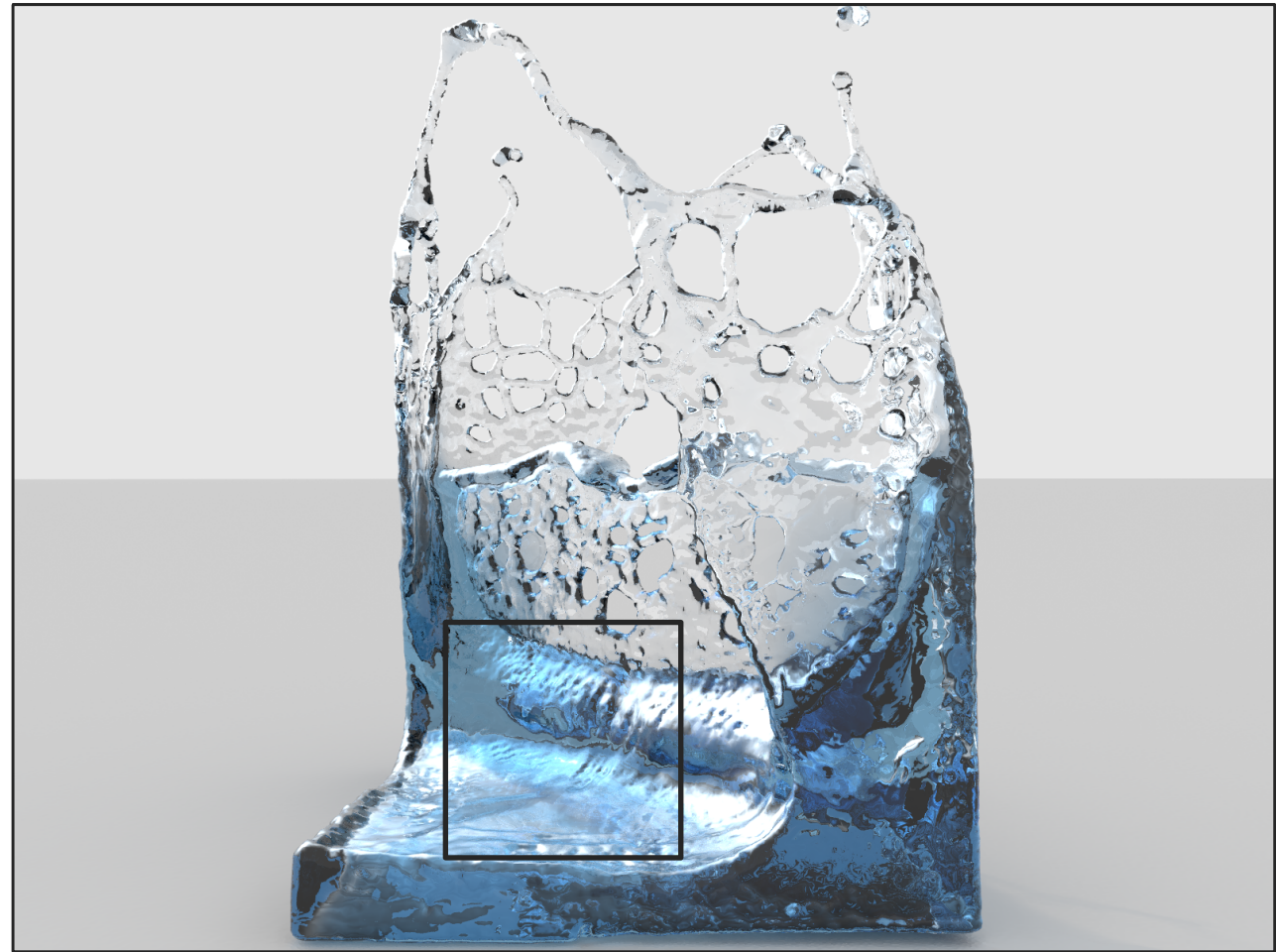
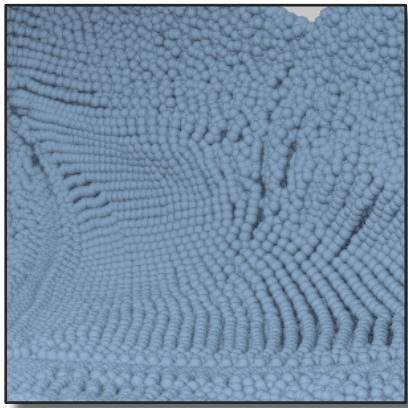
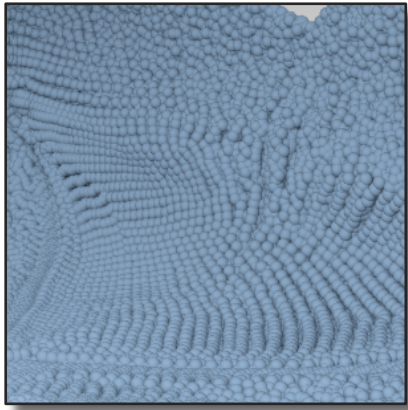
Final result



