Scale-Space for Unions of 3D Balls

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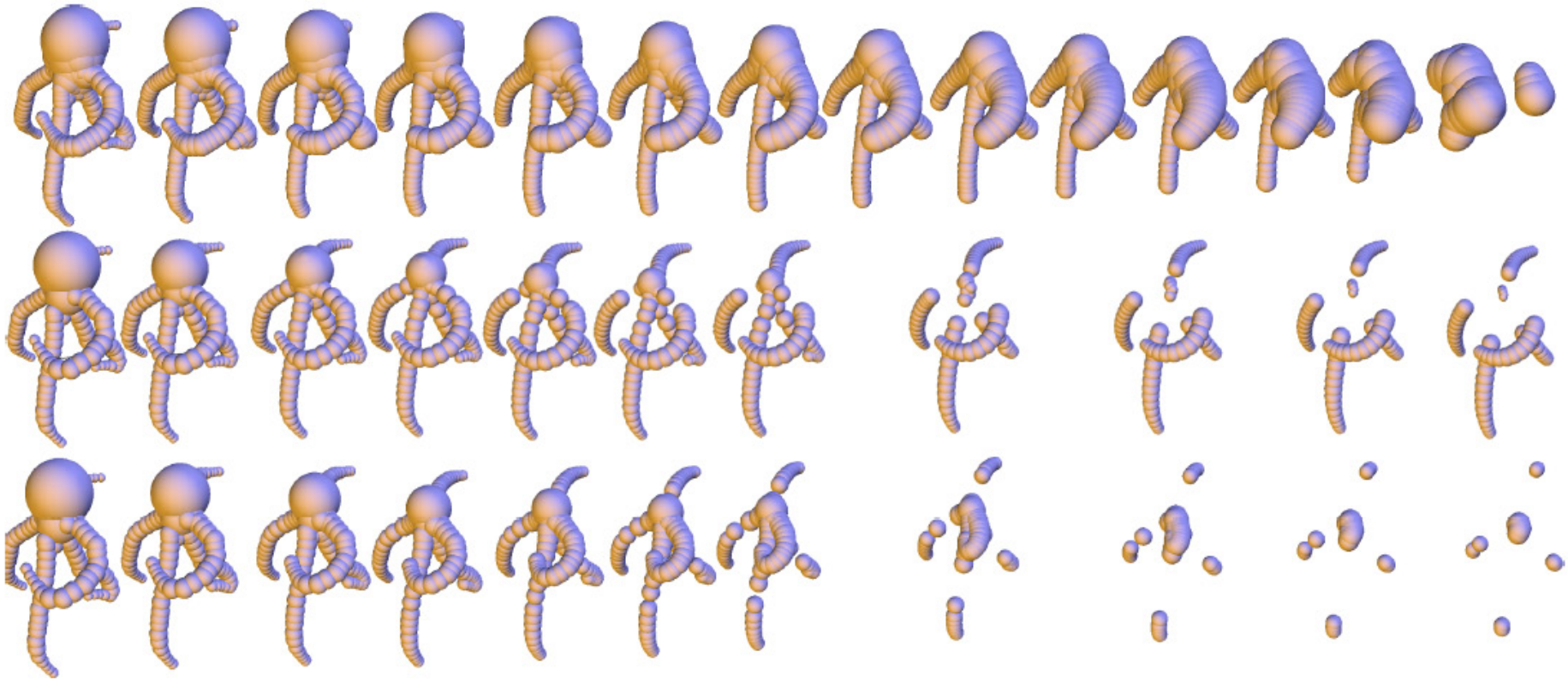

