Qualitative Comparison of Shape Matching Methods

by Zane Smith

Methods Compared

1. “Bending Invariant Signatures” from Elad and Kimmel [1]

   combined with

   “Shape Distributions” from Osada, Funkhouser, Chazelle, Dobkin [2]

2. Matching Shape Contexts with Earth Mover’s Distance

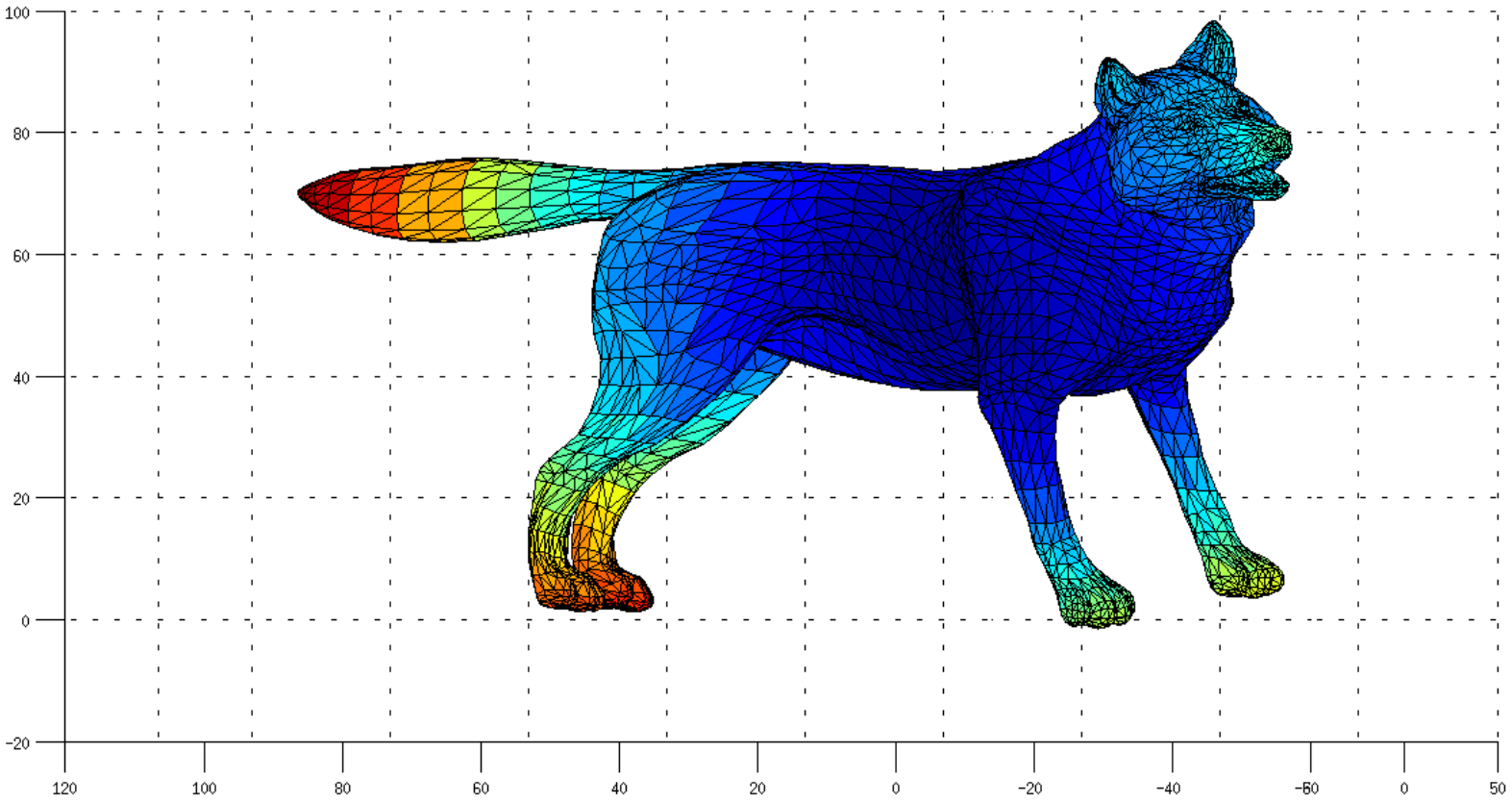