Surface Reconstruction



Surface Reconstruction



09th-13th MAY
LISBON, PORTUGAL

EUROGRAPHICS



2016

Boundary Detection in Particle-based Fluids

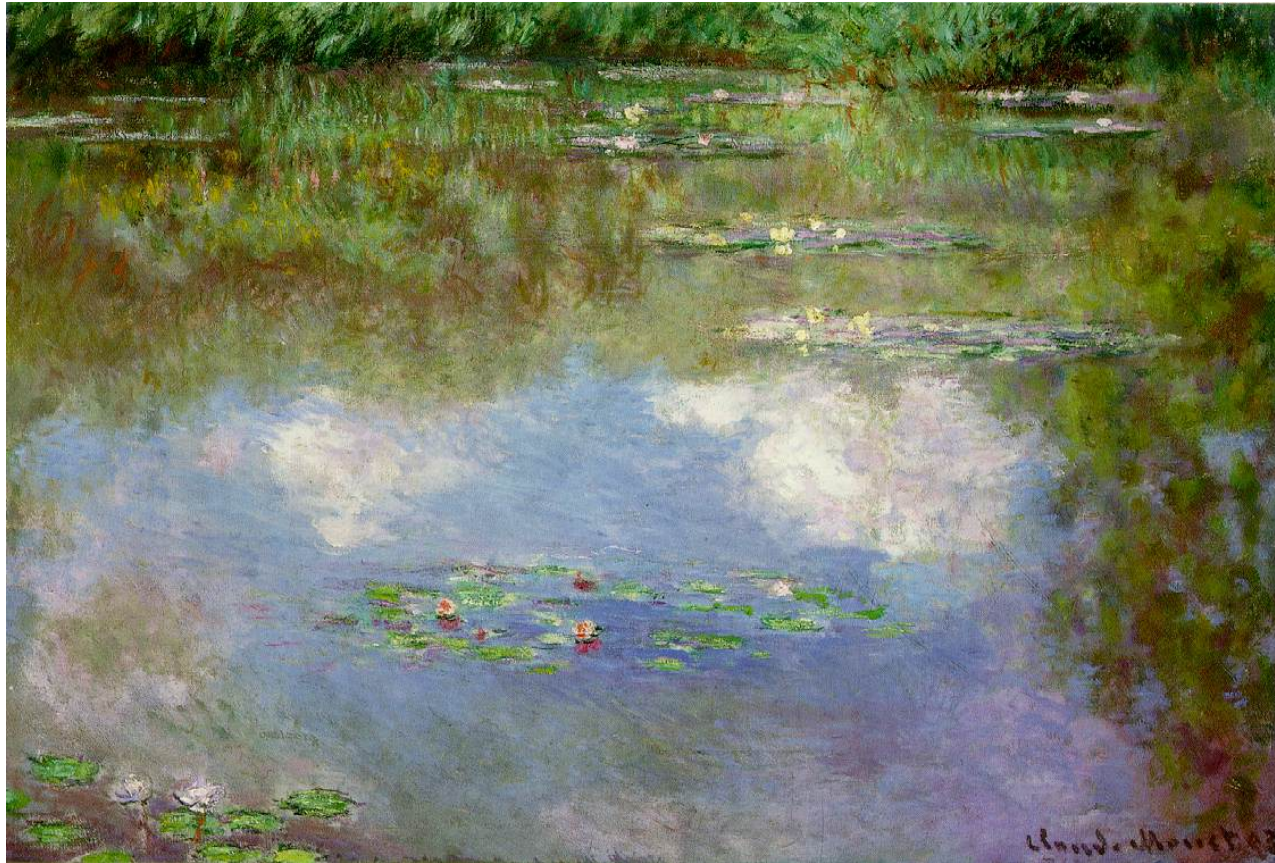
Marcos Sandim¹, Douglas Cedrim¹,
Luis Gustavo Nonato¹, Paulo Pagliosa², and Afonso Paiva¹

¹ICMC-USP
²FACOM-UFMS



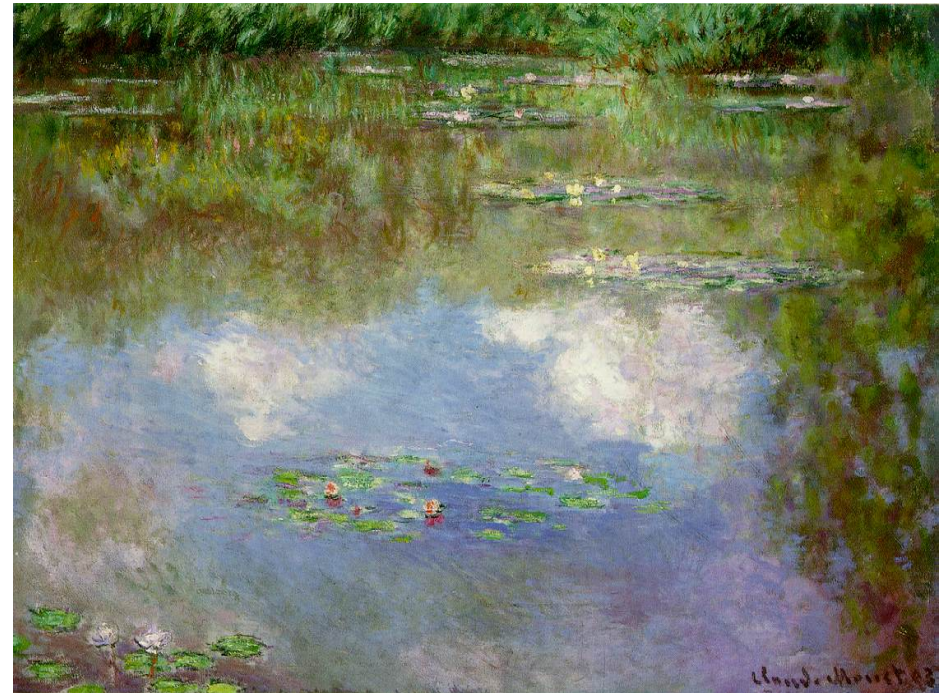
Rendering

A Brief History of Art



Monet, 1904

The Enemy



Ray-Tracing



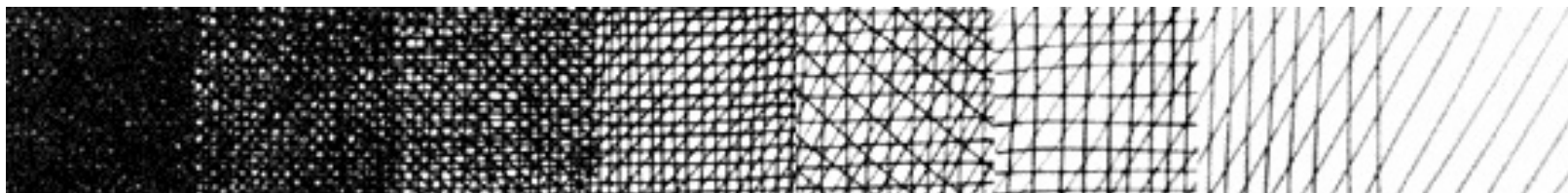
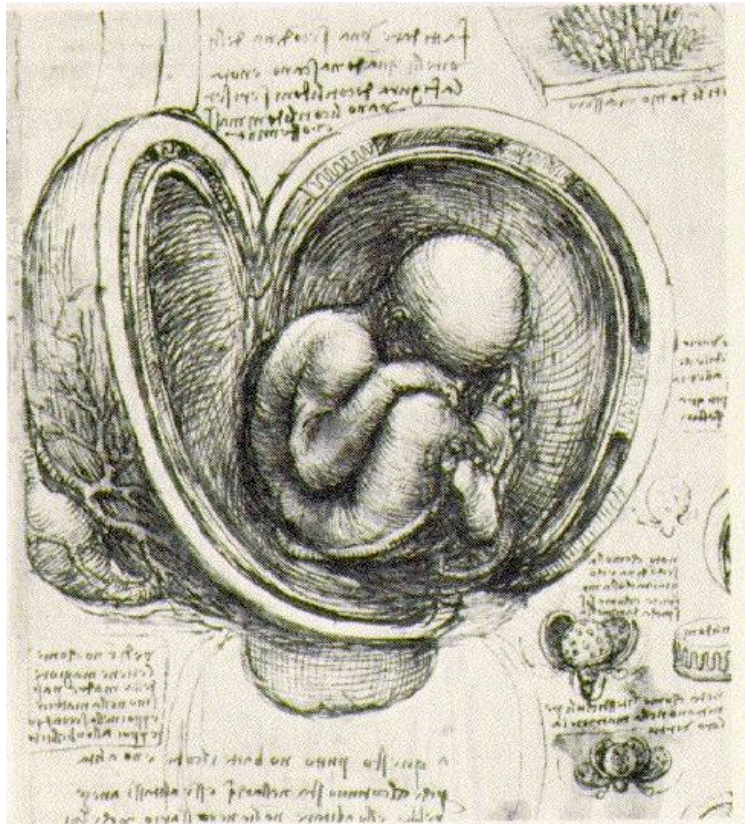
POV-Ray