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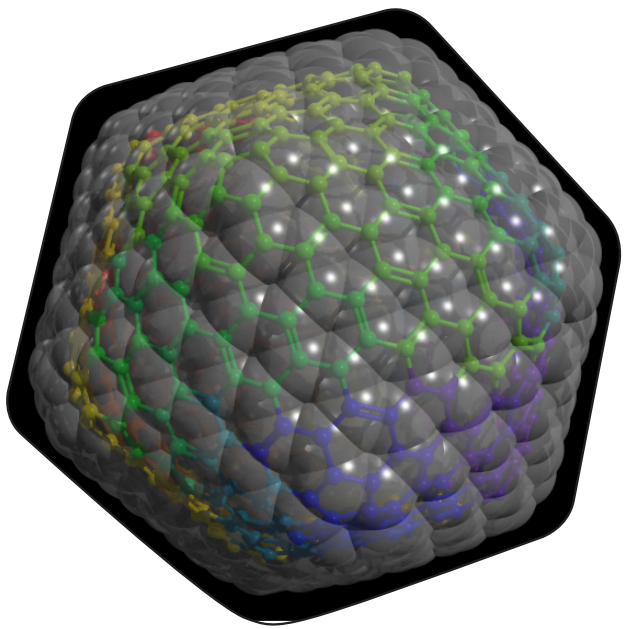
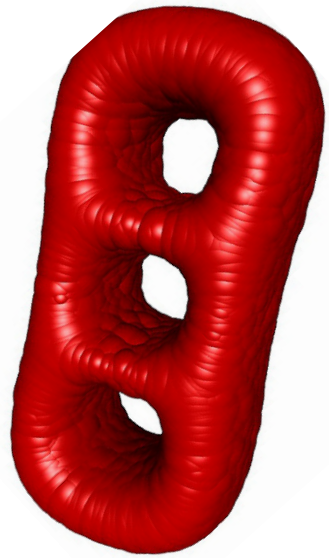
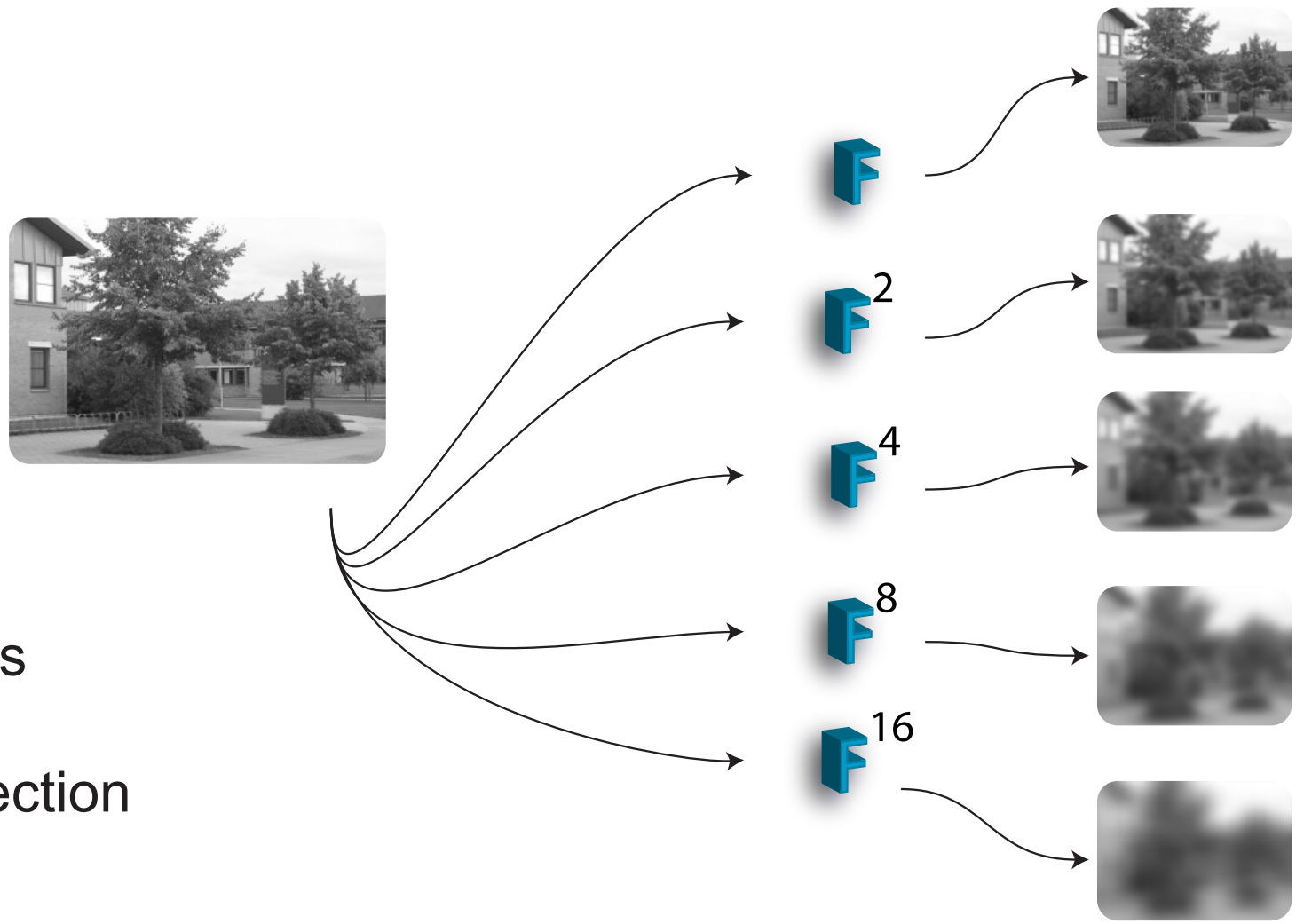
Union of balls





Related with point sets

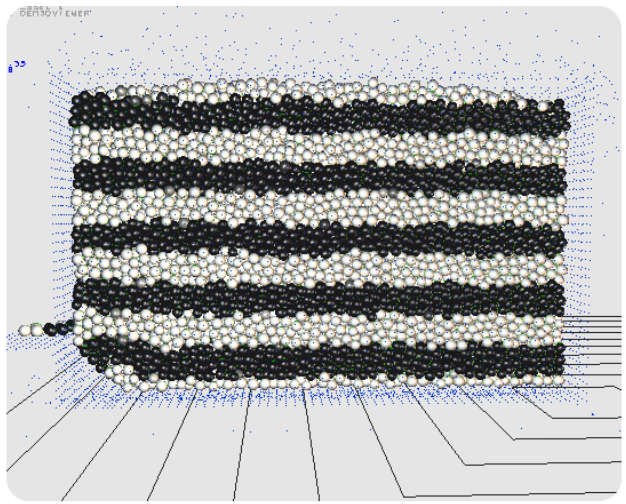
Scale Space



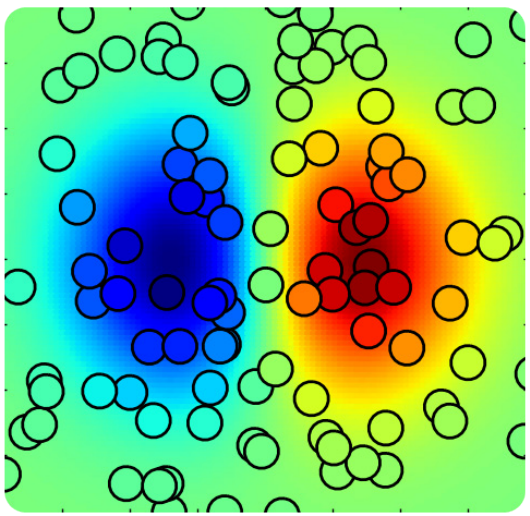
Applications
Vision
  Edge detection
Games
  Texture
Compression
  Wavelets

