

An aerial view of a city's LiDAR point cloud, showing a dense collection of points representing buildings, streets, and terrain. The image is rendered in grayscale, with the points forming a textured, three-dimensional representation of the urban environment. The text is overlaid on a semi-transparent white box in the upper left quadrant.

Towards Medial Axis-based simplification of LiDAR point clouds

iQmulus workshop

Cardiff, July 8, 2014

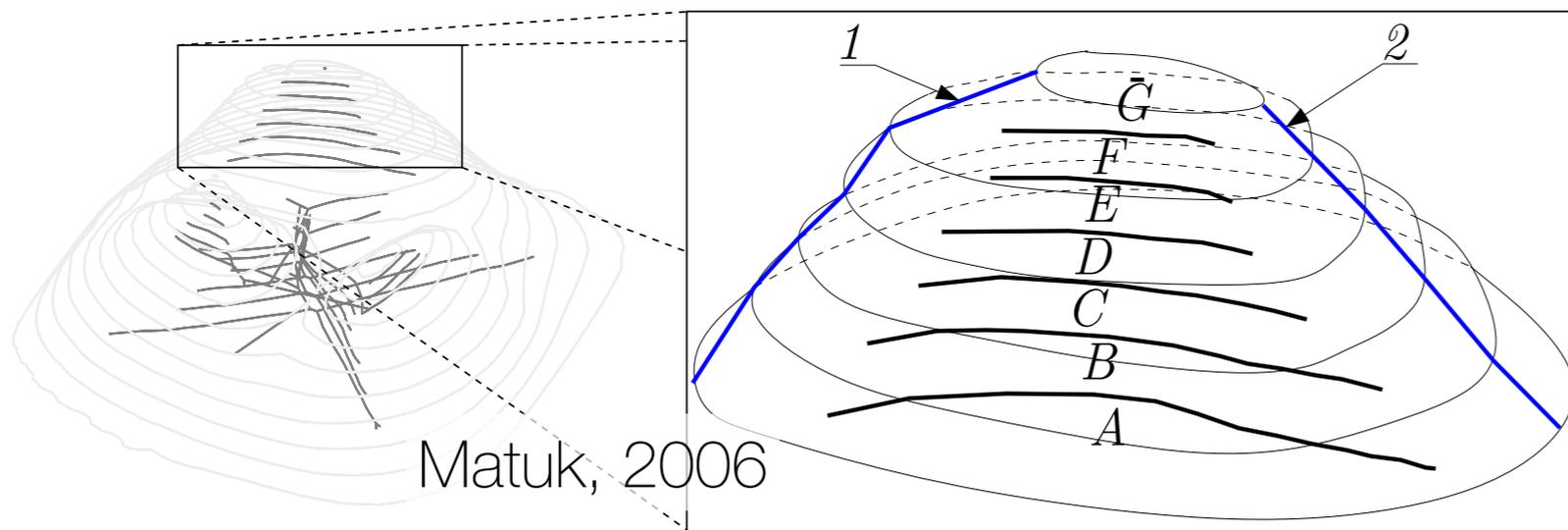
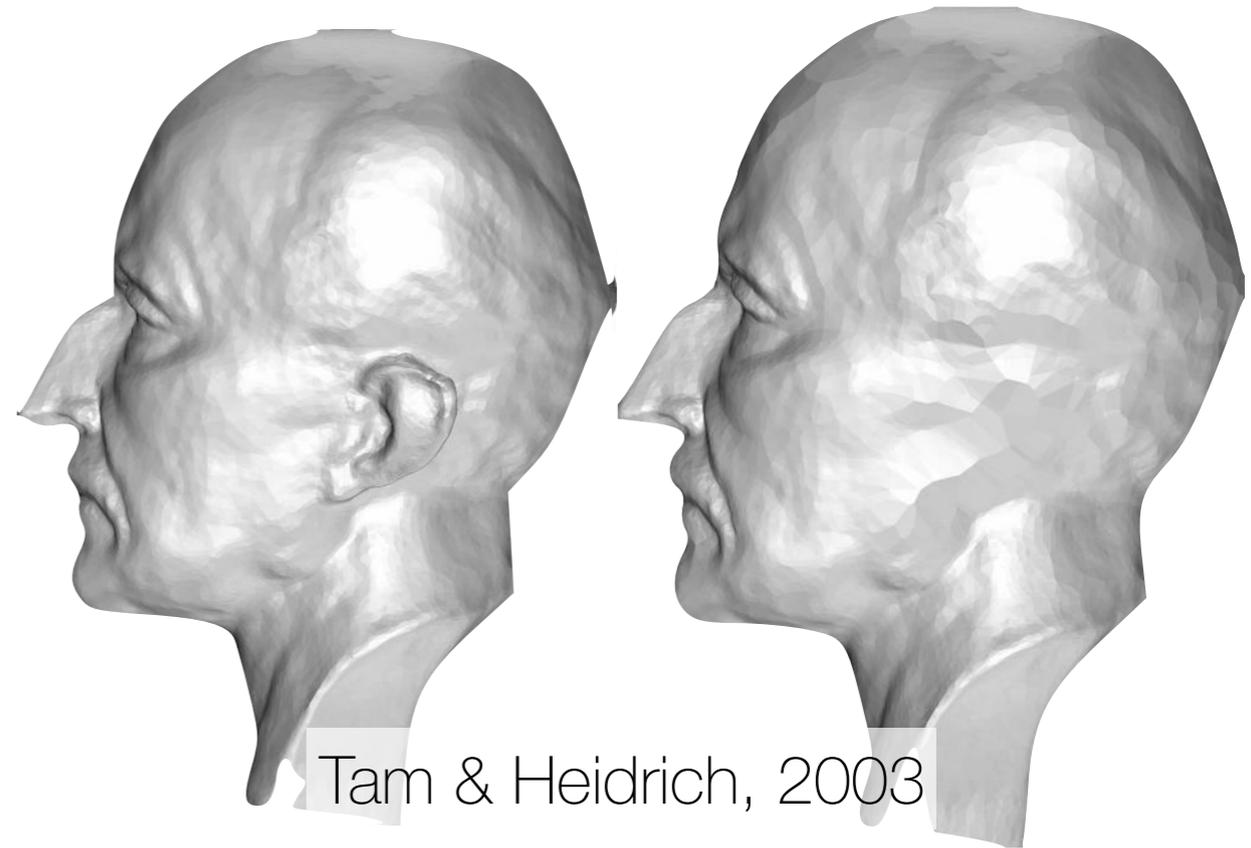
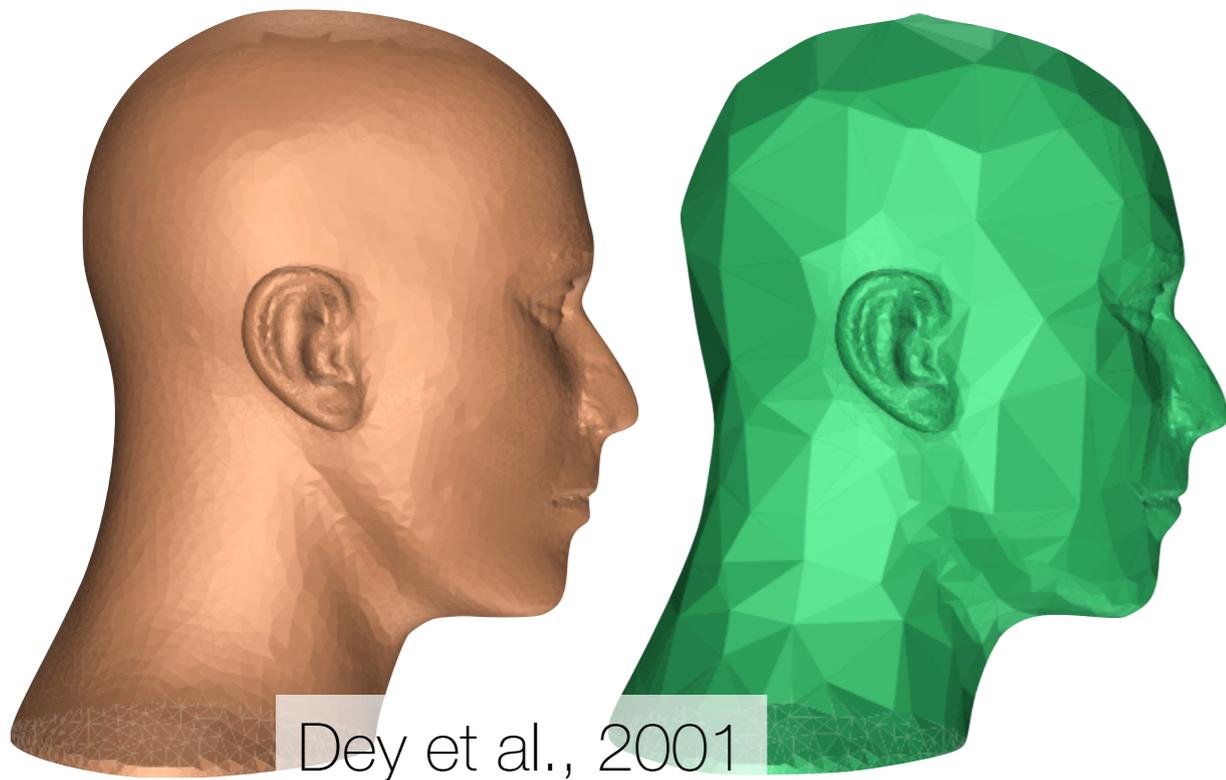
Ravi Peters



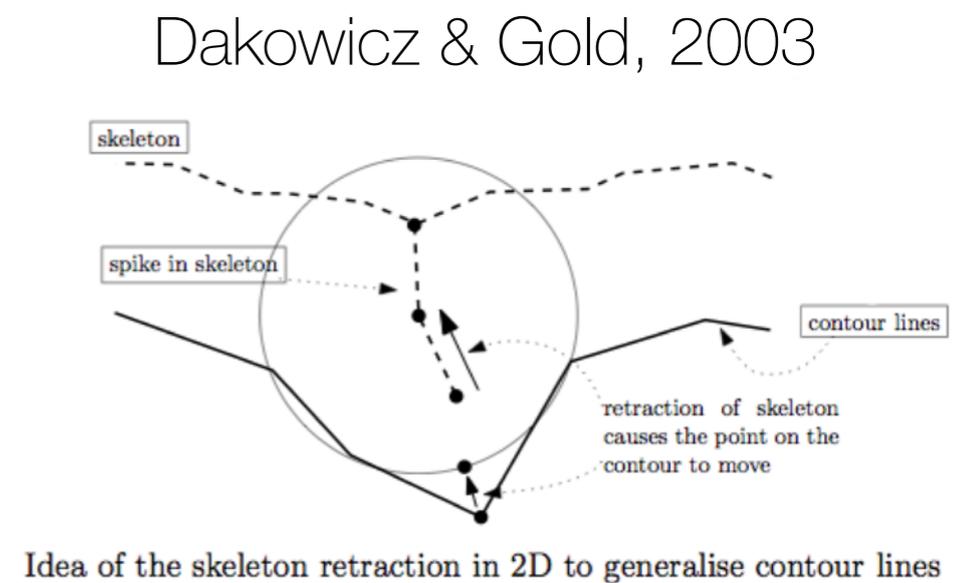


Introduction

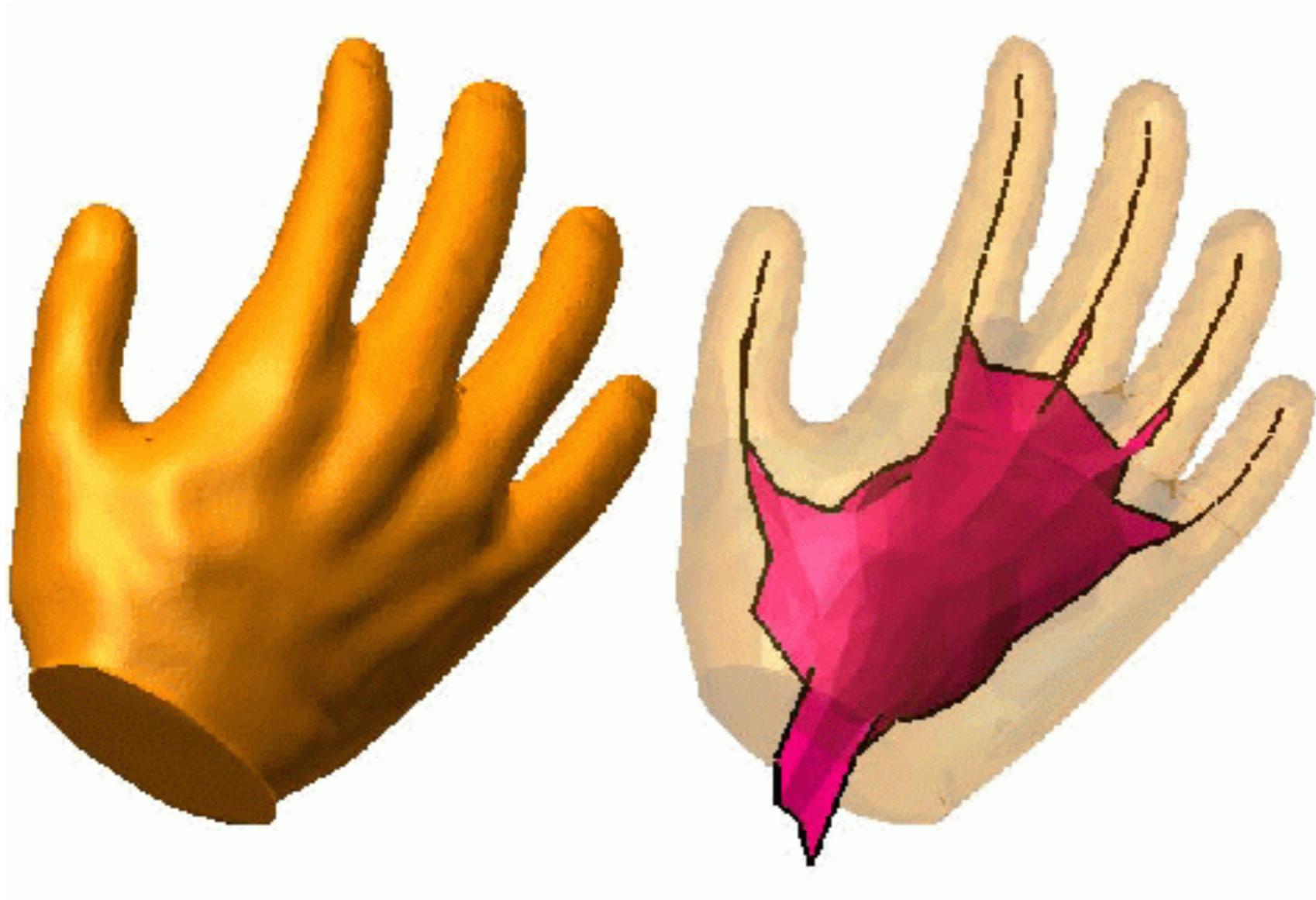
Why Medial Axis?