Non-Photorealistic Rendering (NPR)

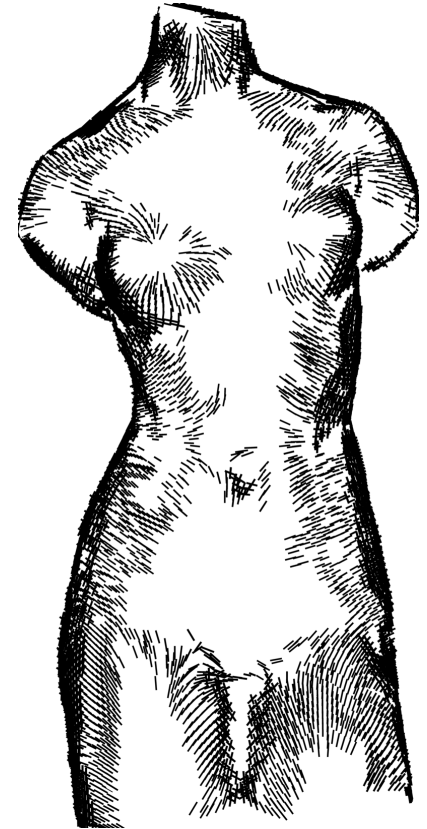
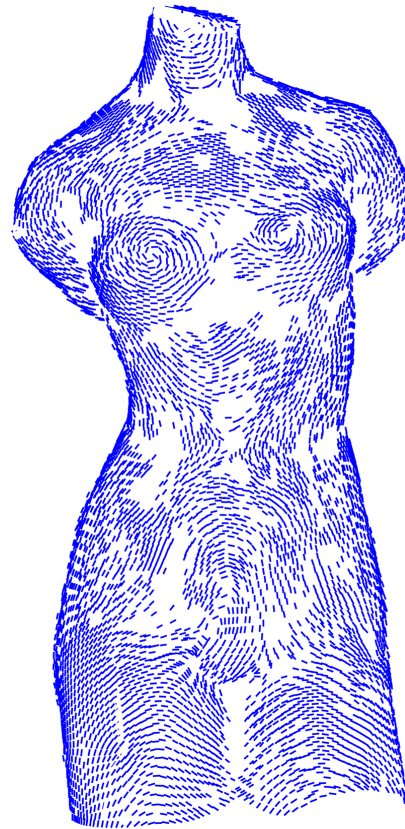
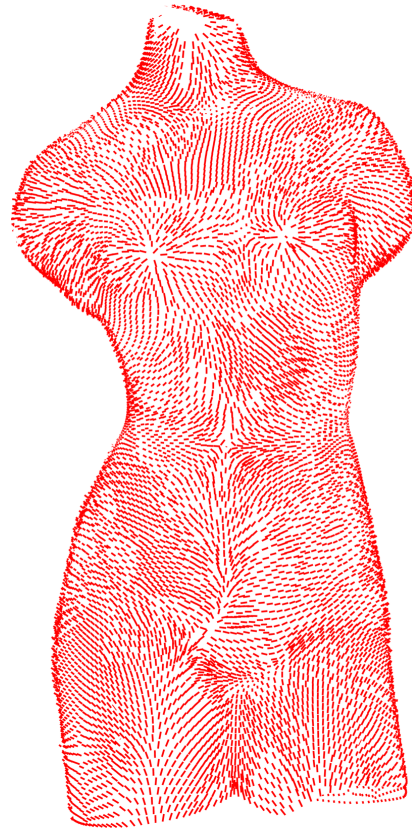
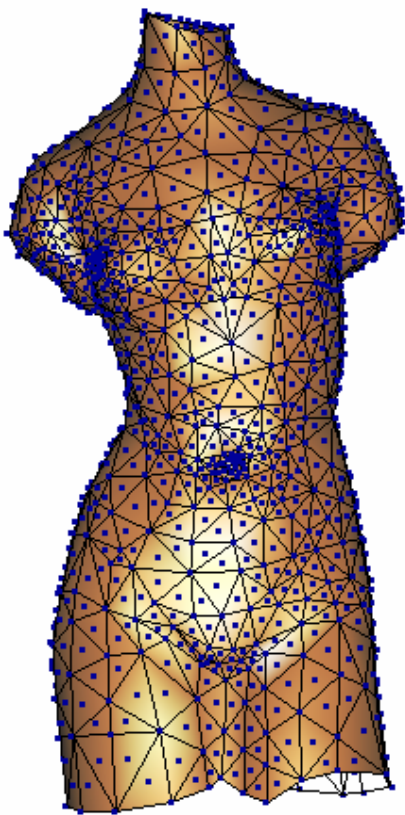