Union of Balls Scale Space Aplications

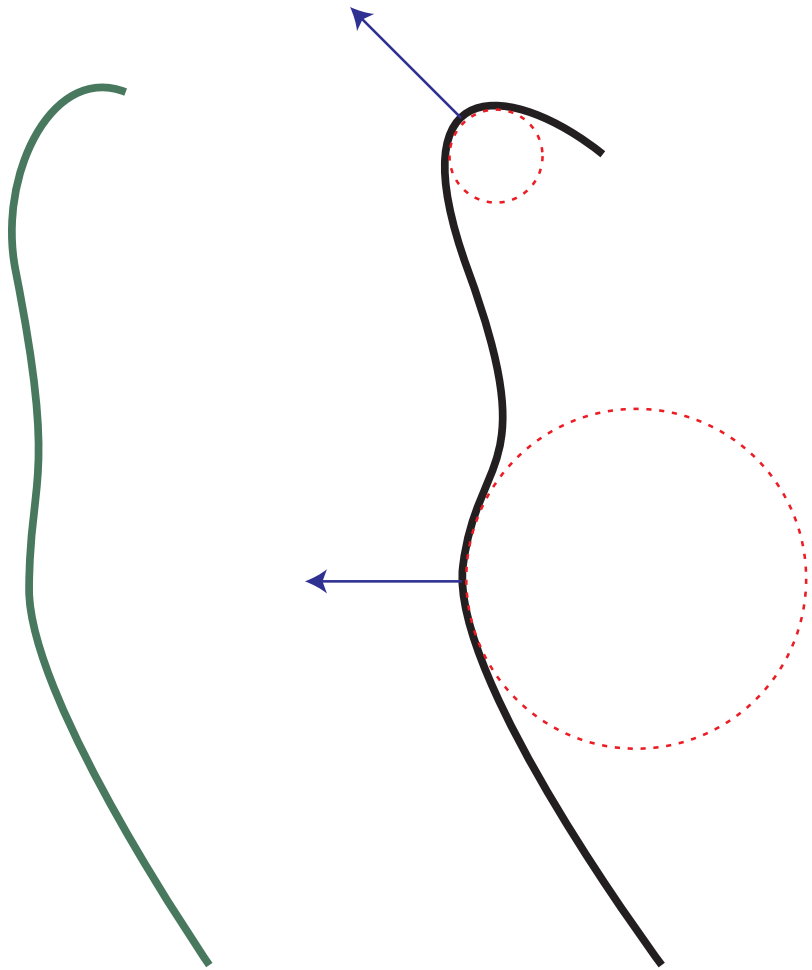
Point sets
RBF
DEM
SPH



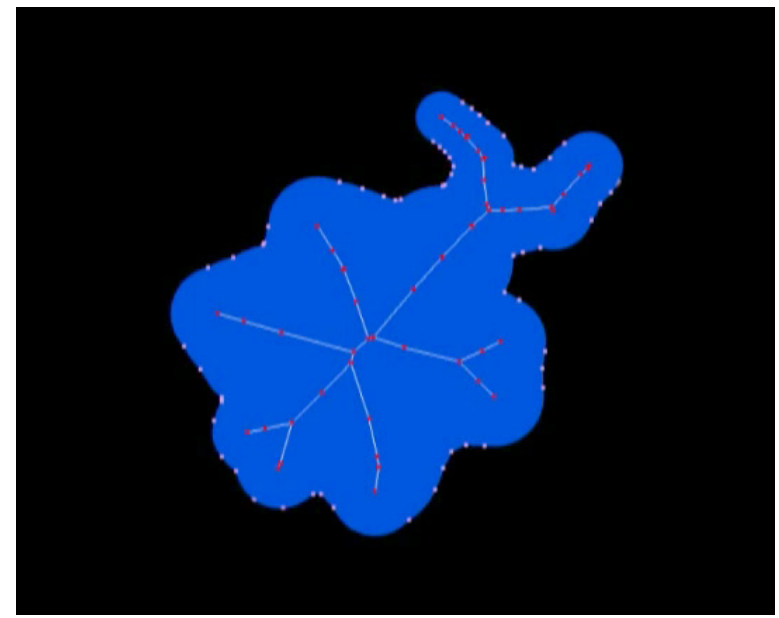
Multi-scale feature detection/classification



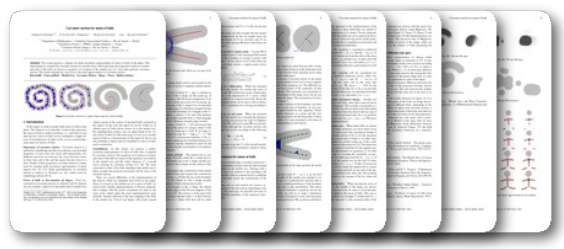
2d Curvature Motion



$$Q_t(s,t) = \underbrace{K(s,t)}_{\text{Curvature}}\underbrace{\overrightarrow{\mathbf{N}(s,t)}}_{\text{normal}}$$



T. Lewiner, C. Ferreira, M. Craizer, and R. C. Teixeira. Curvature motion for union of balls. In *Sibgrapi*, pages 47–54, Natal, Oct. 2005. IEEE.