3



Medial Axis Transform



Current goal

Simplification of LiDAR point clouds:

Reduce number of points while maintaining detail.

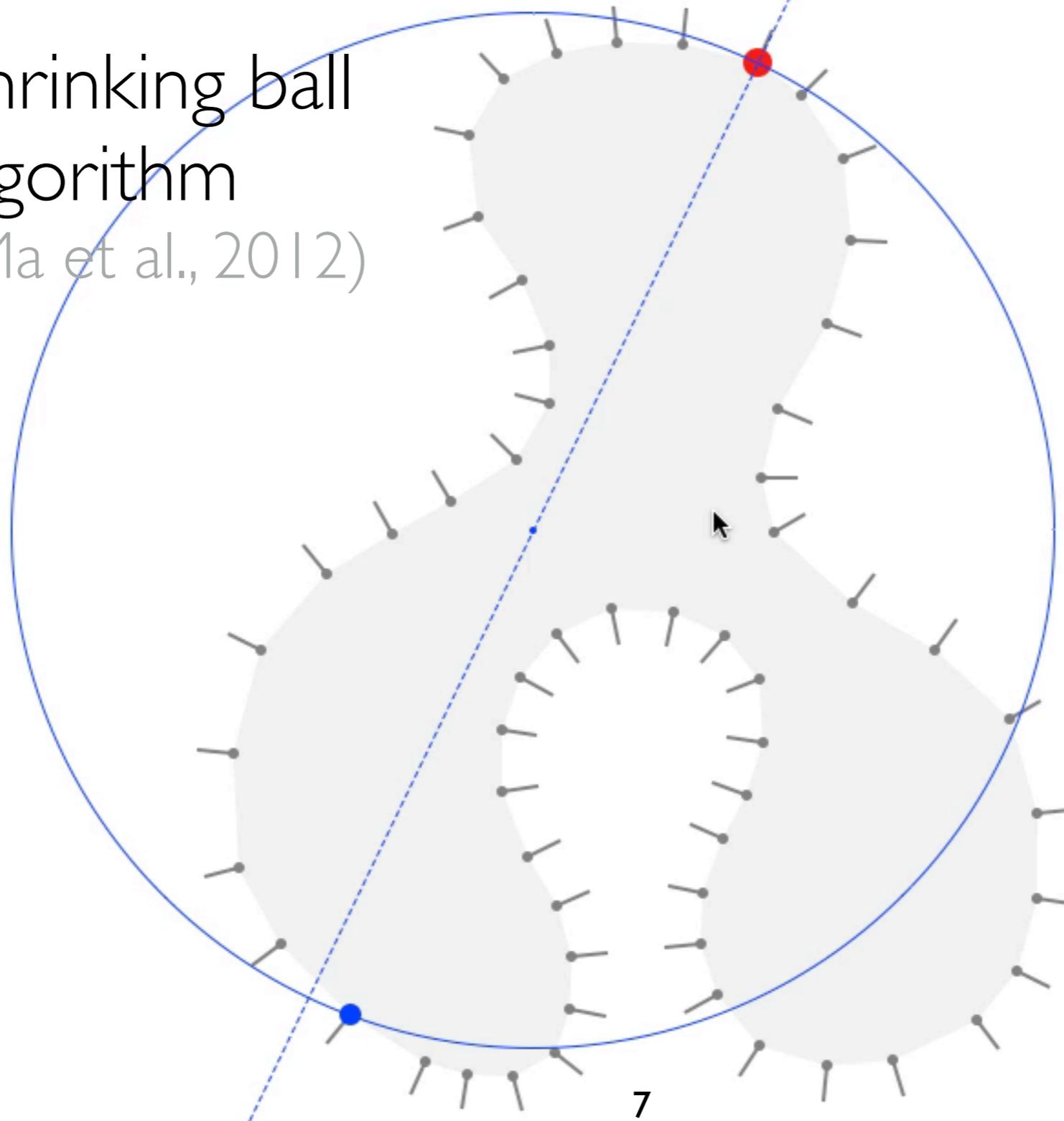
E.g. for creation 3DTOP10NL



Methods

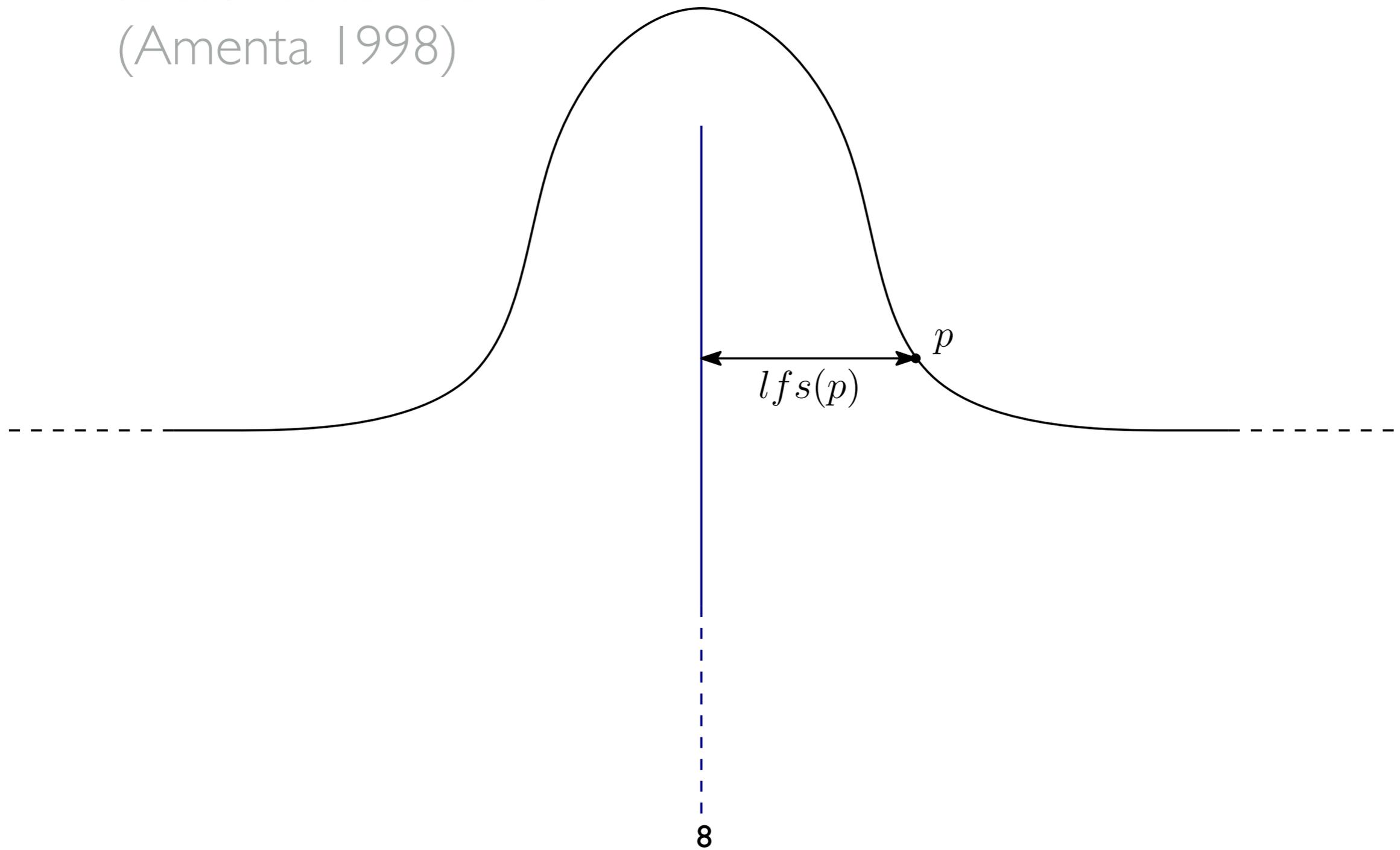
MAT approximation

Shrinking ball
algorithm
(Ma et al., 2012)