Scanner Darkly , 2006

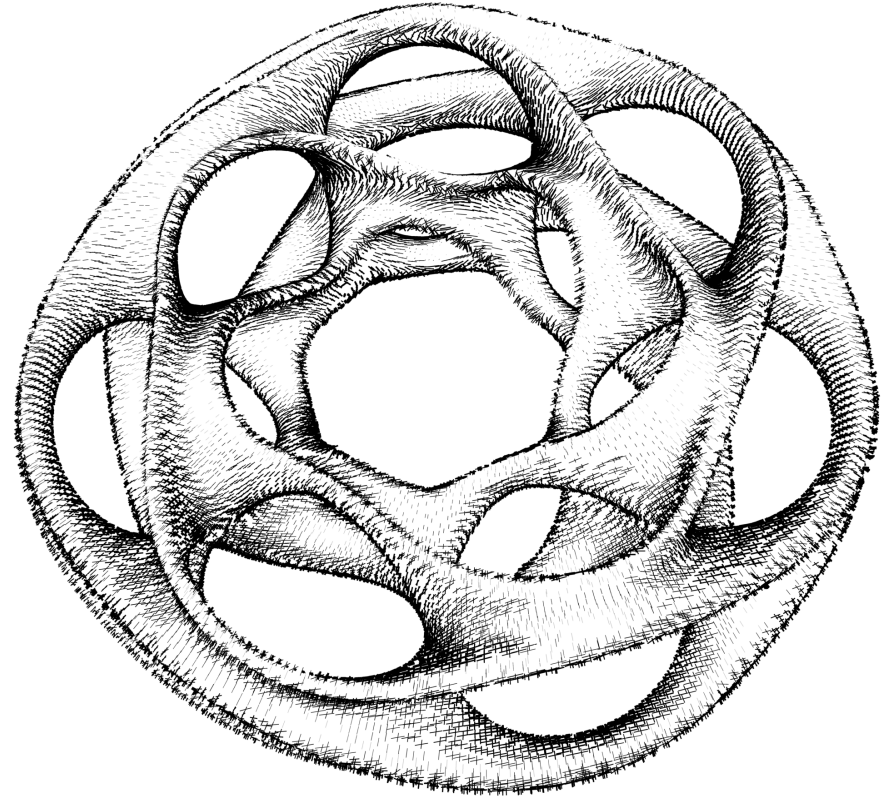
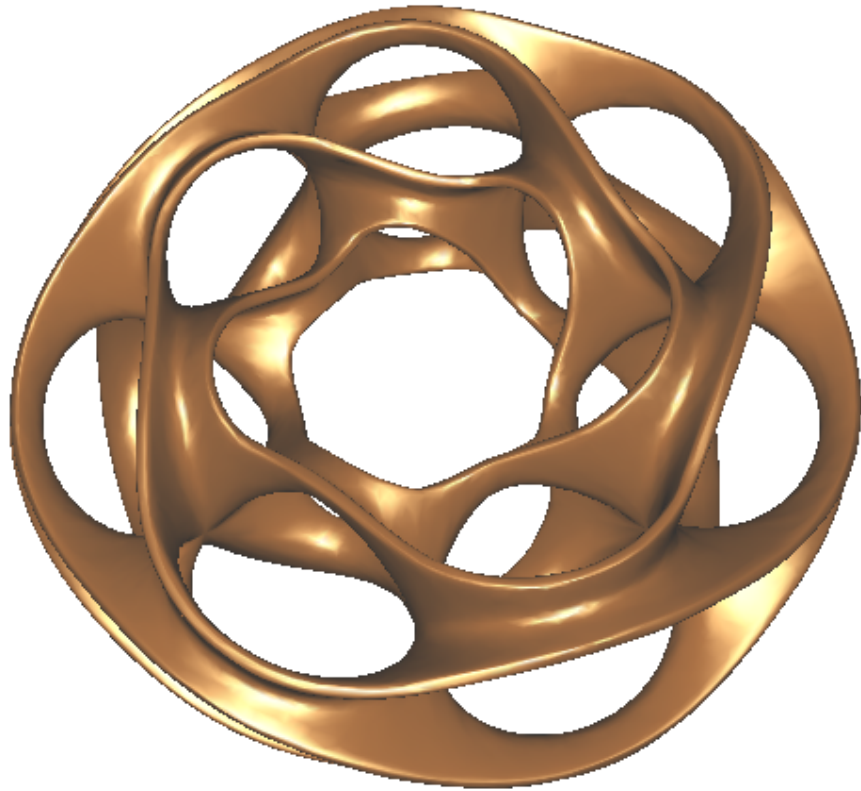
Pen-and-Ink Illustration



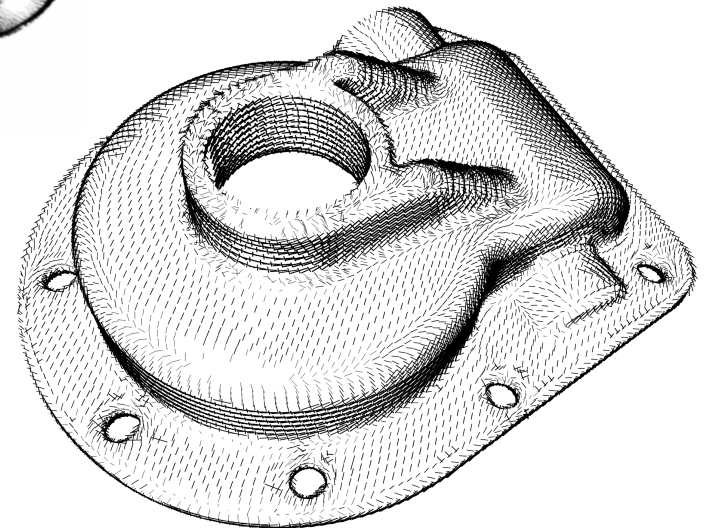
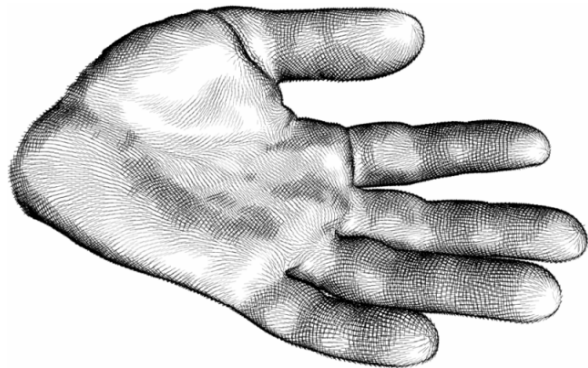
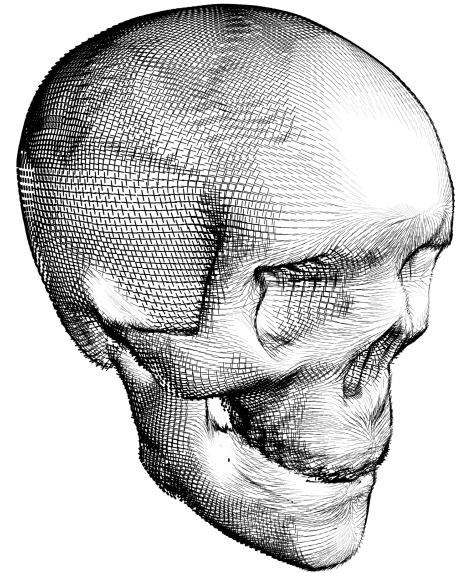
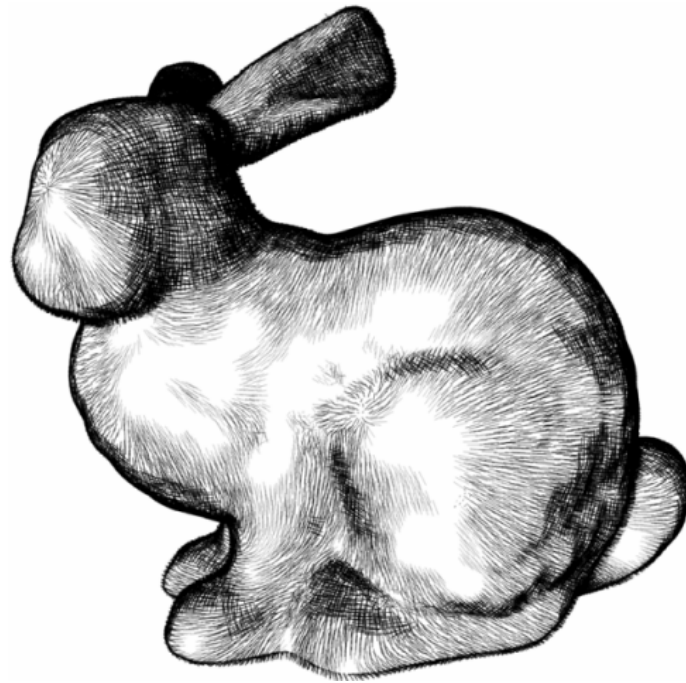
Fluid-based Hatching