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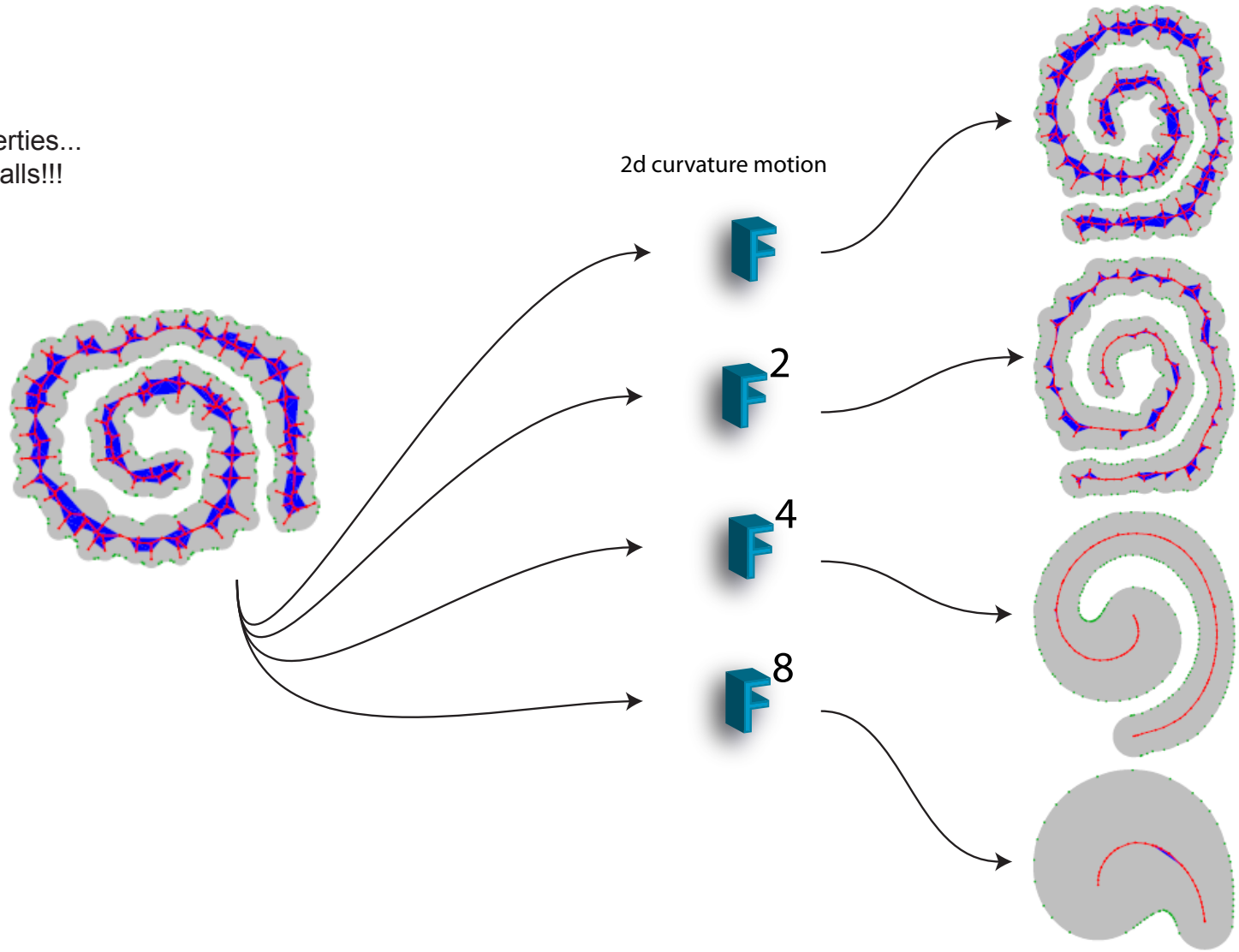
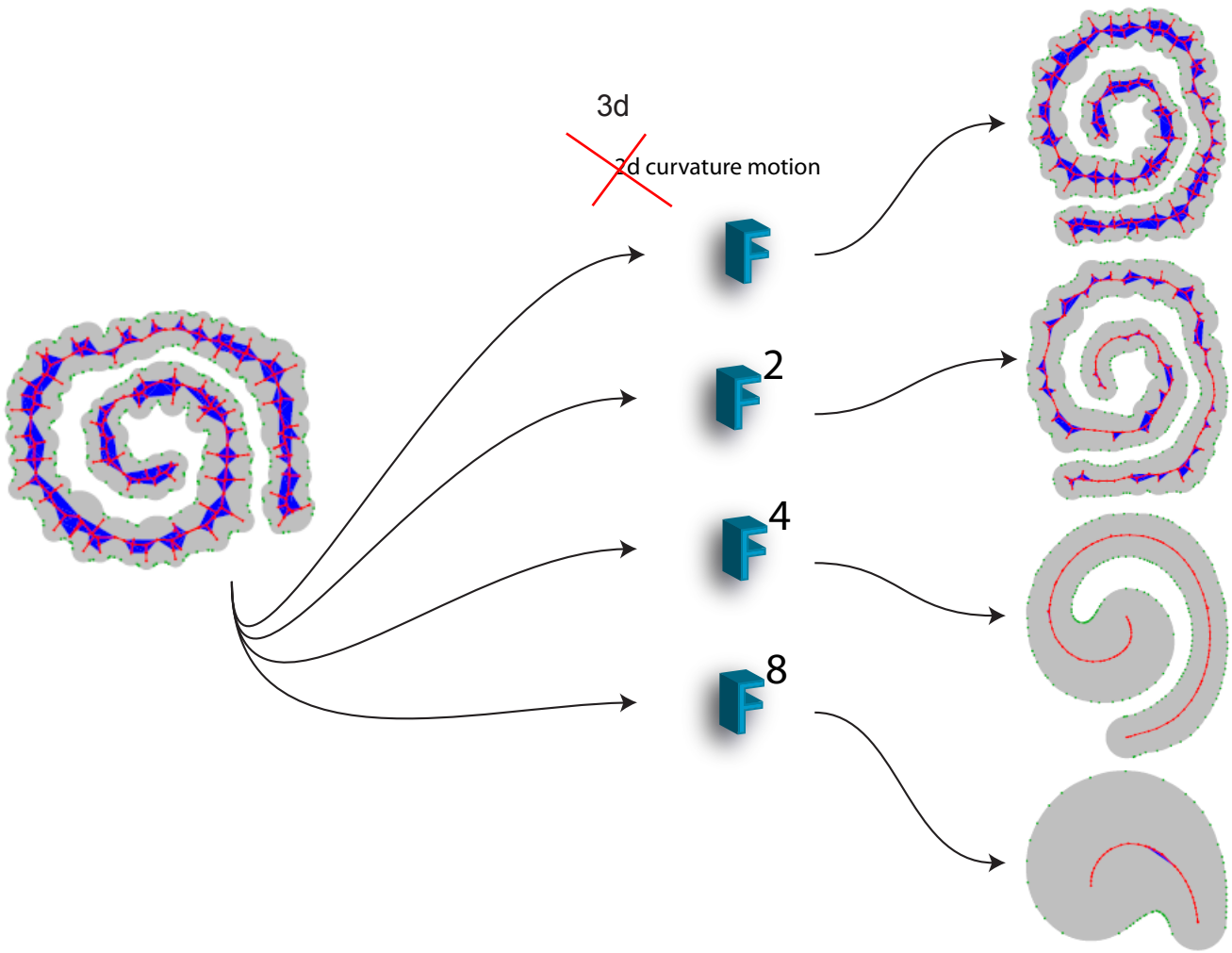
2d Curvature Motion