Data set used and Geodesic Distance

Data Set

- 148 shapes in 12 groups
- Triangle Mesh

Geodesic Calculation

- Both methods need Geodesic Distance
- Dijkstra’s Algorithm on mesh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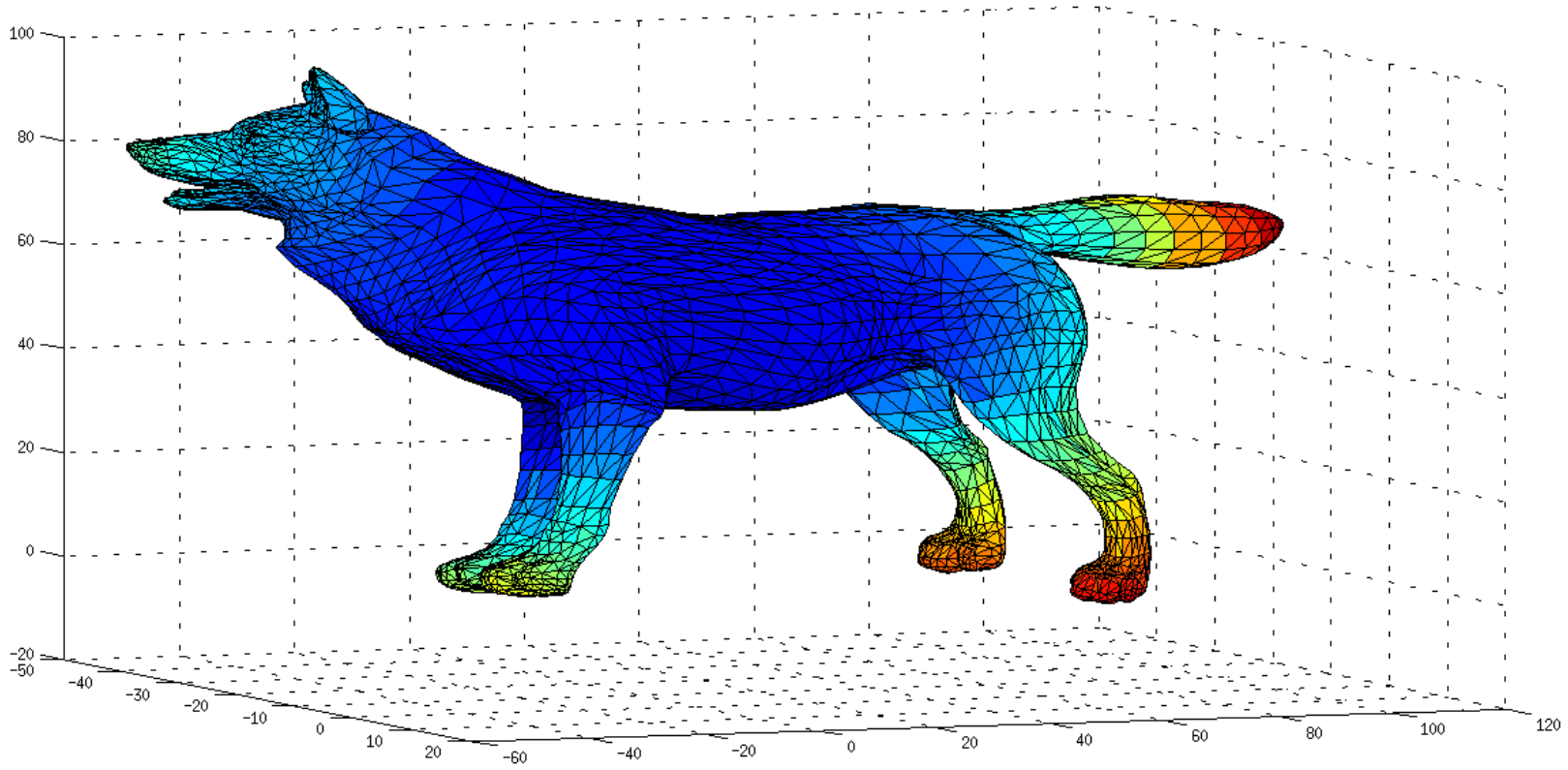
Invariant Signature and the D2 Distribution