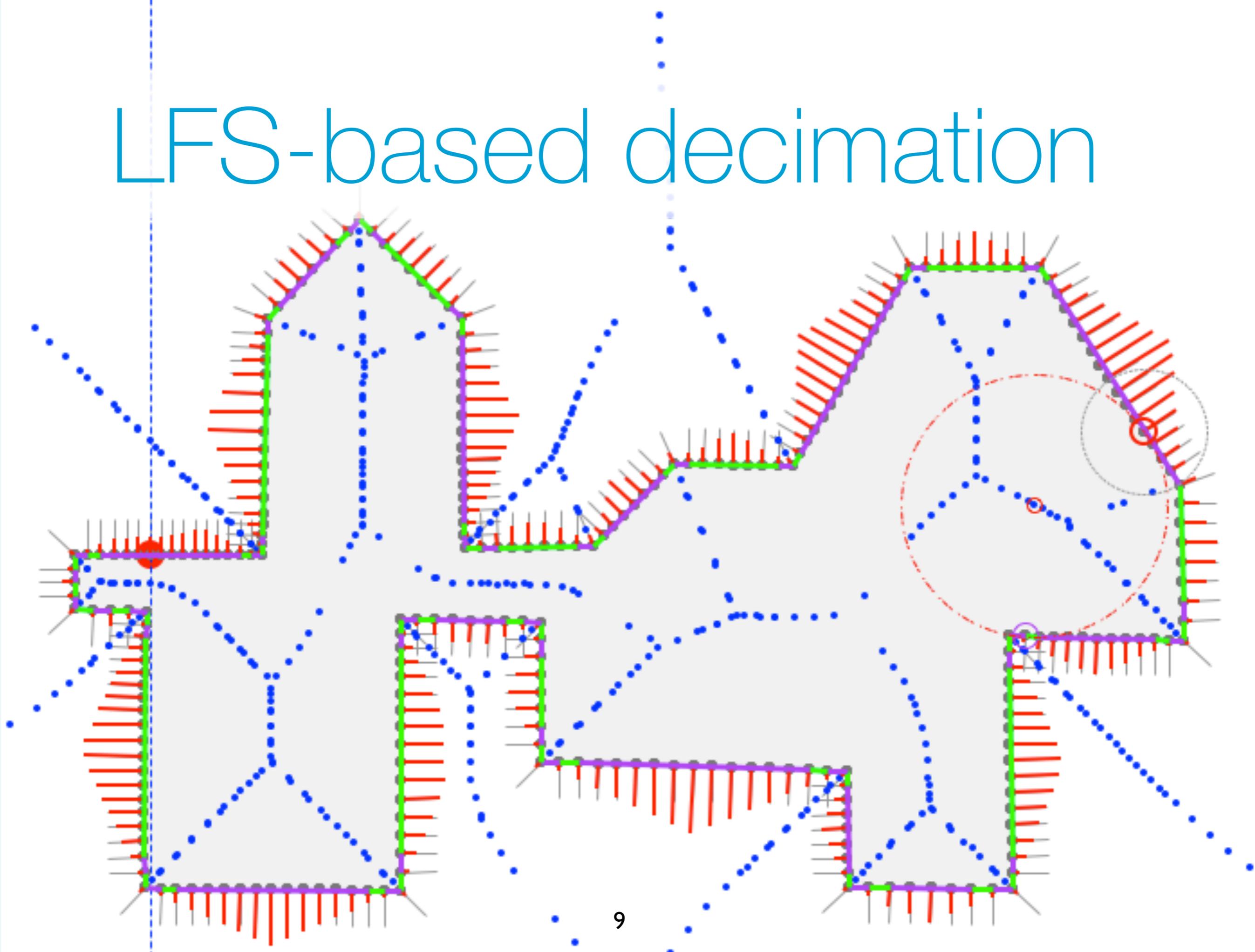


Metrics on the MAT

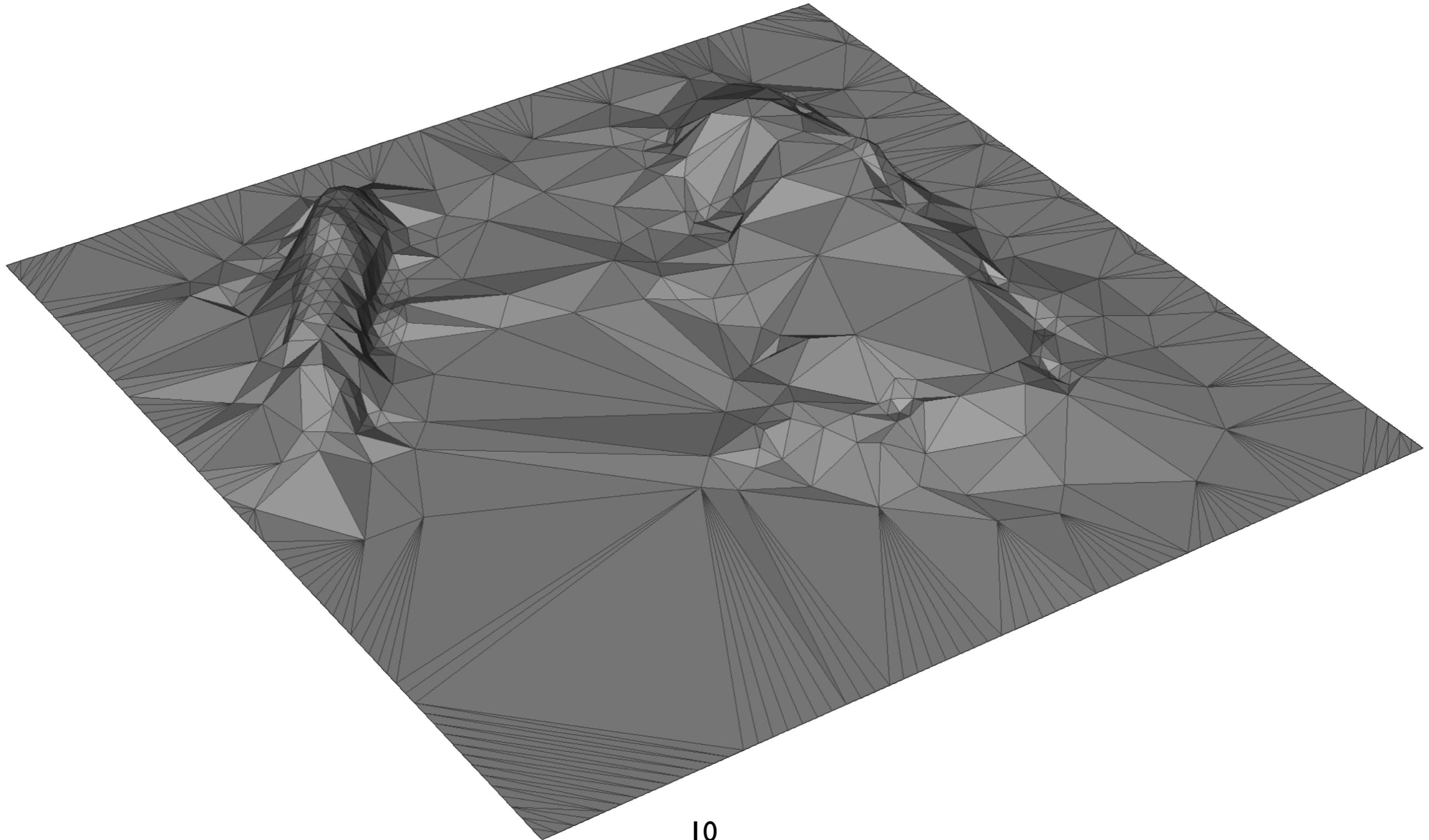
local feature size
(Amenta 1998)