Nice properties...
Work on balls!!!

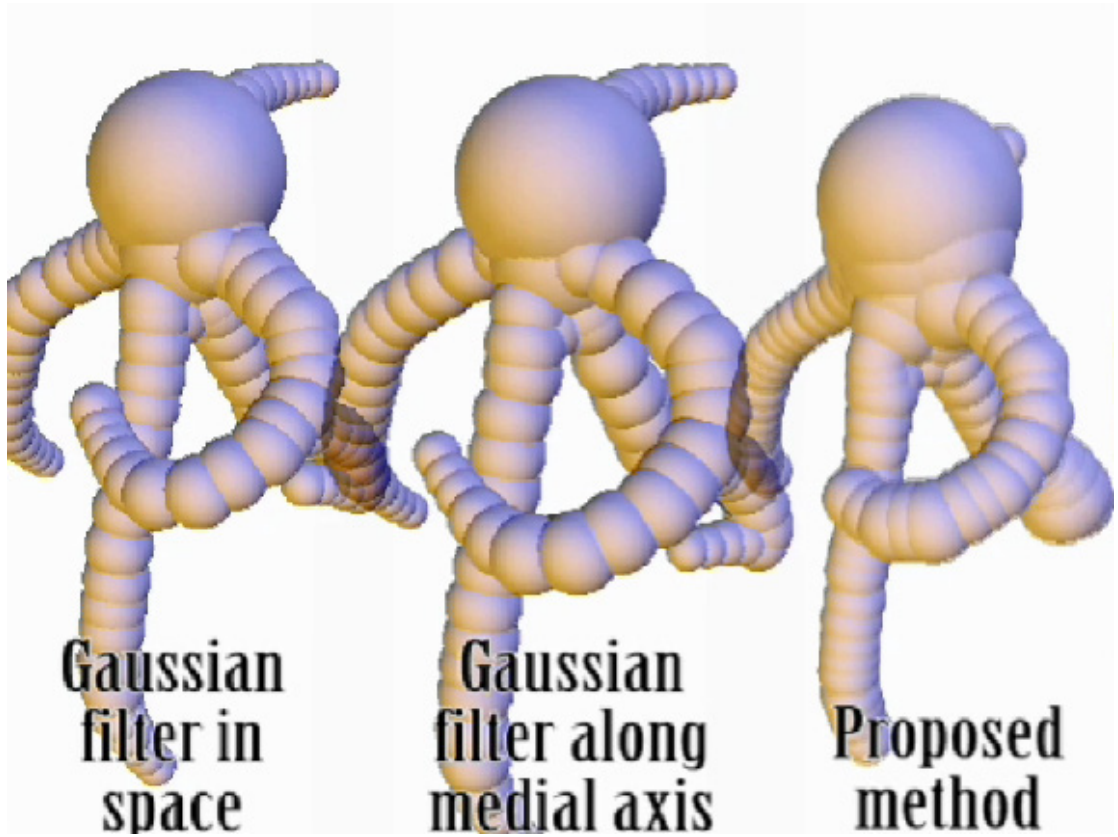


3d Curvature Motion ... problems...

Nice properties...
Work on 2d balls!!!