Fluid-based Hatching



Fluid-based Hatching





Visualization & Image Processing

Multidimensional Projection

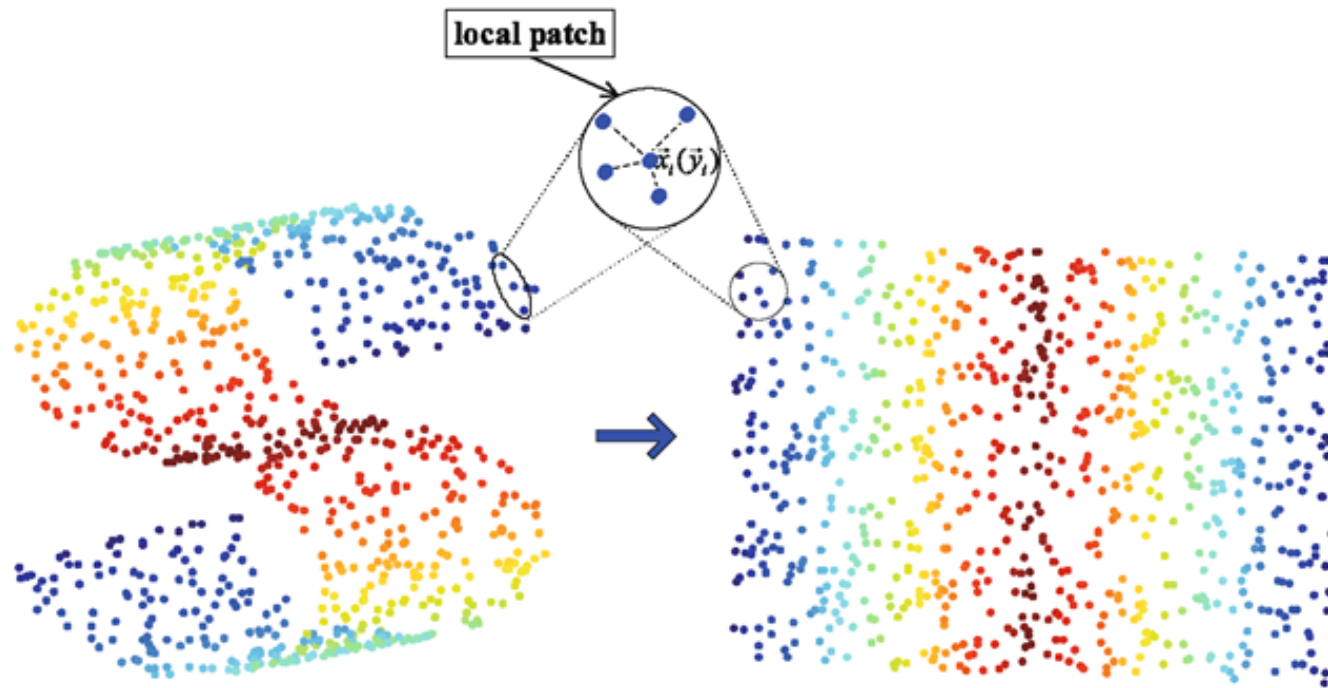
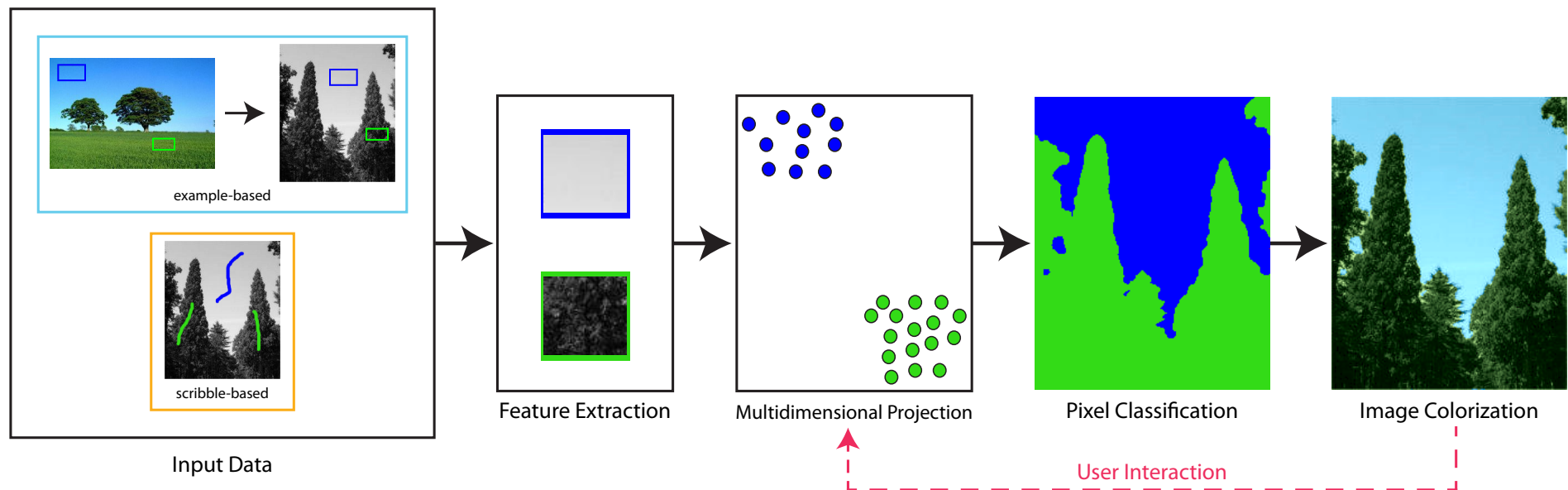
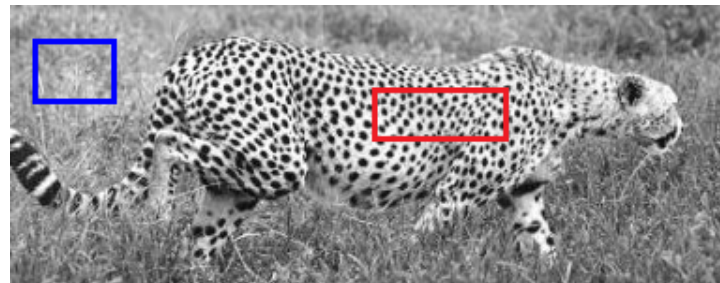
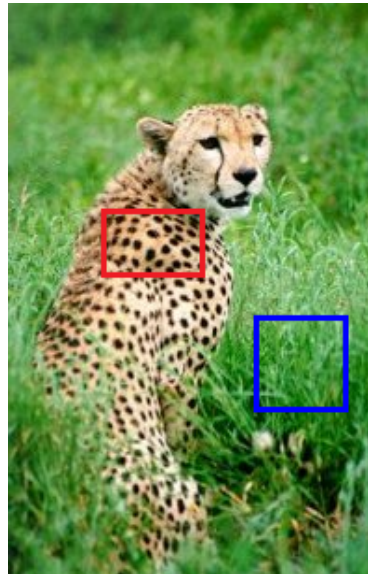