LFS-based decimation



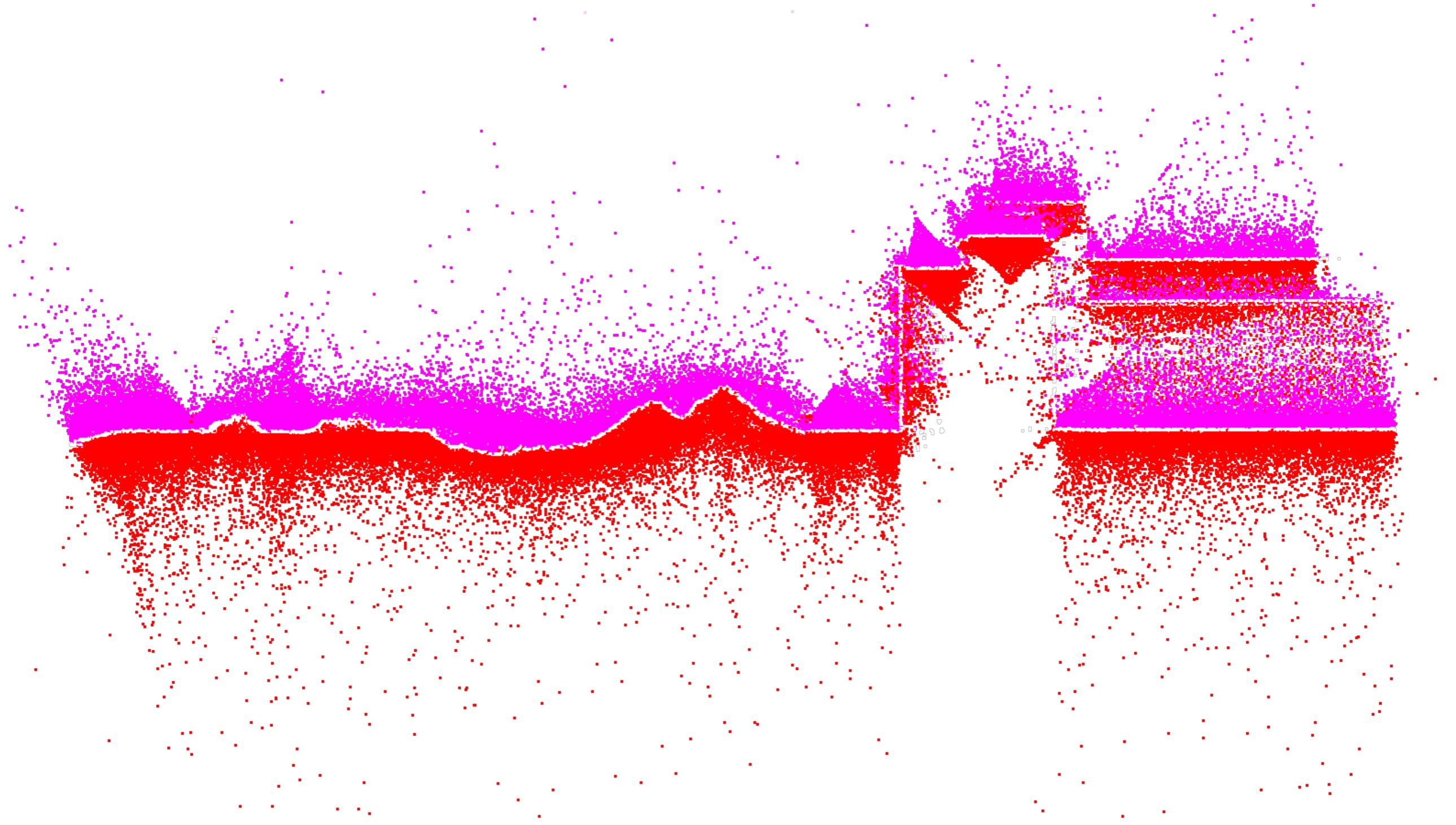
LFS-based decimation



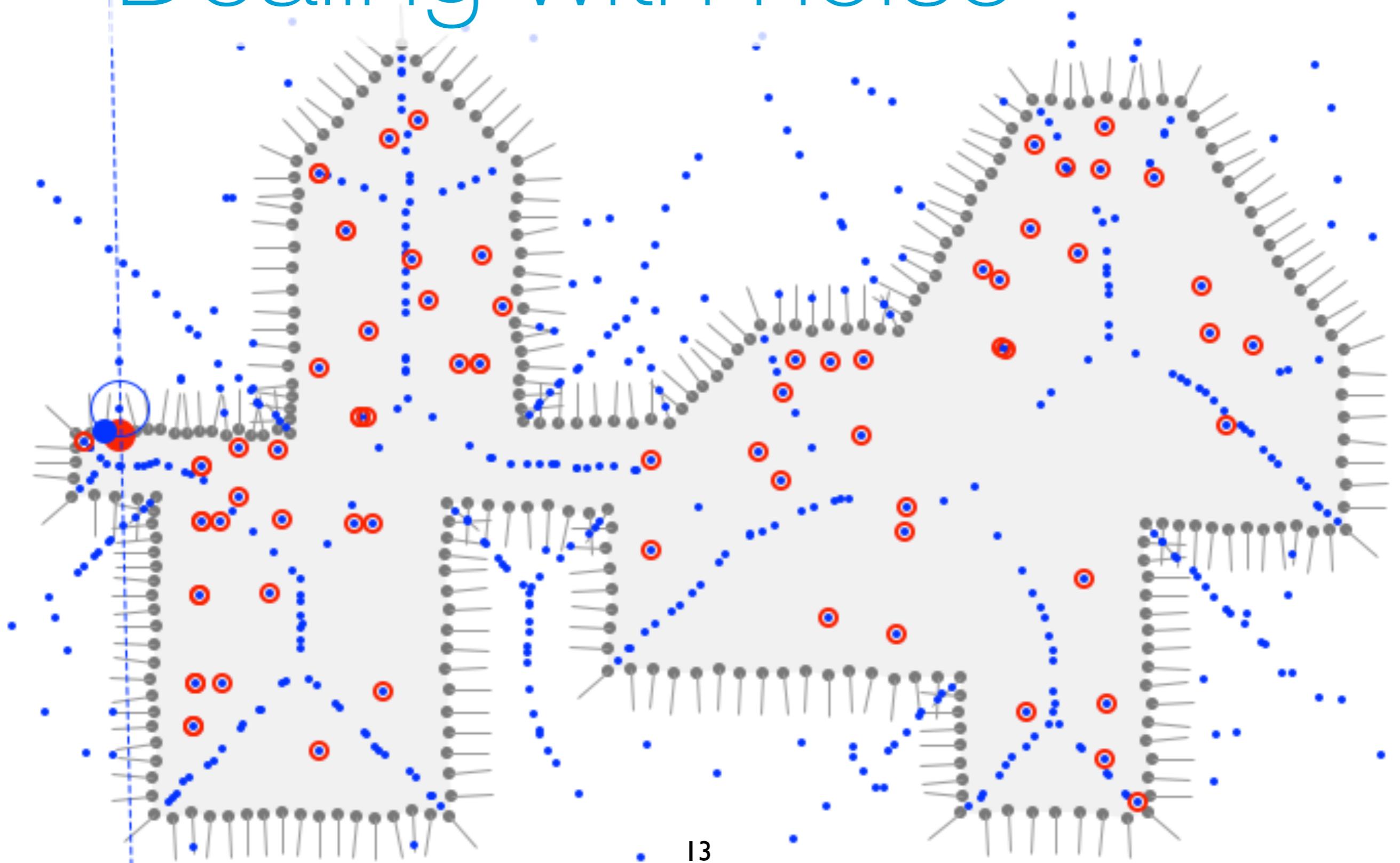


Noise

Dealing with noise

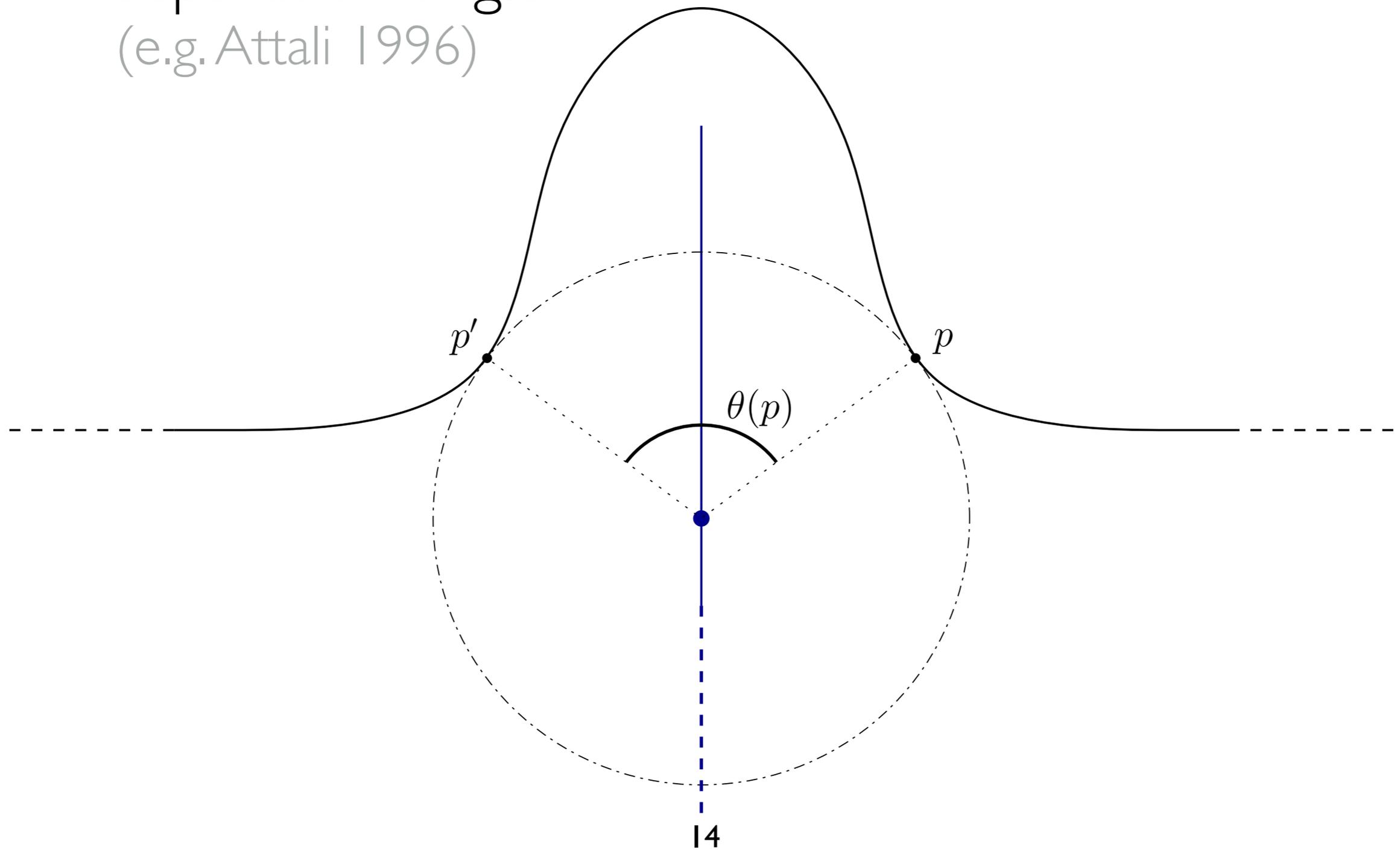


Dealing with noise



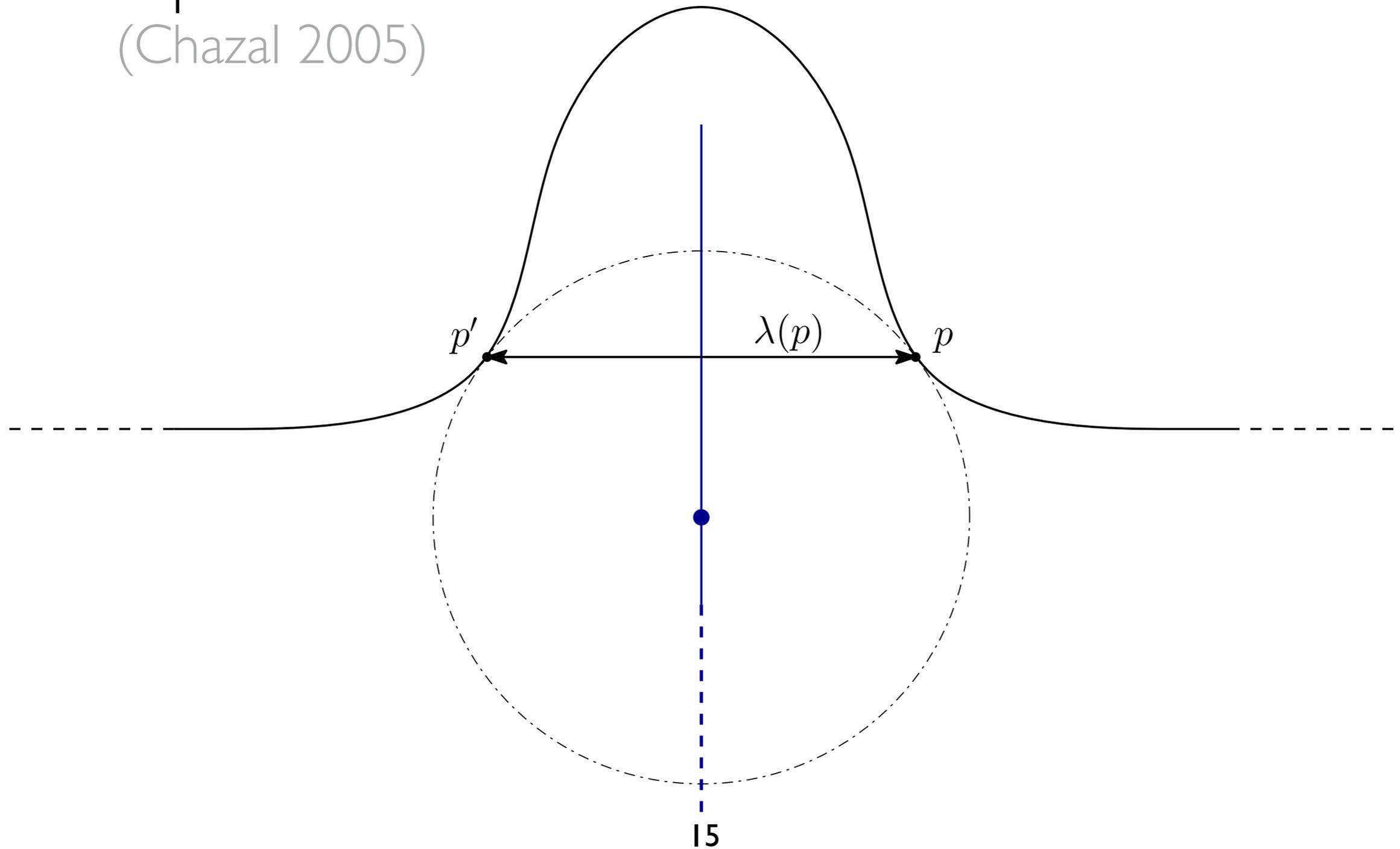
Metrics on the MAT

separation angle
(e.g. Attali 1996)



Metrics on the MAT

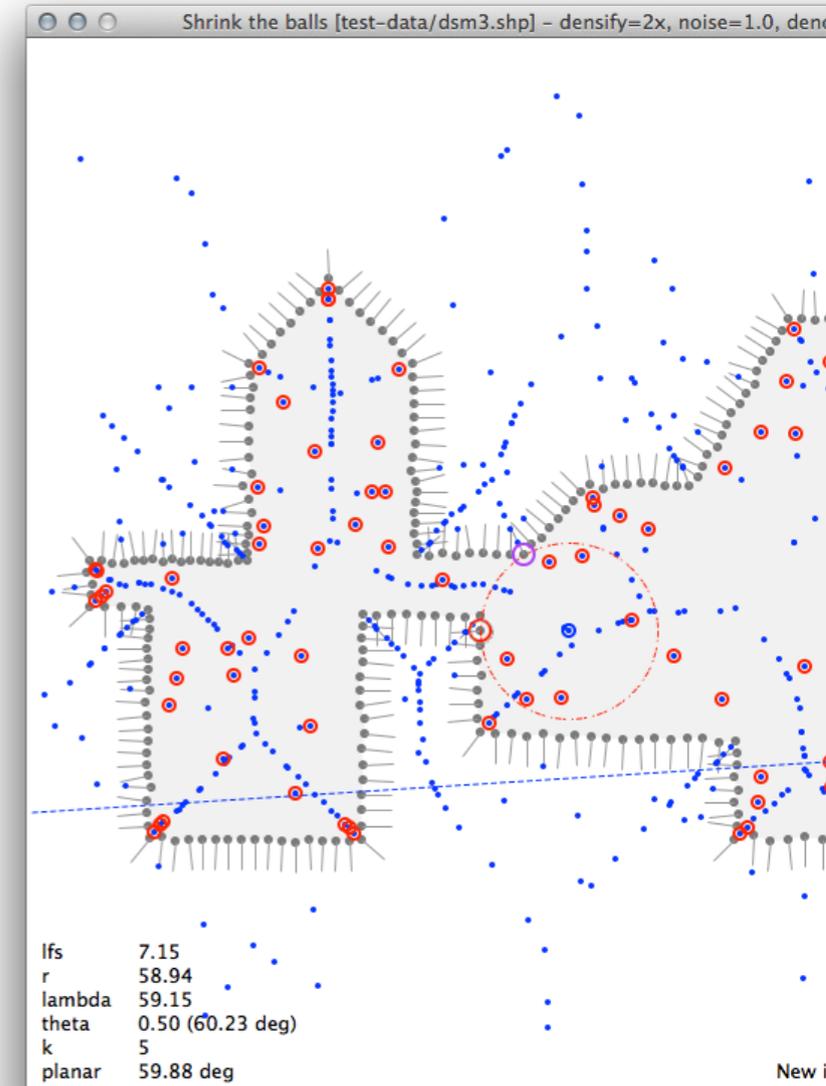
separation distance
(Chazal 2005)



Simple noise detection

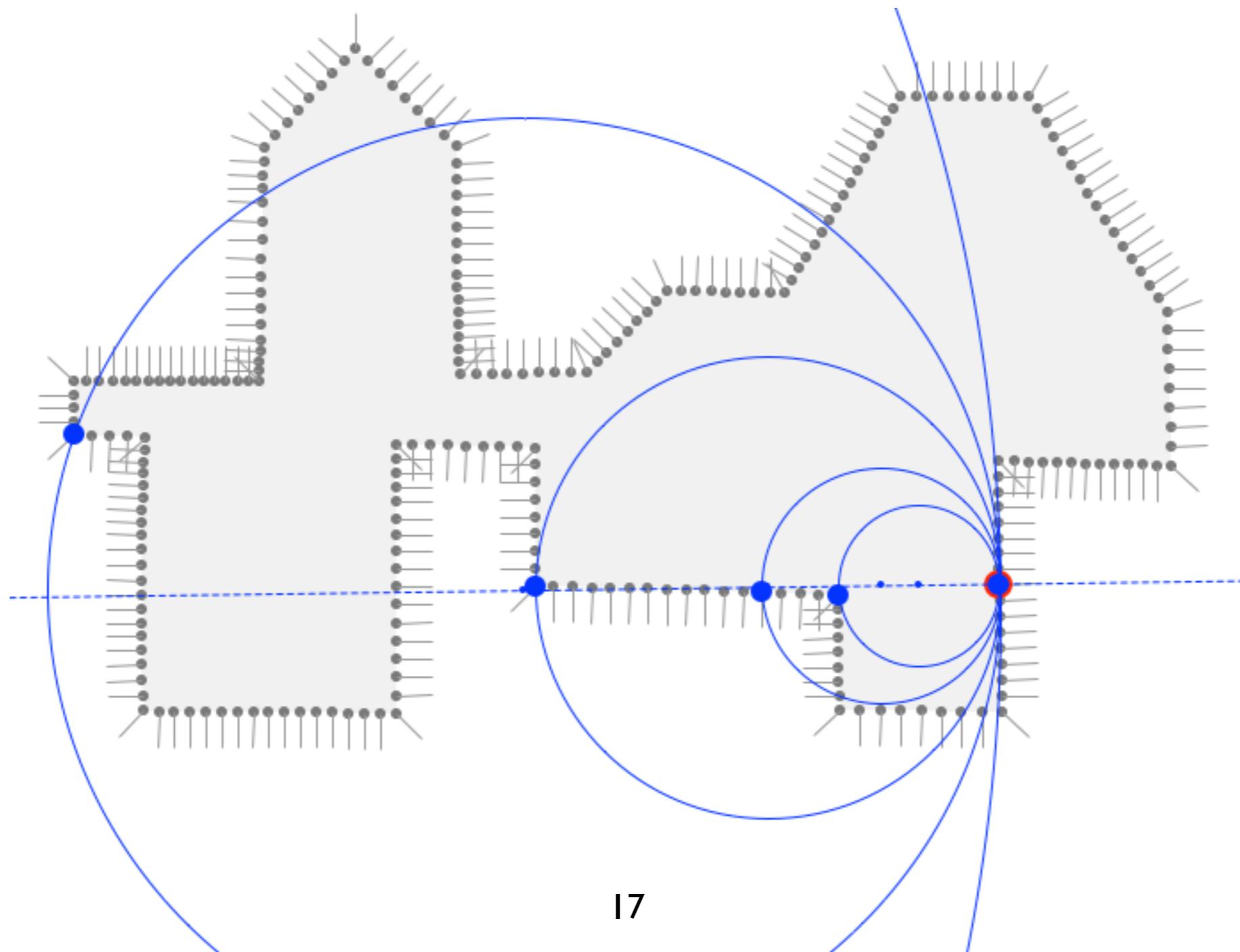
Based on thresholding:

1. Not so discriminative
2. Many MAT points are lost



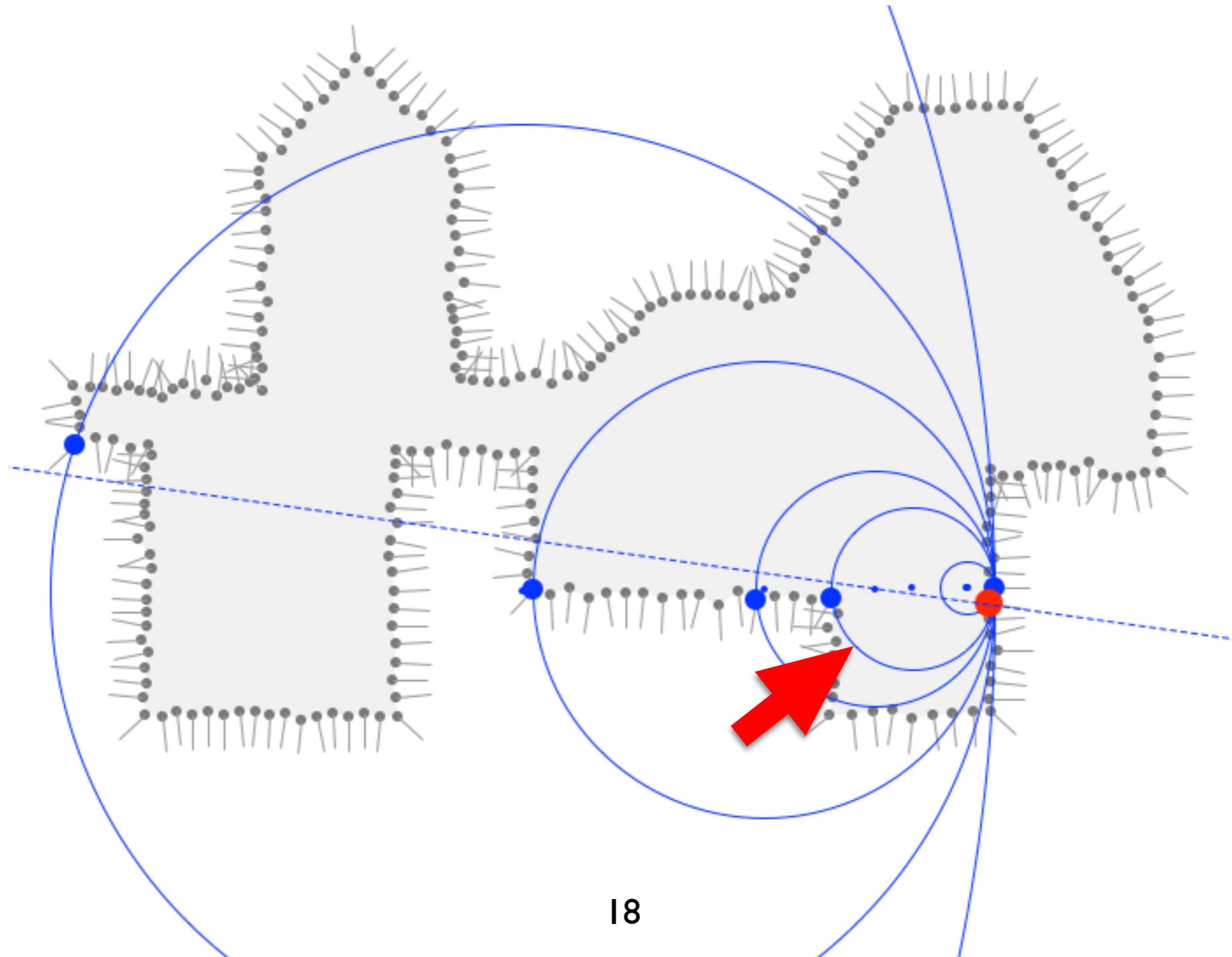
My proposal

Consider series of *shrinking balls* for every point



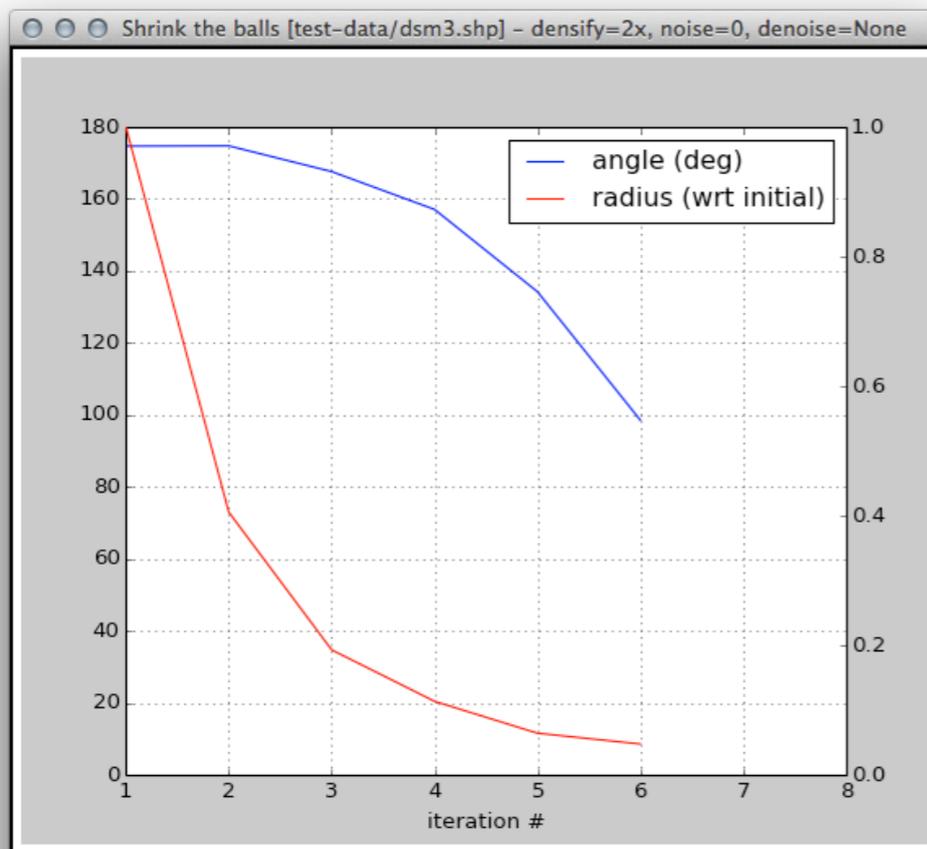
Observation

Even for noisy points, 'good' ball is computed

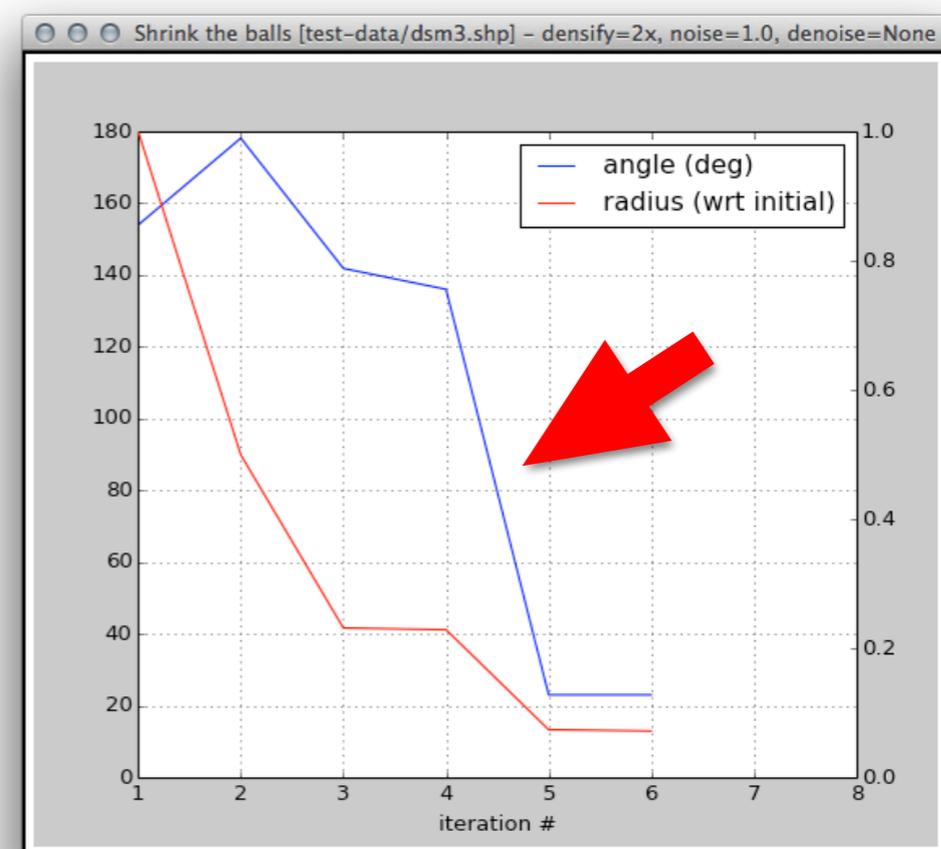


How to recognise 'good' ball?

Look at development of ball metrics



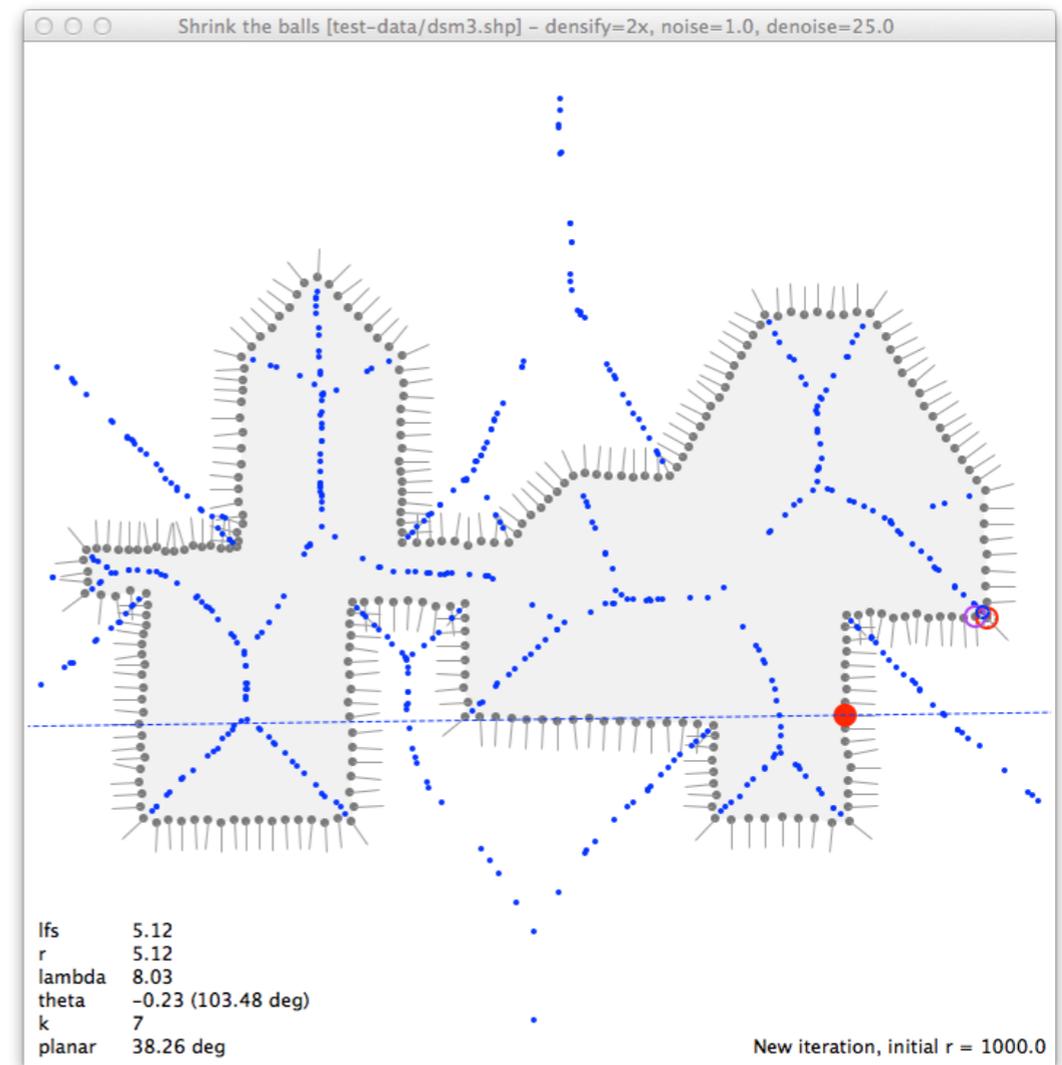
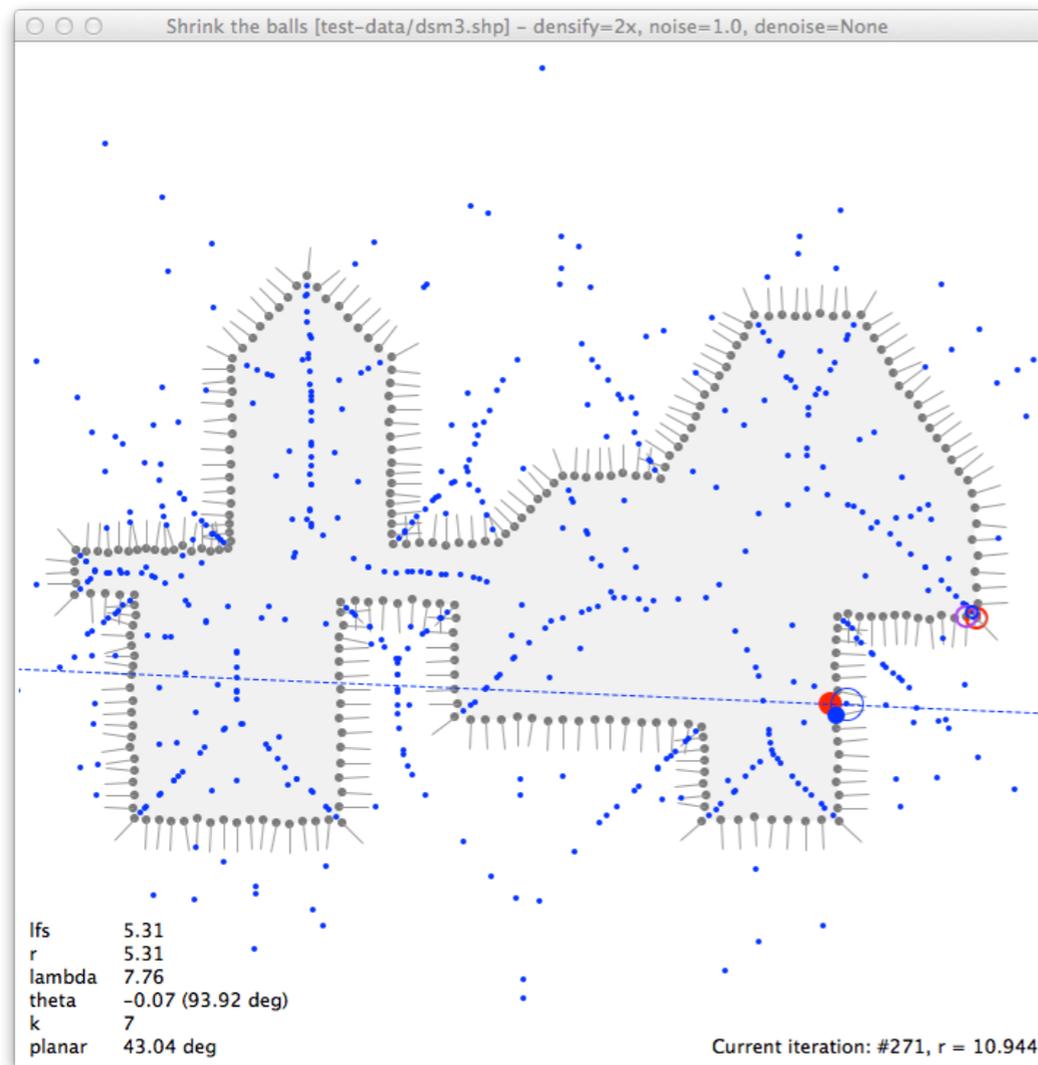
Good point