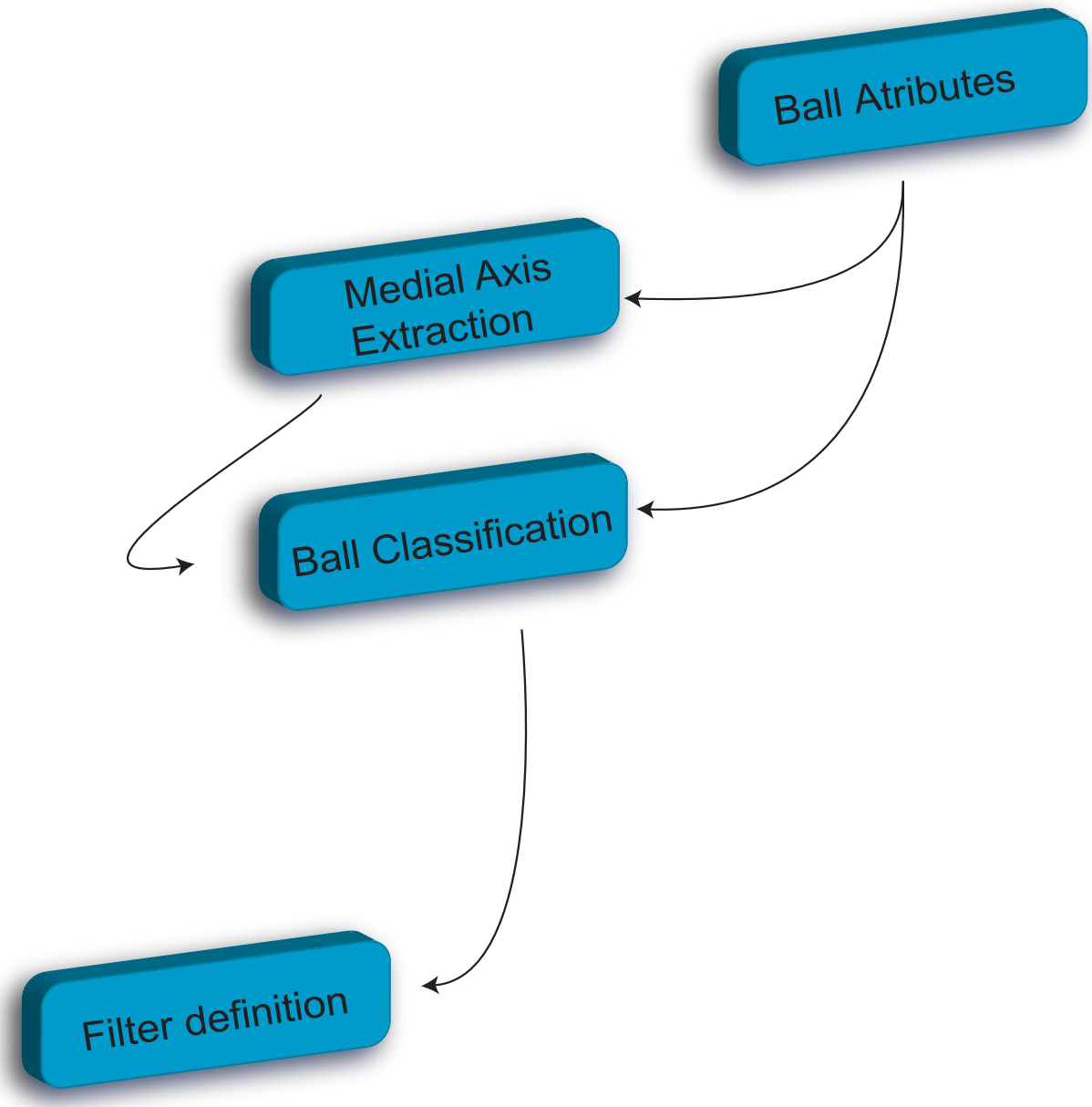


3d Filter

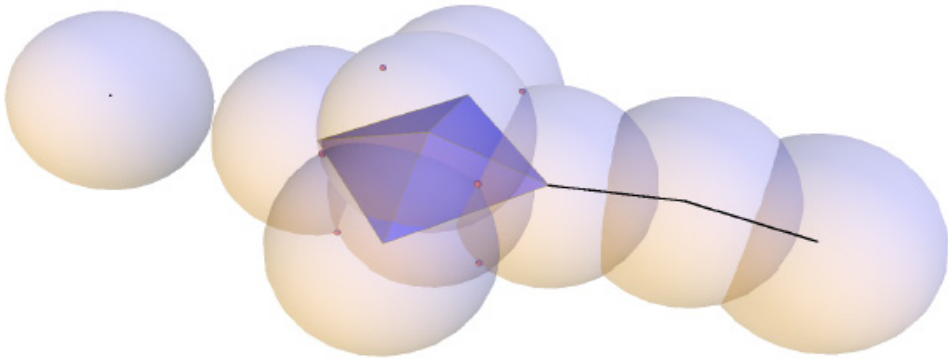


Task: Develop a filter that exhibit good properties.

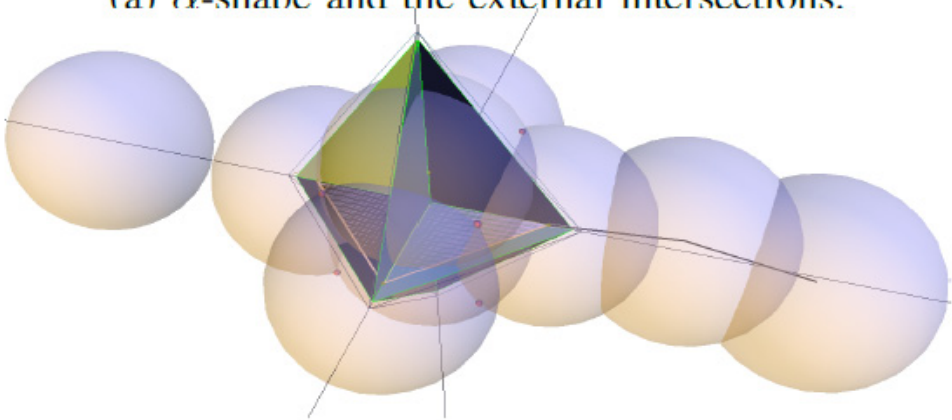
3d Filter Framework



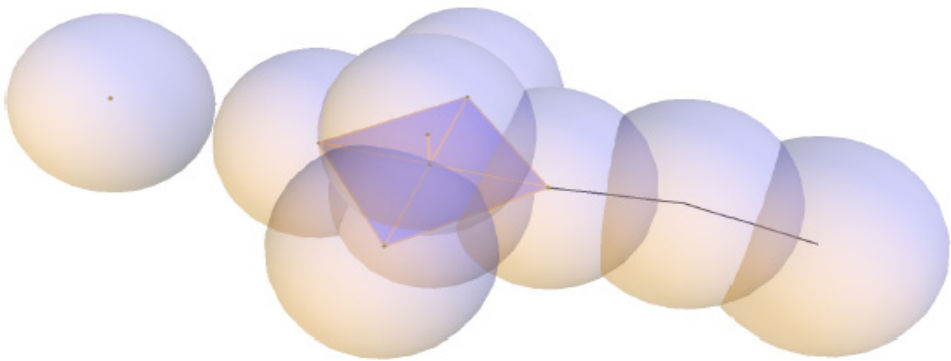
Medial Axis Extraction



(a) α-shape and the external intersections.