Image Colorization



XXVI SIBGRAPI - CONFERENCE ON GRAPHICS, PATTERNS AND IMAGES
SIBGRAPI 2013
August 5-8, Arequipa - Peru



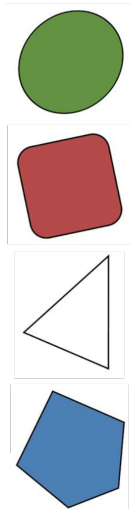
MIST

Multiscale Information and Summaries of Texts

Paulo Pagliosa Rafael Martins Douglas Cedrim
Afonso Paiva Rosane Minghim Luis Gustavo Nonato

FACOM - UFMS
ICMC-USP

Multi-task Classification



Class probabilities

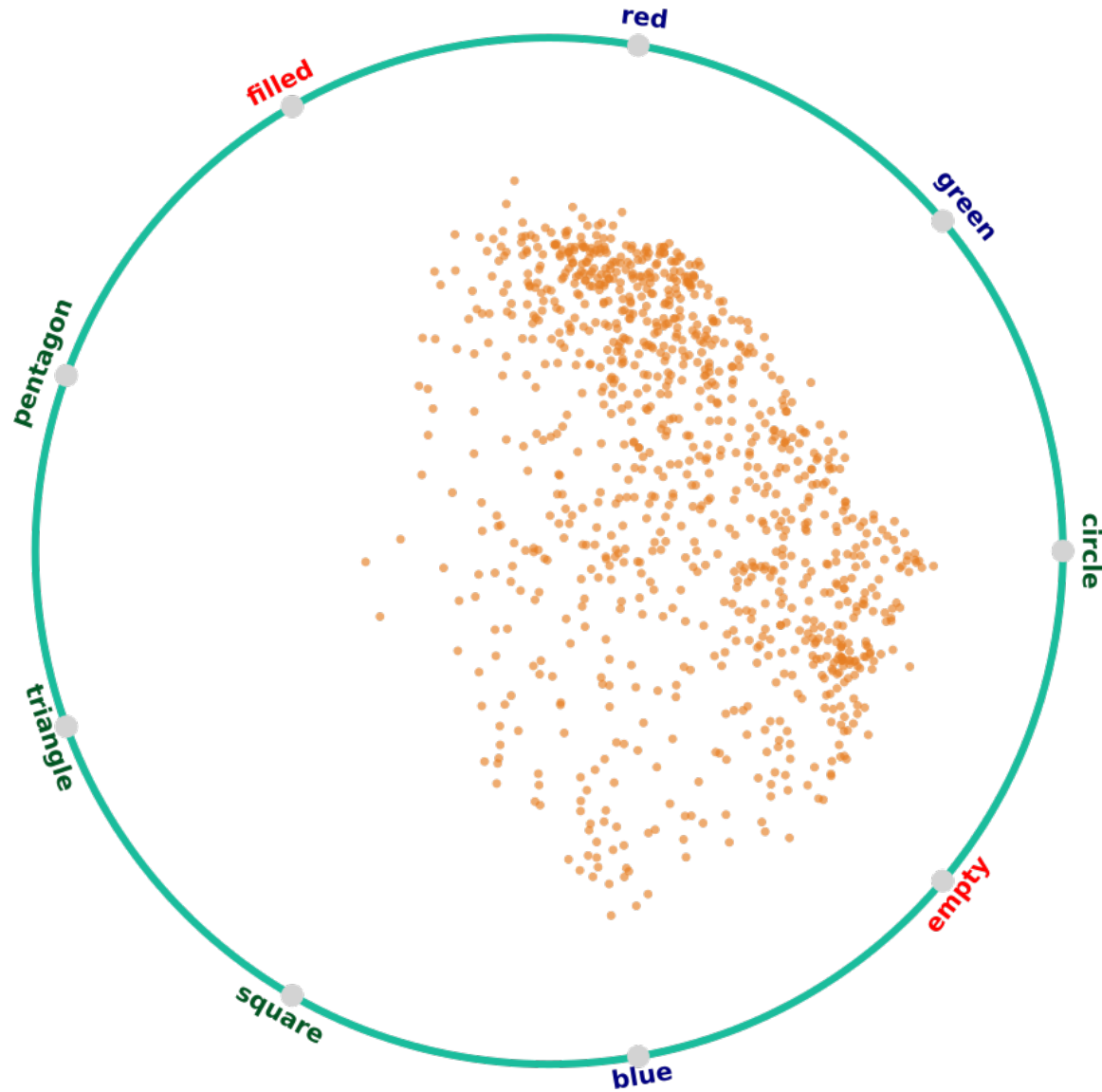
| | shape | | | | Filling | | color | | |
|--|--------|--------|----------|----------|---------|-------|-------|-------|------|
| | square | circle | triangle | pentagon | filled | empty | red | green | blue |
| | 0.15 | 0.60 | 0.05 | 0.20 | 0.07 | 0.93 | 0.7 | 0.85 | 0.8 |
| | 0.55 | 0.20 | 0.10 | 0.15 | 0.05 | 0.90 | 0.90 | 0.6 | 0.4 |
| | 0.05 | 0.02 | 0.90 | 0.03 | 0.95 | 0.05 | 0.33 | 0.33 | 0.34 |
| | 0.15 | 0.25 | 0.1 | 0.5 | 0.09 | 0.91 | 0.03 | 0.05 | 0.92 |