Noisy point

Getting a denser MAT

by keeping 'good' balls





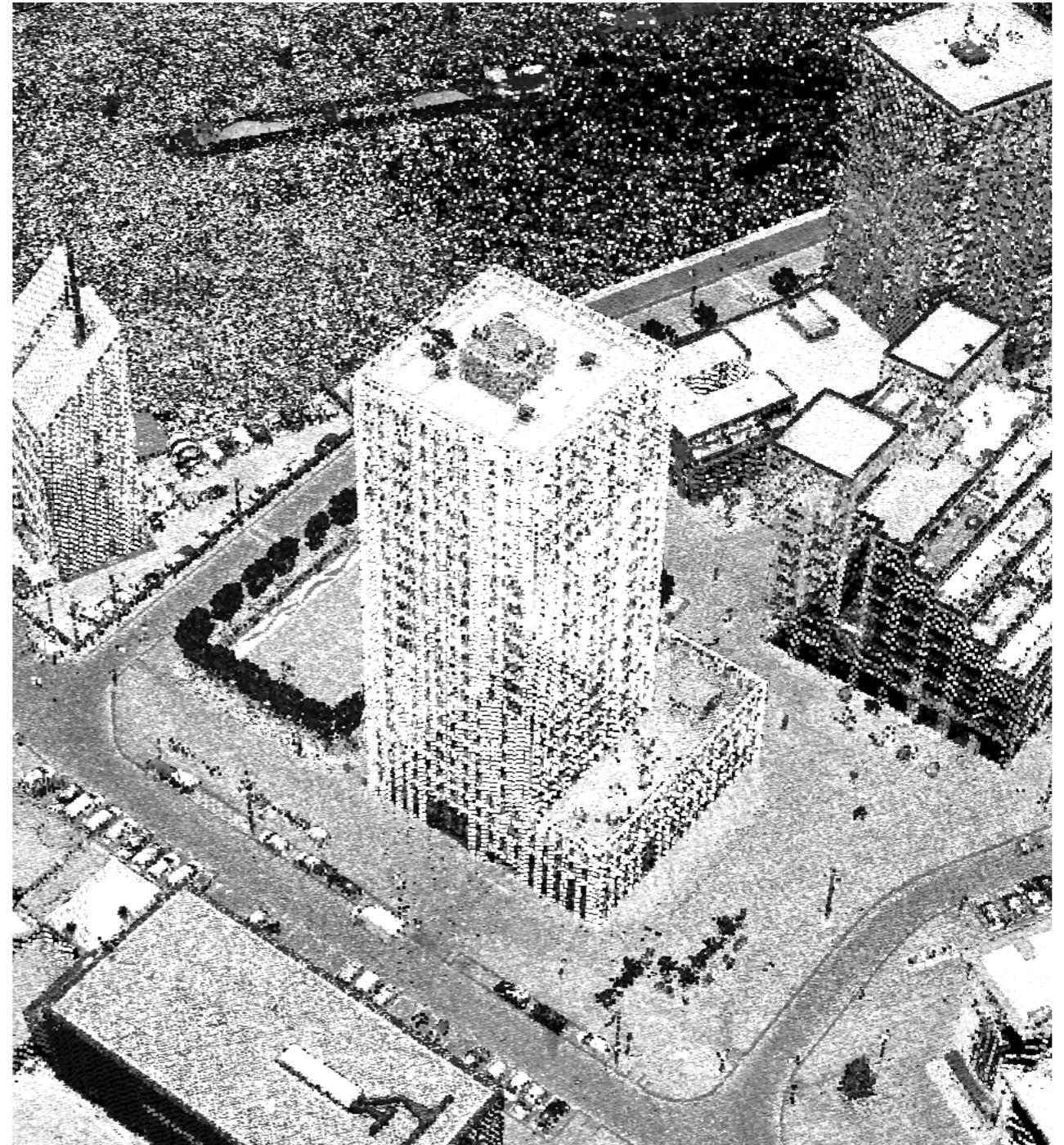
Results

Results

dataset:

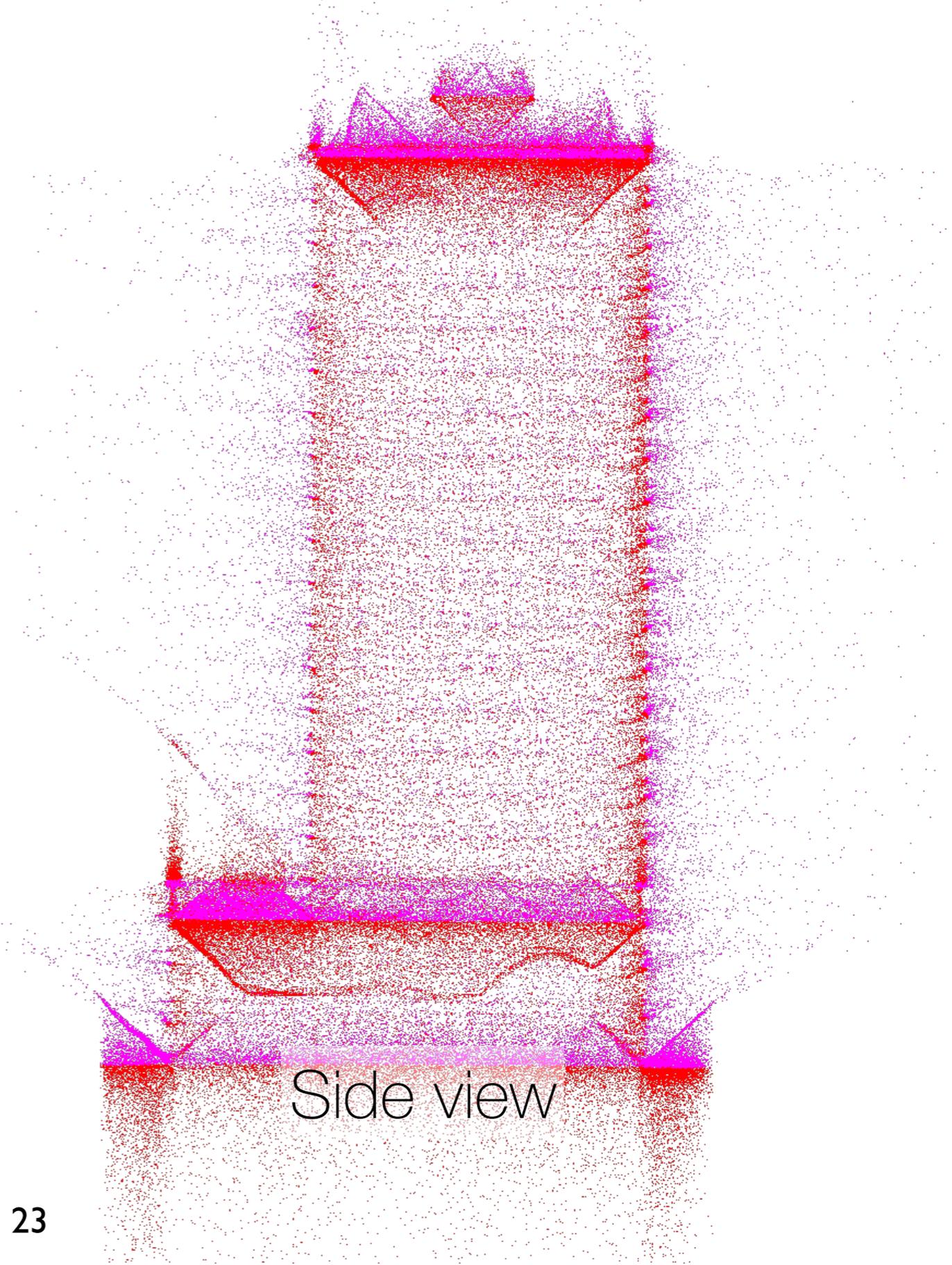
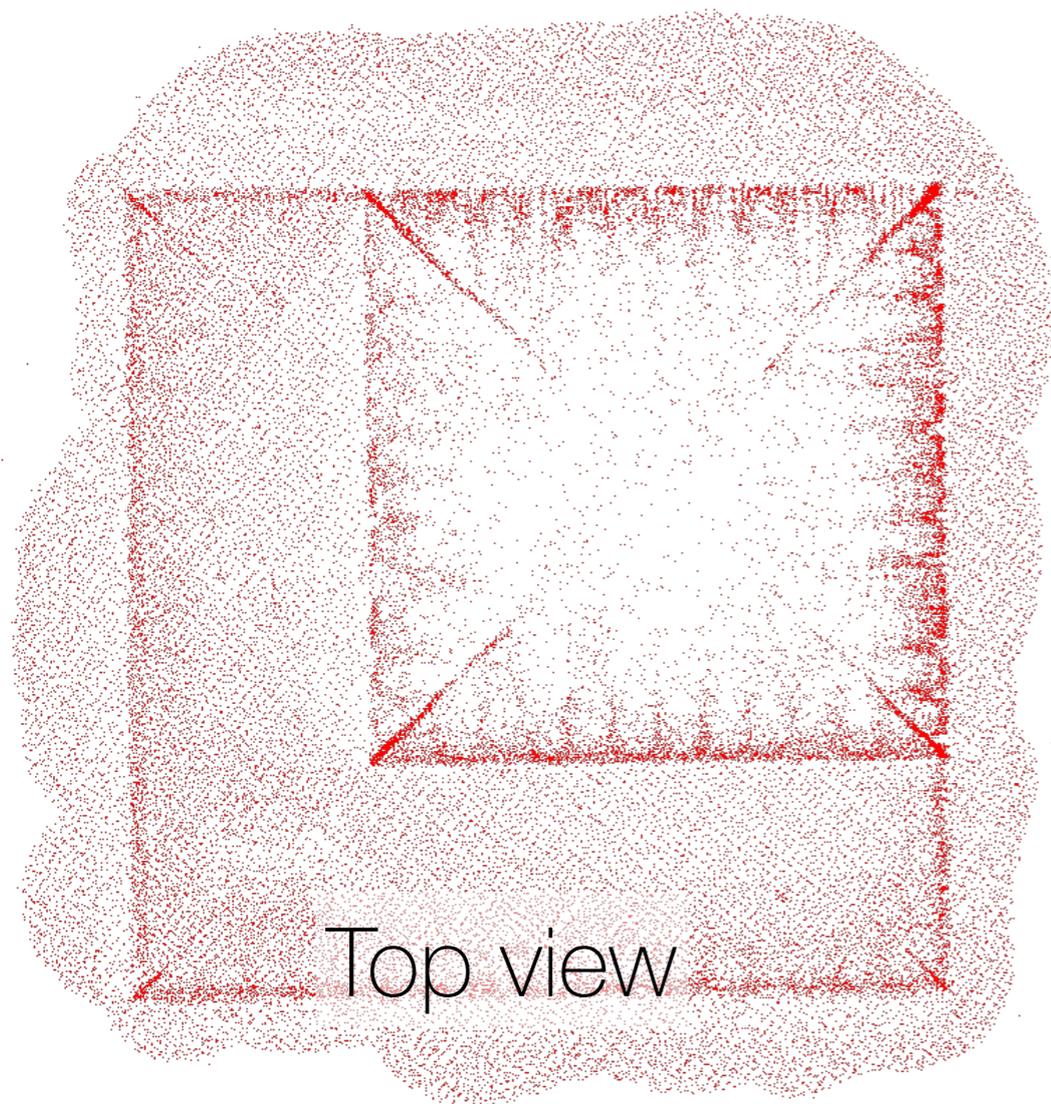
Rotterdam 2012