- Apply Classical MDS to Geodesic Distance Matrix
- Create shape distribution function from D2 shape function in Osada et. al.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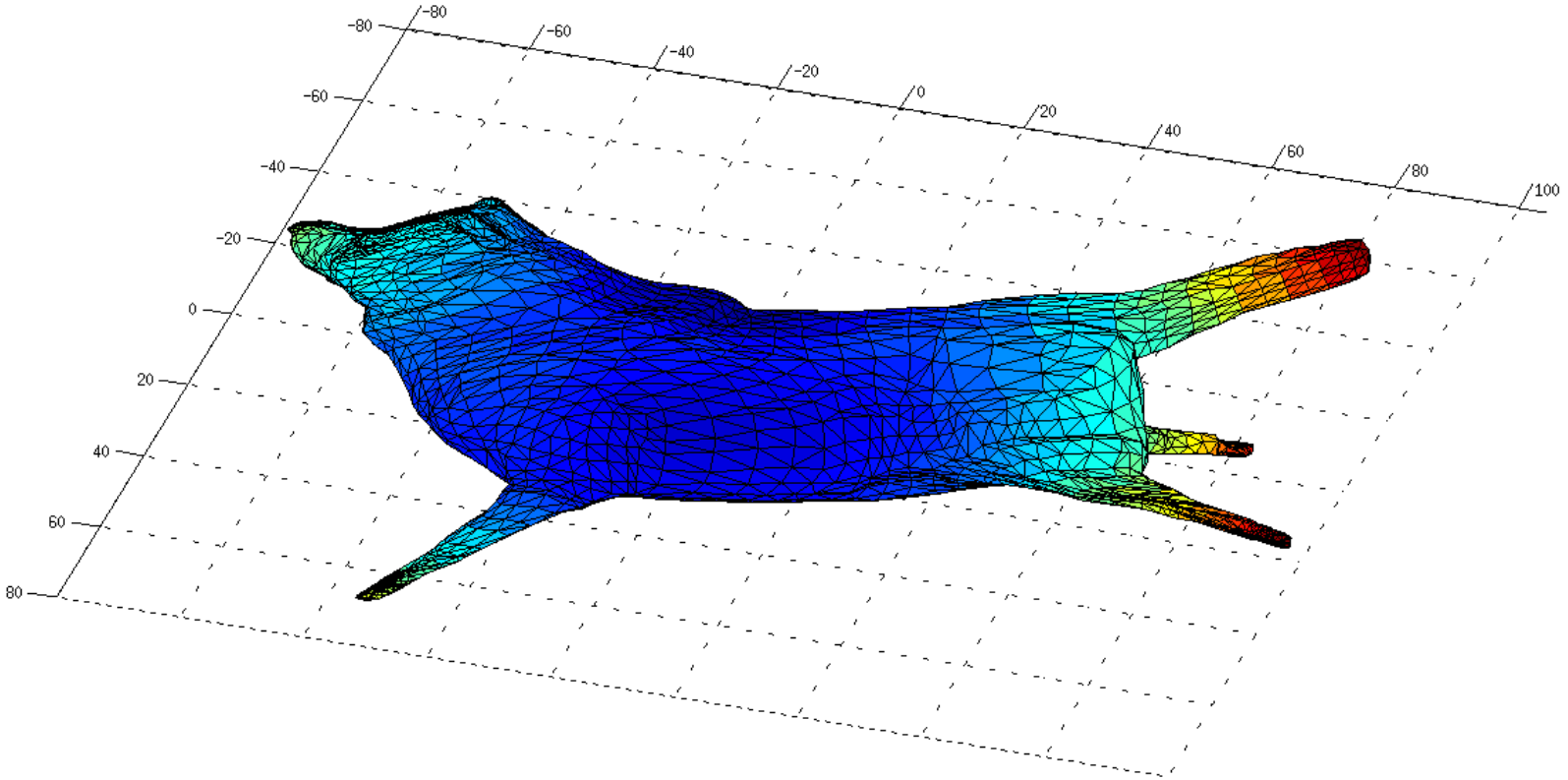
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Shape Context