Visual analysis

Global behaviors
or

Multi-task queries:
Squares & filled & red

Radviz

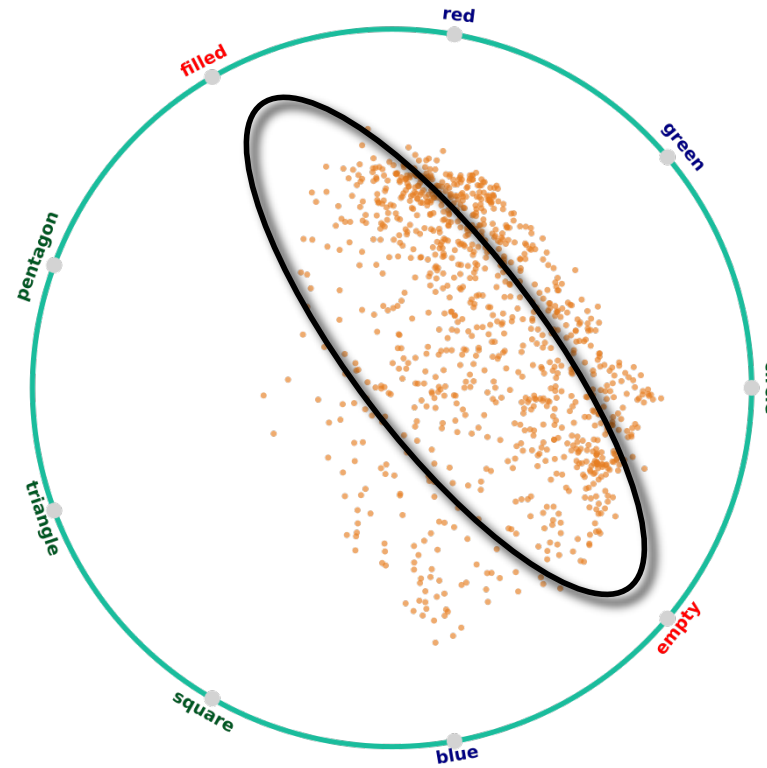


Seifert et al. (2010)

Radviz

Problems:

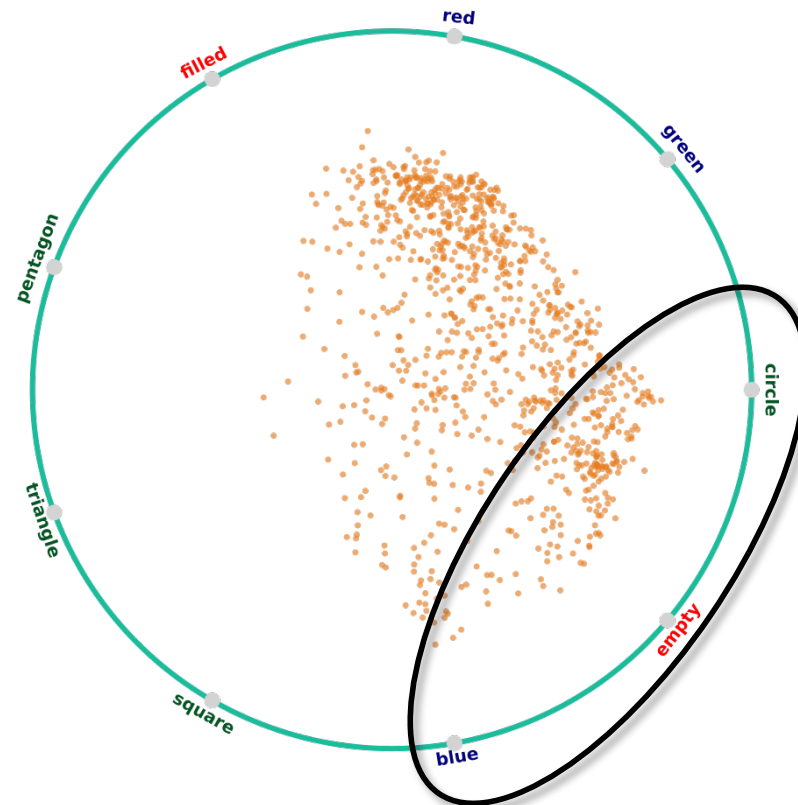
- Binary > Multi-class



Radviz

Problems:

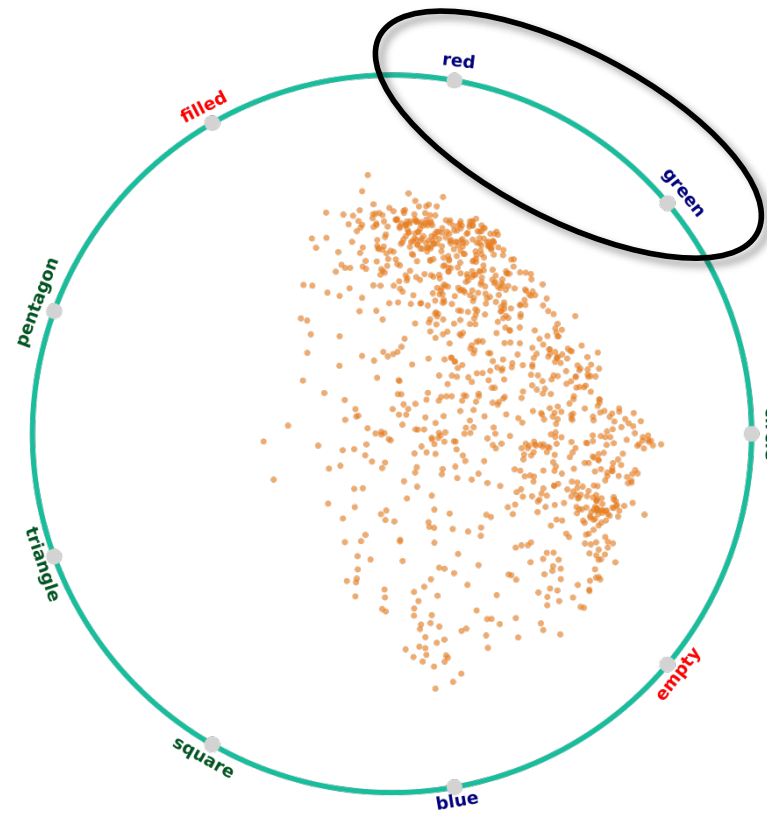
- Binary > Multi-class
- Mixed tasks



Radviz

Problems:


- Binary > Multi-class
- Mixed tasks
- Opposed anchors side by side




Concentric Radiviz

Concentric circles

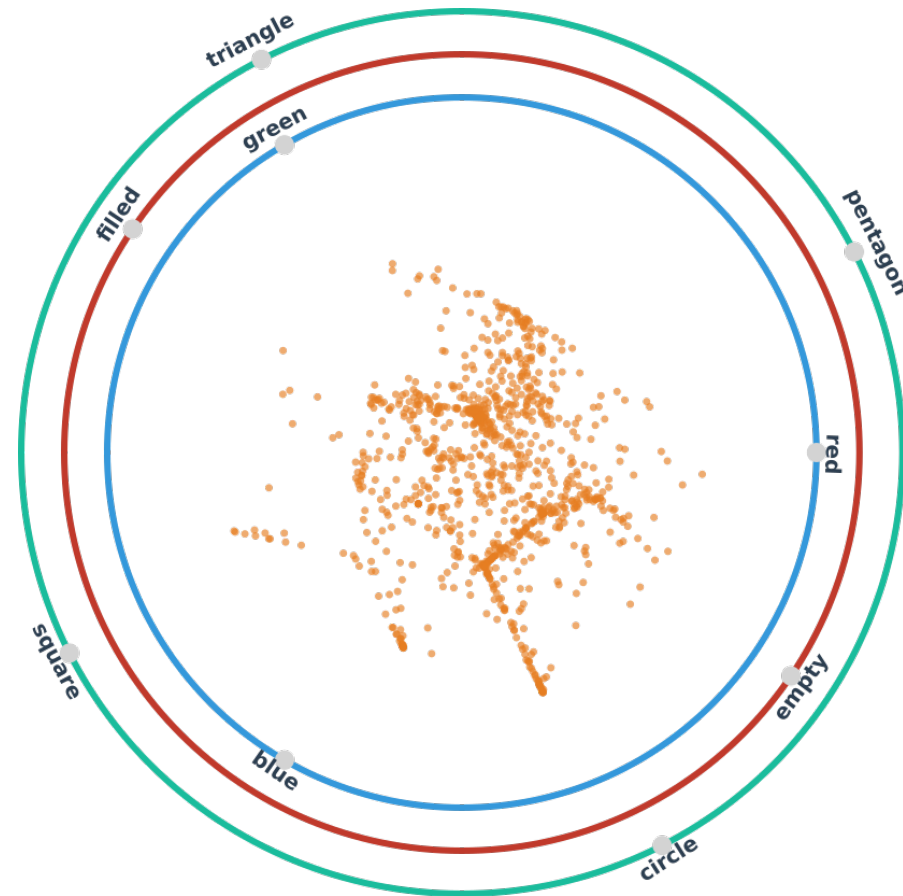

Shape Task



Filling Task



Color Task



Concentric Radviz

Visual Exploration of Multi-Task Classification

Jorge H. Piazzentin Ono

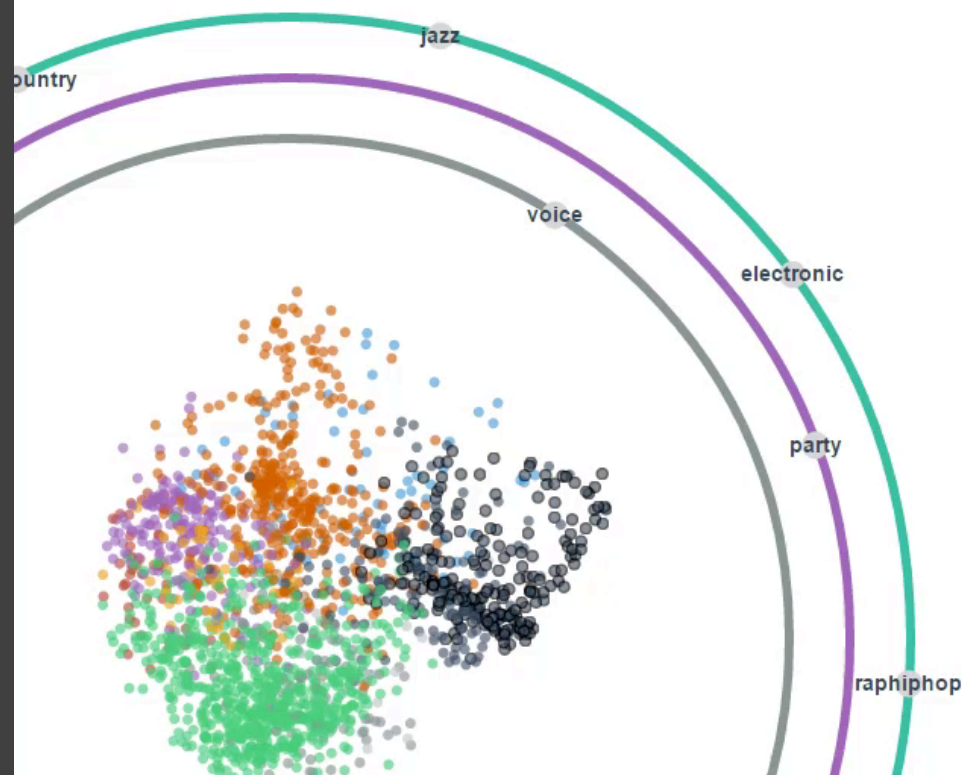
Fabio Sikansi

Débora Corrêa

Fernando Paulovich

Afonso Paiva

Luis Gustavo Nonato



SIBGRAPI 2015
XXVIII CONFERENCE ON GRAPHICS, PATTERNS AND IMAGES

USP
vis.icmc.usp.br

Thanks!



Questions?

Vídeos da apresentação:

<http://www.icmc.usp.br/~apneto/pub.html>