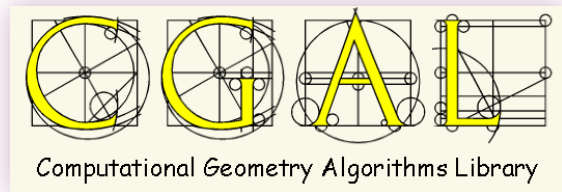


(b) Voronoï diagram of the intersections.

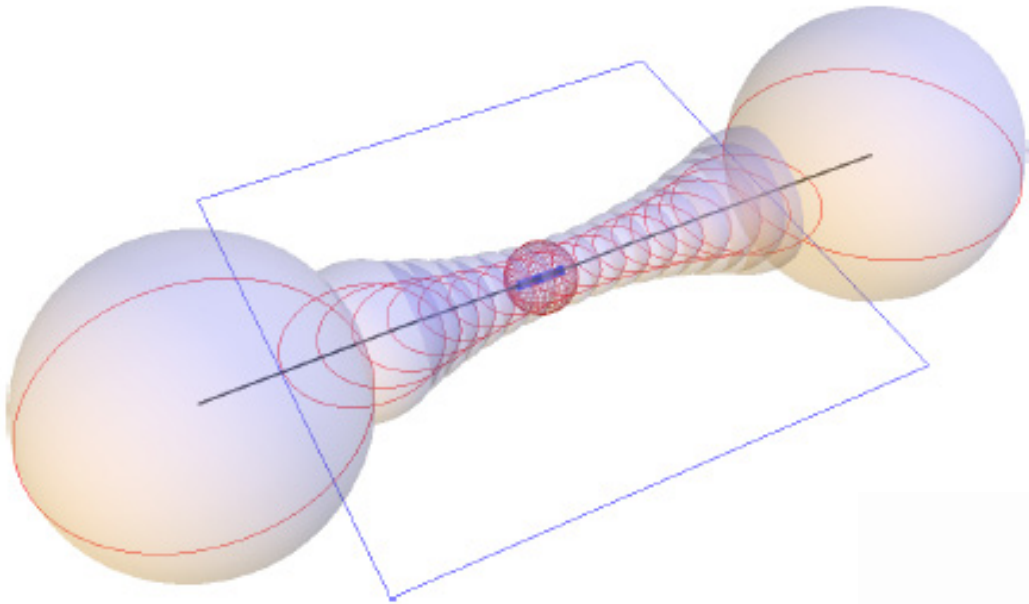


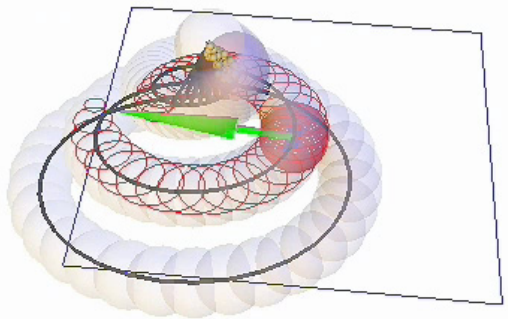
(c) Medial axis: singular part from the α-shape and regular part from the Voronoï diagram.

N. Amenta and R. Kolluri. The medial axis of unions of balls. *Computational Geometry: Theory and Applications*, 20(1–2):25–37, 2001.