(30 pt/m²)



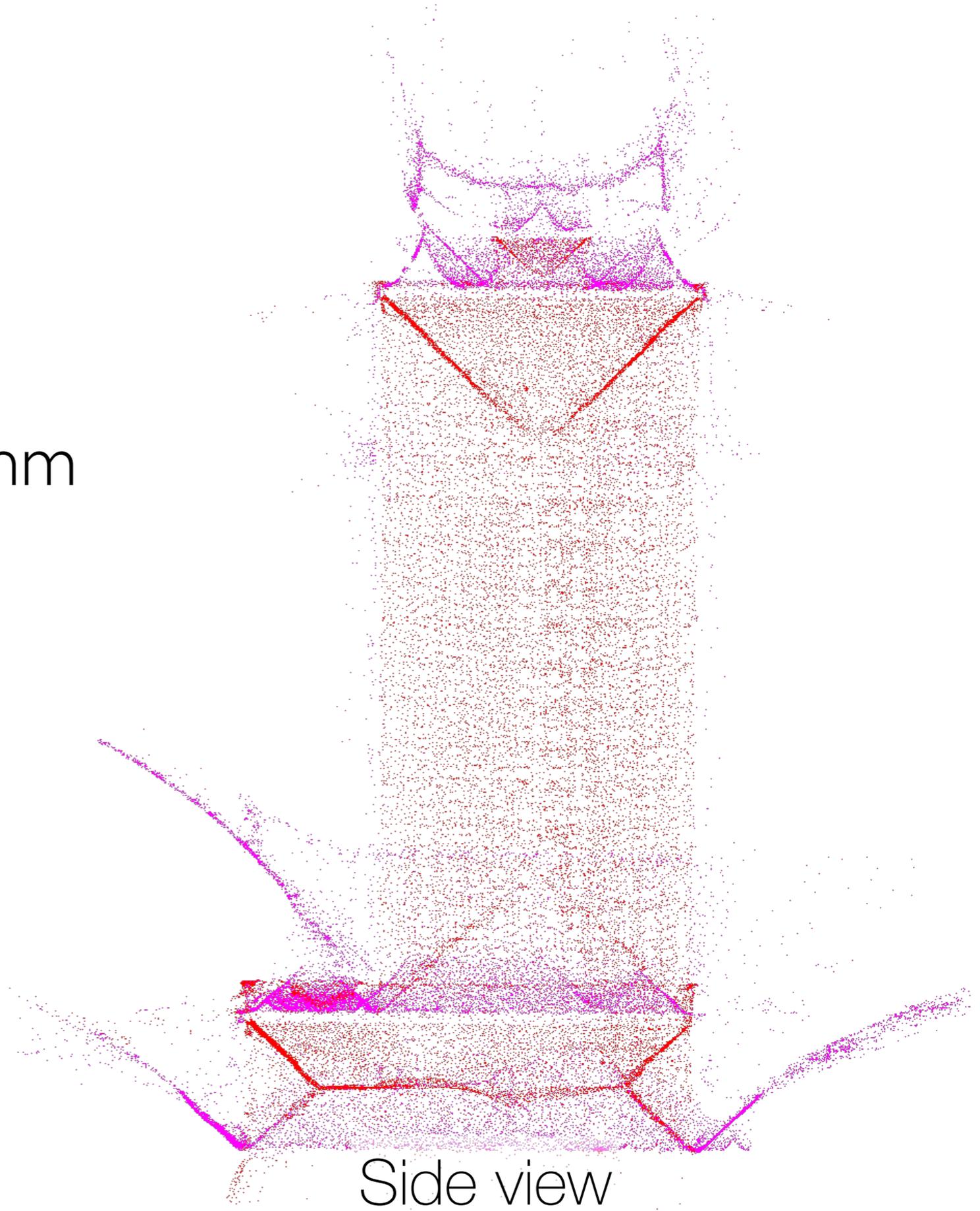
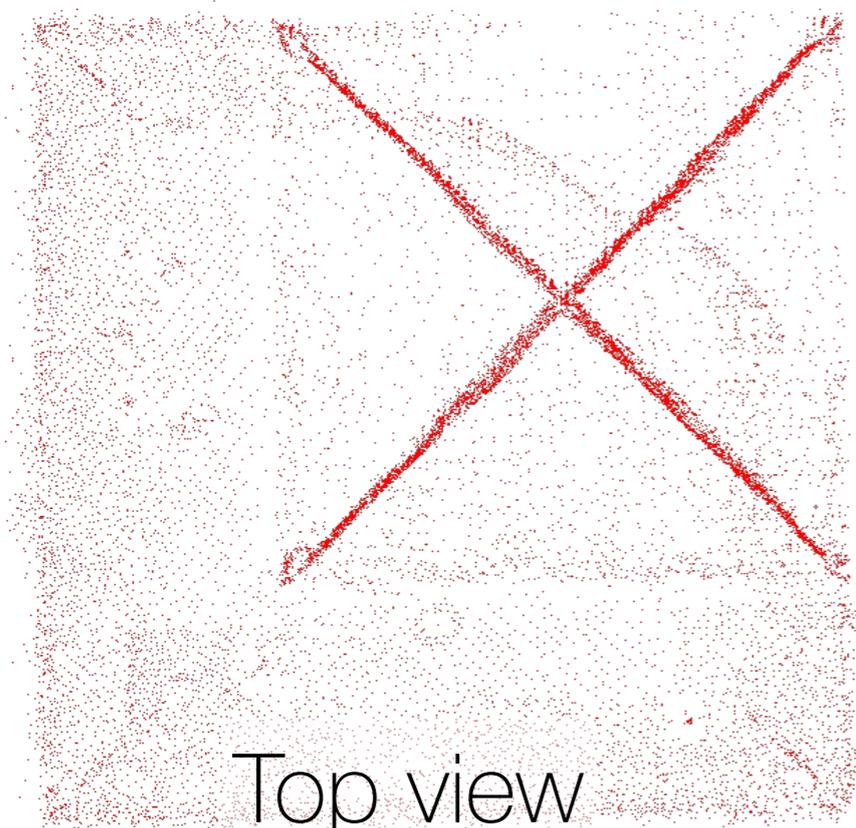
Results

unmodified
shrinking ball algorithm

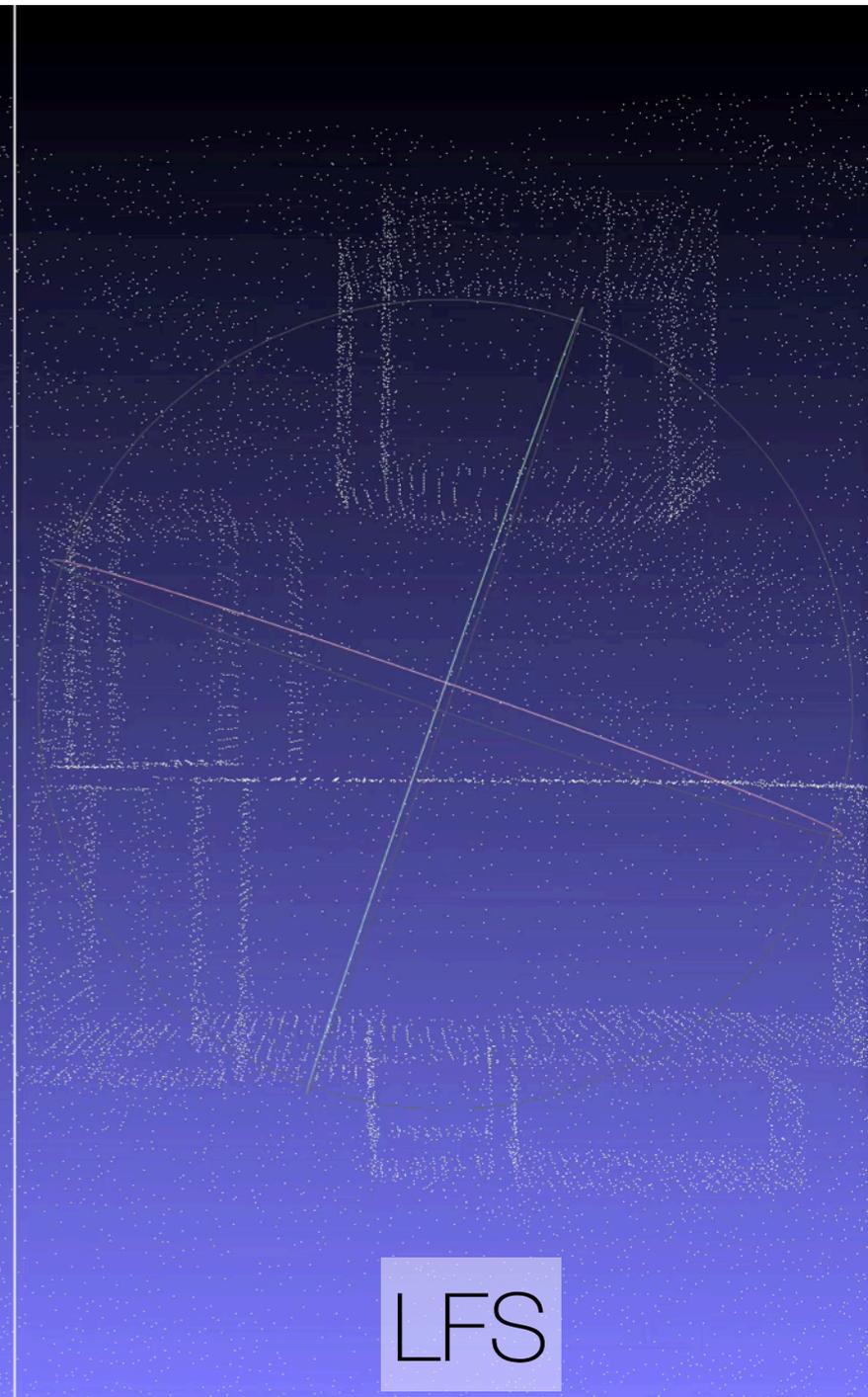
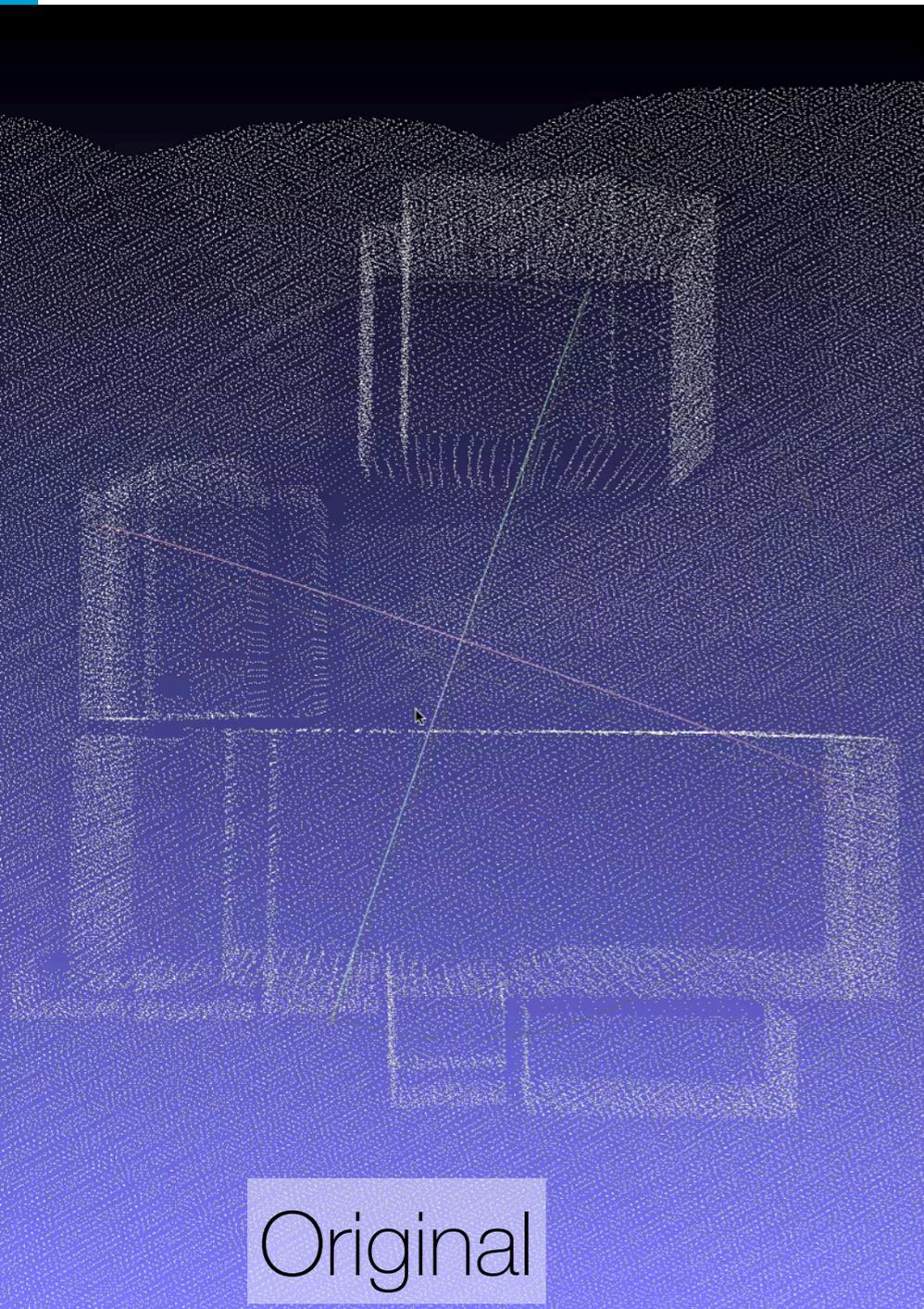