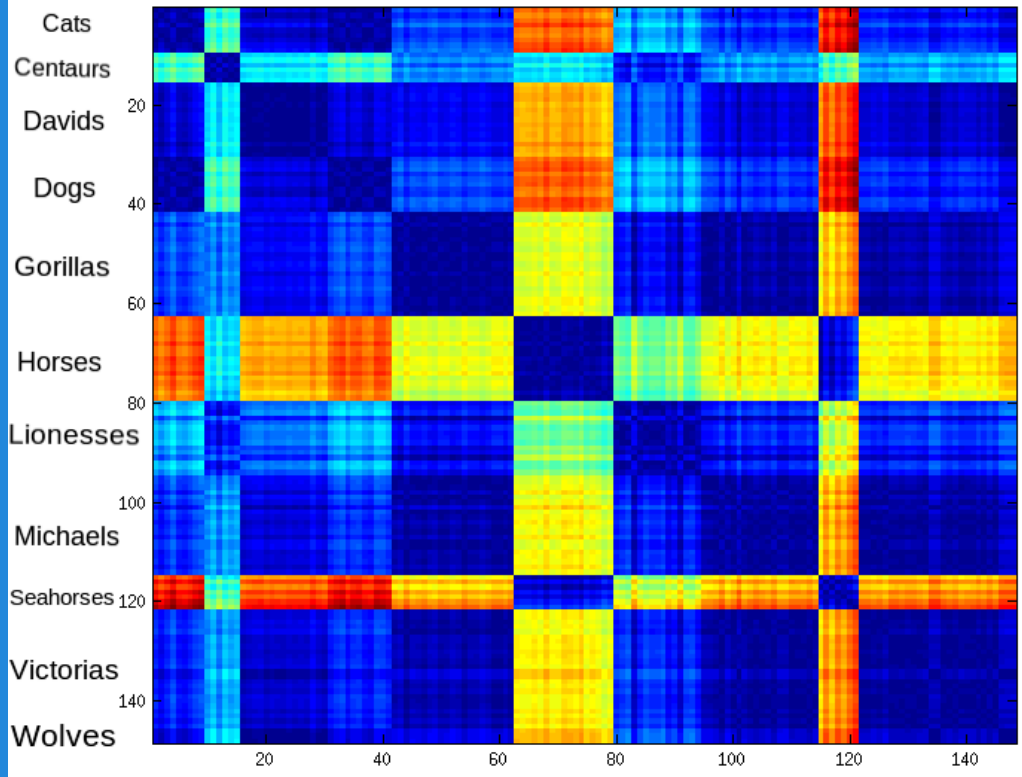
- Each point defines a probability density function of distances from itself to every other point
- Use Earth Mover's Distance as distance between each local distribution
- Use EMD again to find distance between two shapes' global distribution

Representing Data

- Block Matrix

- MDS

Distance Matrix



MDS

- Scale distance matrix to 2D Euclidean space point set

- Display said set in a Scatter Plot

References

[1] “On Bending Invariant Surfaces” by Elad and Kimmel

[2] “Shape Distributions” by Osada, Funkhouser, Chazelle, Dobkin