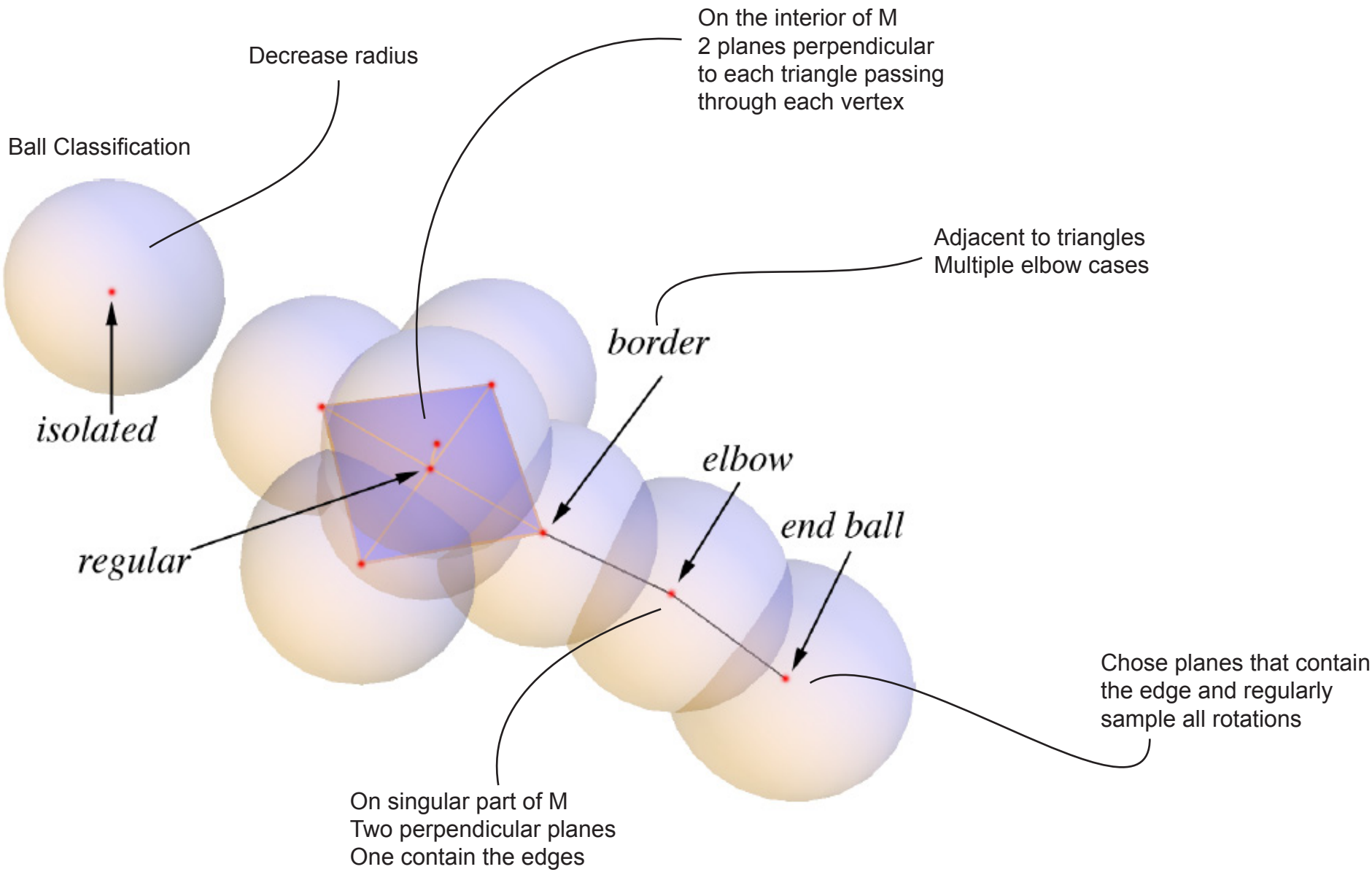
Proposed Filter



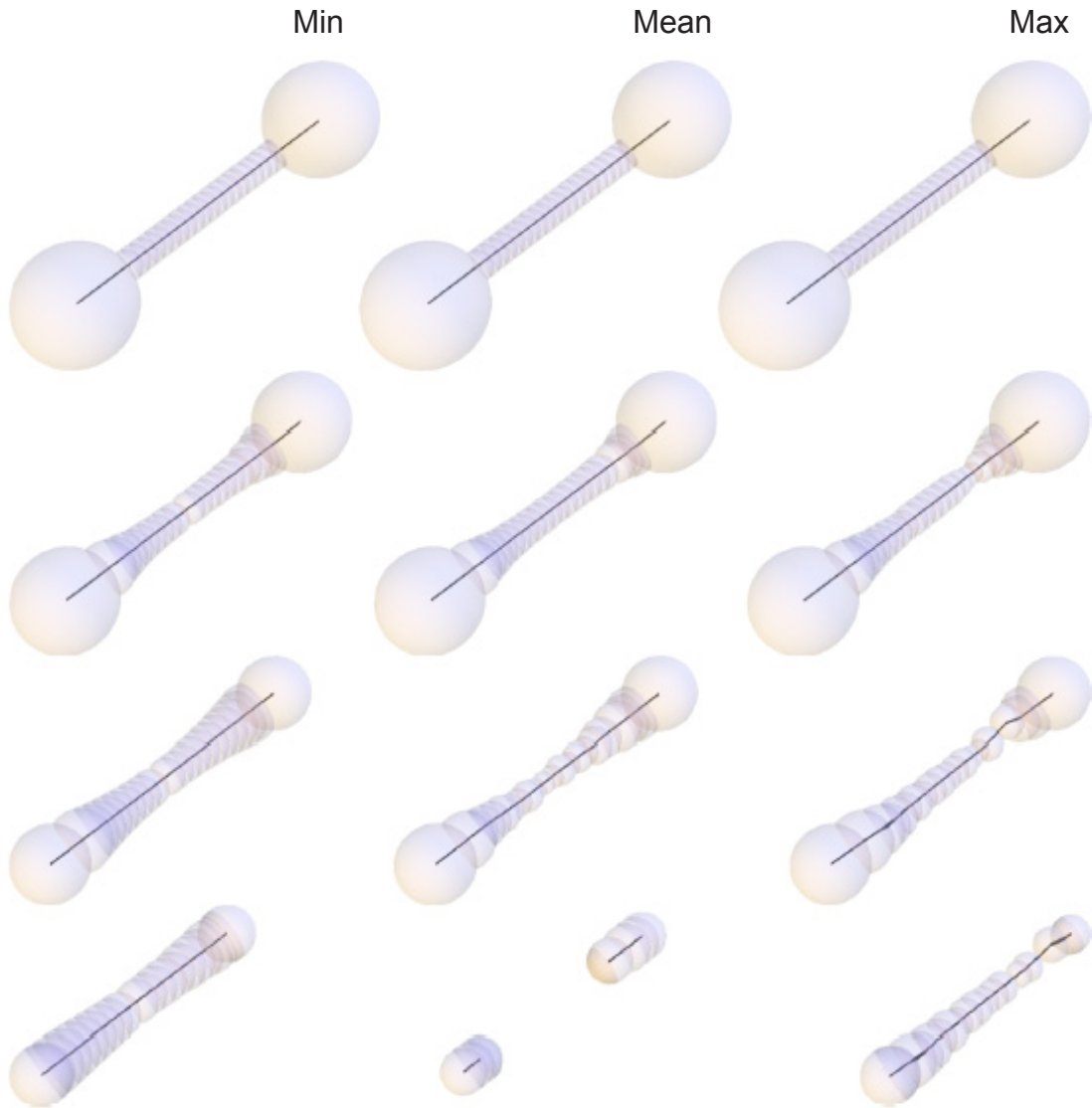


We intersect the union of balls with local planes and apply planar curvature motion on the intersected disks.

Ball Classification and Plane Selection



Proposed Filter Nice Properties



Results

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193 elements
0.2 sec per iteration

Comparison