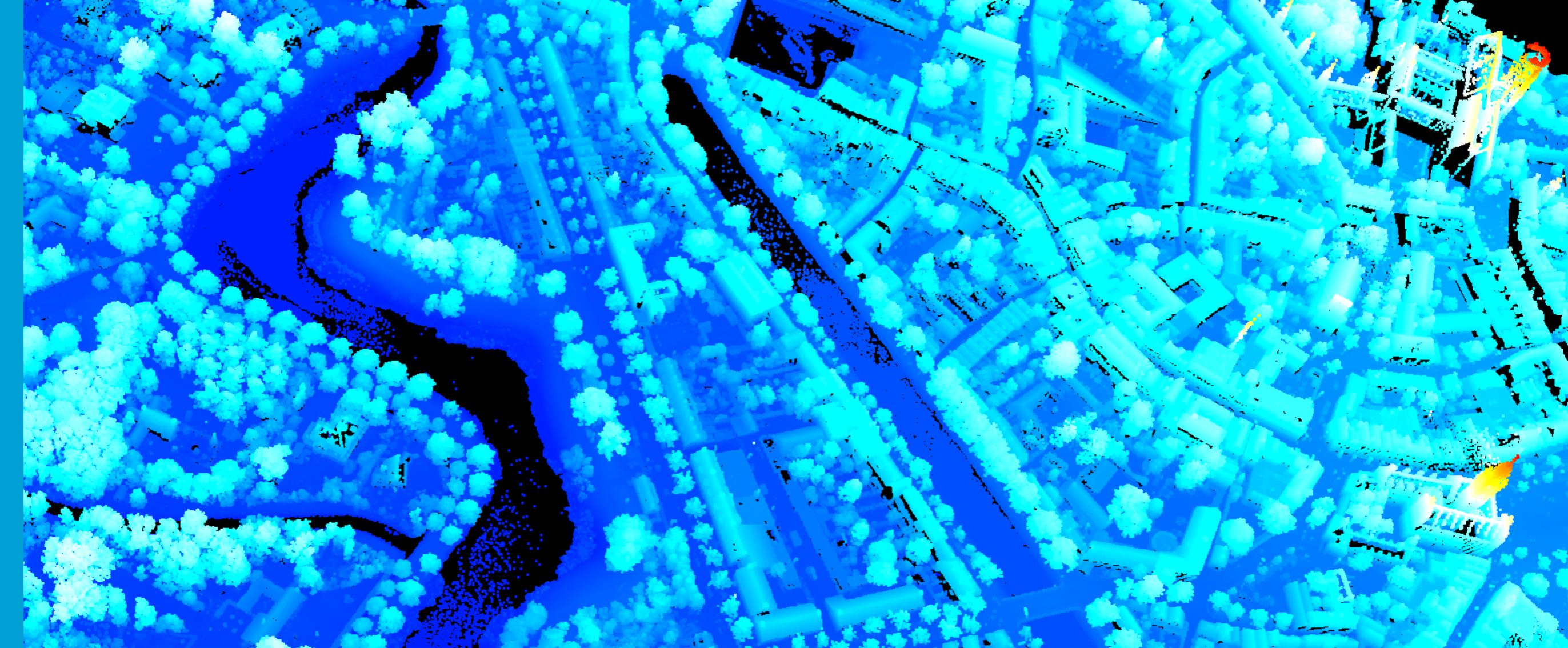
Results

modified
shrinking ball algorithm

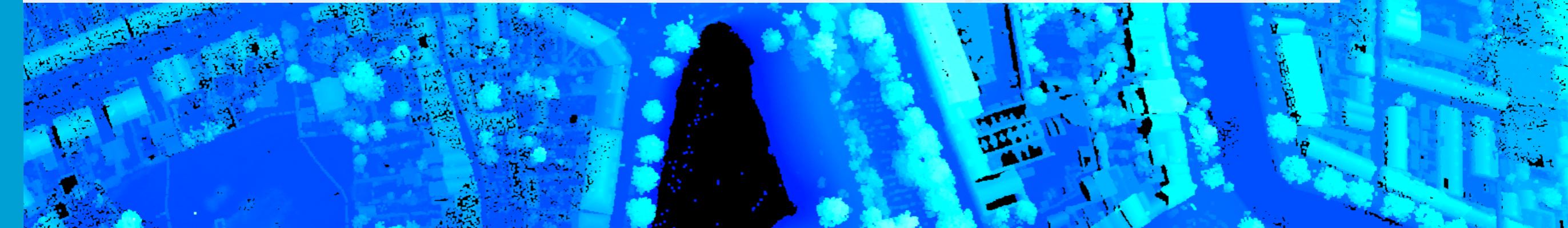


Simplification to $\sim 10\%$





Thank you



References

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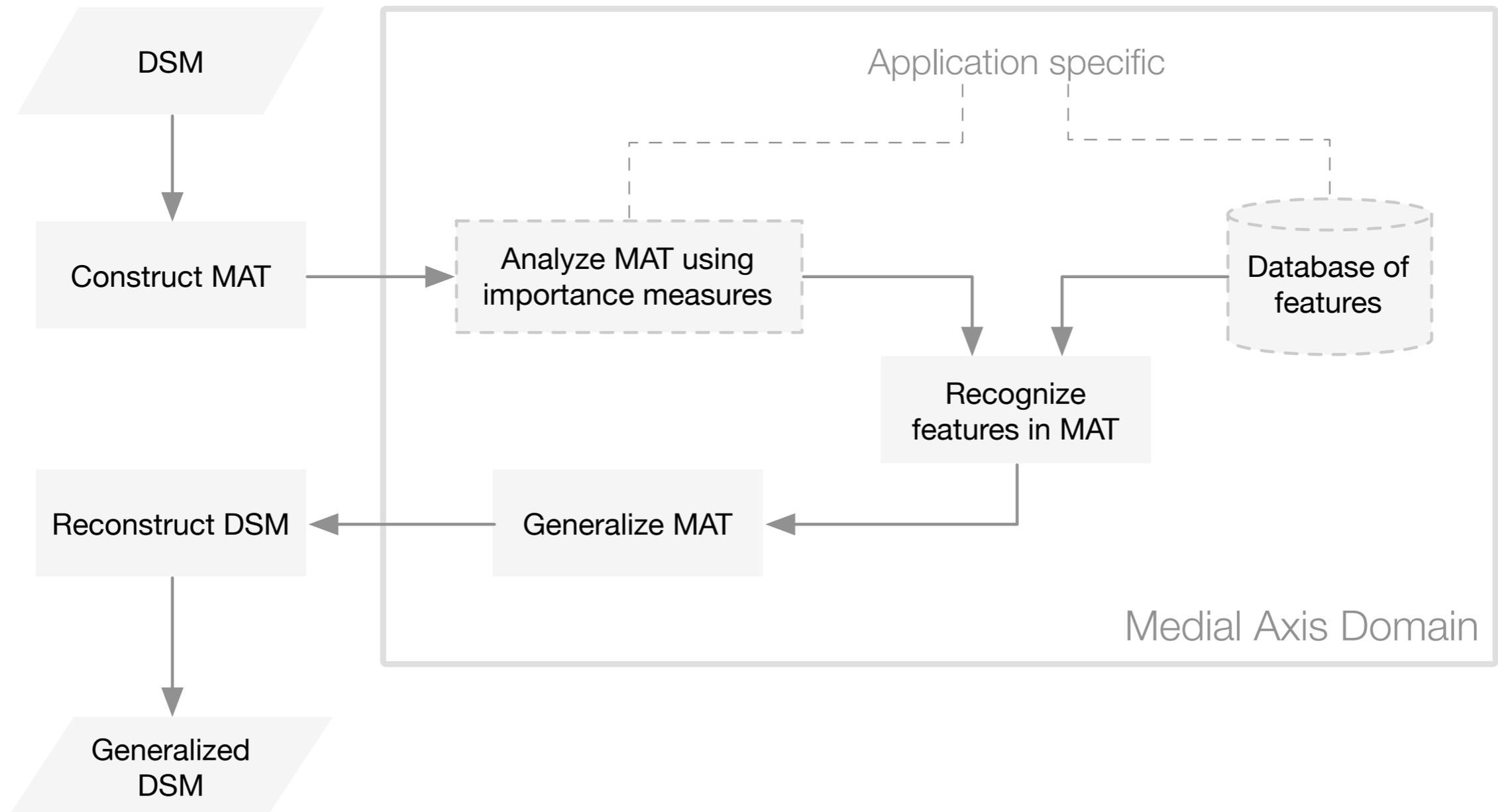
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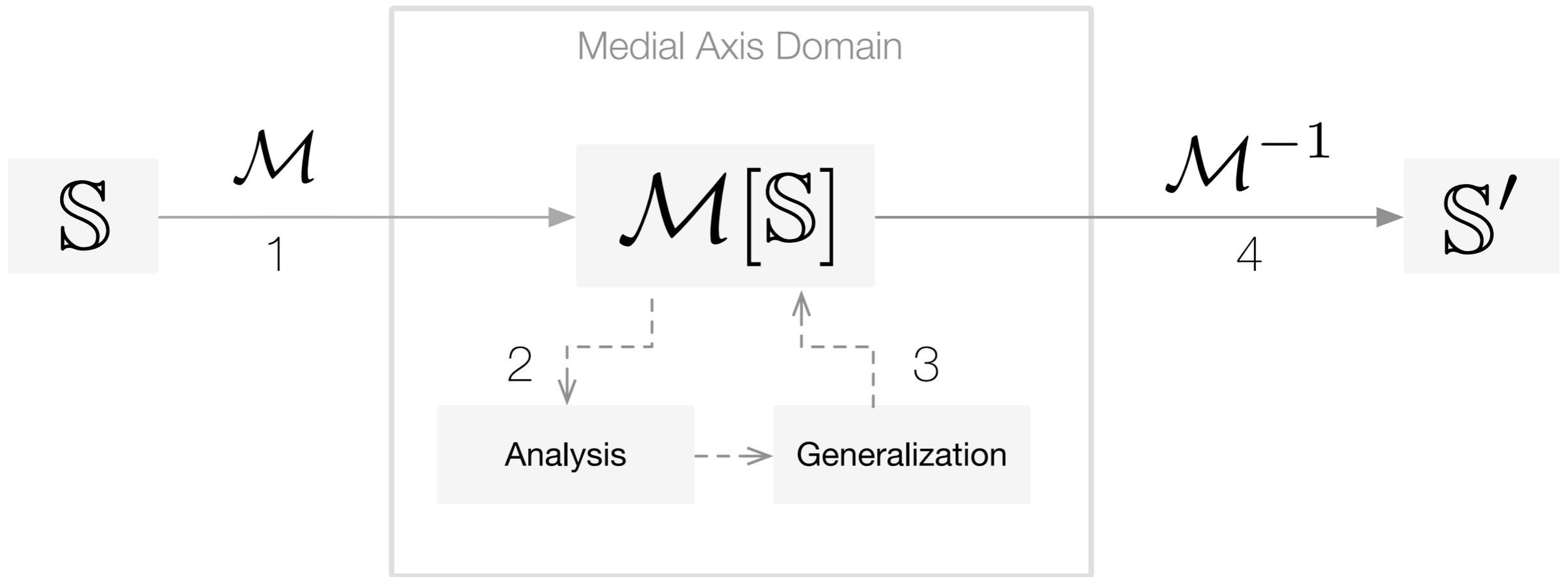
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Workflow





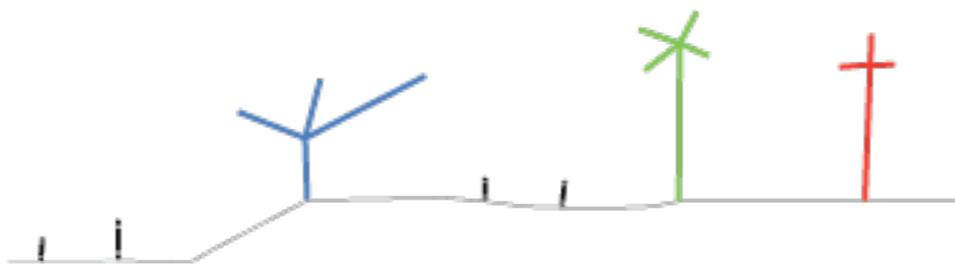
1



3



2



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