Fundamentals of Computer Graphics

Shape visualization II

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SAPIENZA
UNIVERSITÀ DI ROMA

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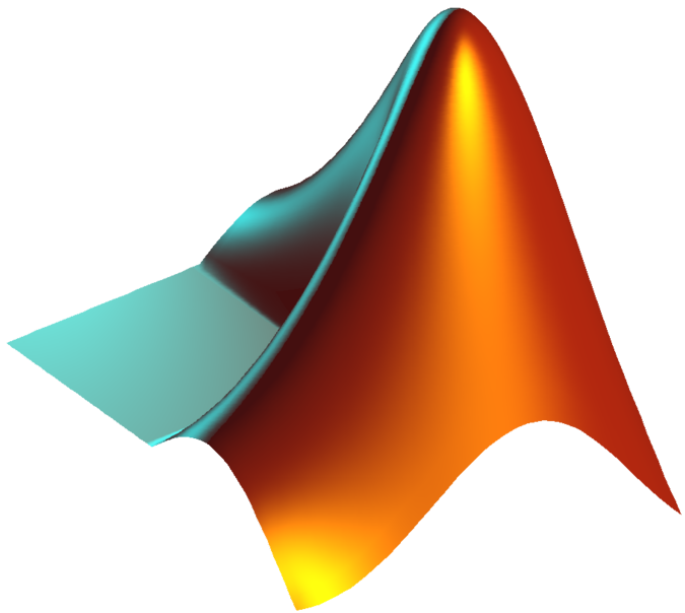
Exercises

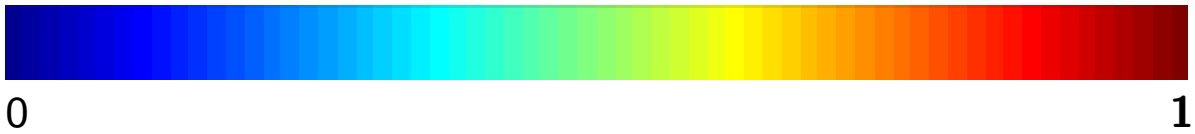
- Voronoi basis
- ICP



Colormap limits

Sometimes it is useful to modify the colormap to get saturation effects

We can increase the maximum value represented in the colormap:



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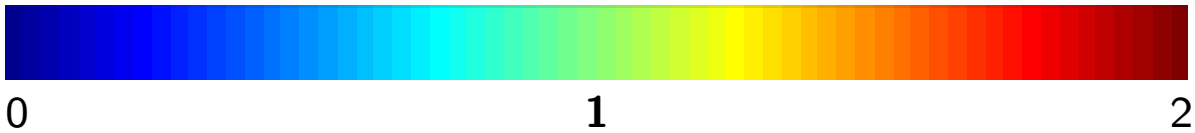

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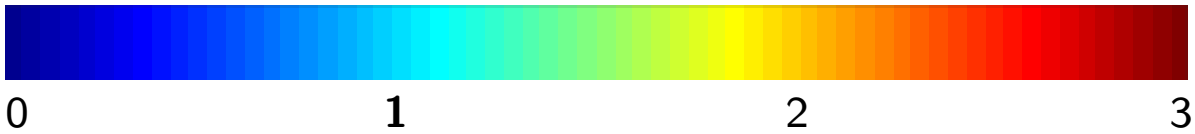

The colors remain fixed, but the mapping from values to colors changes

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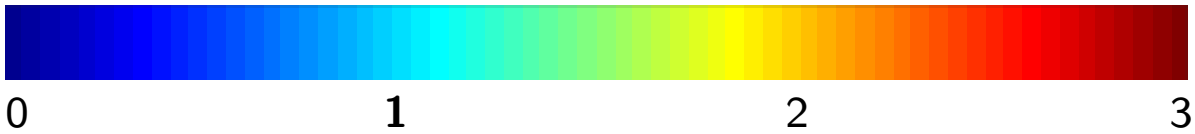

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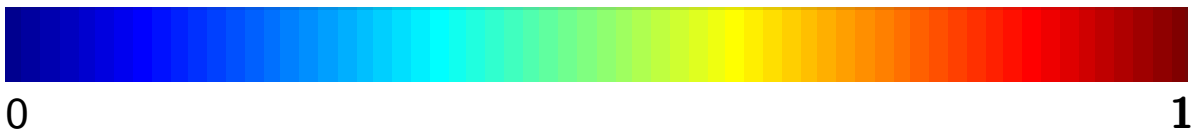

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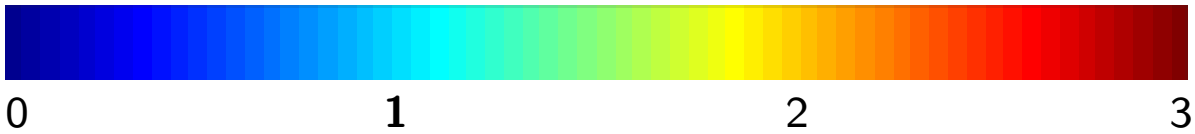

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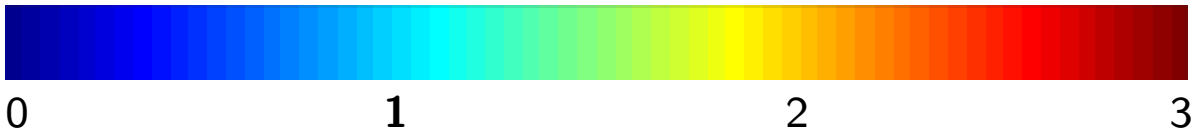

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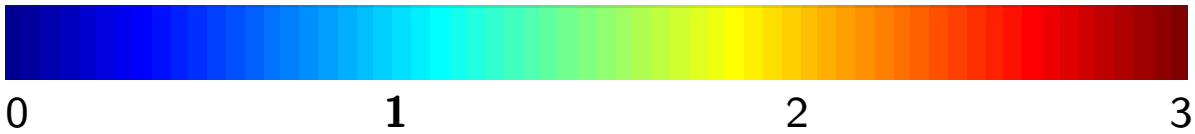
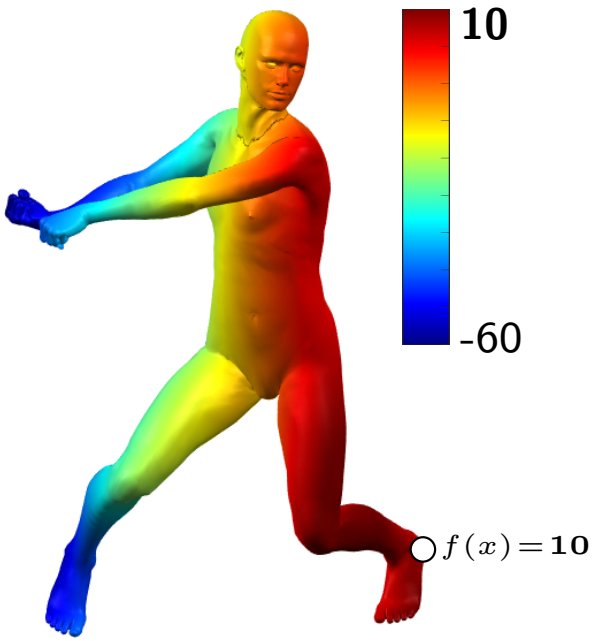


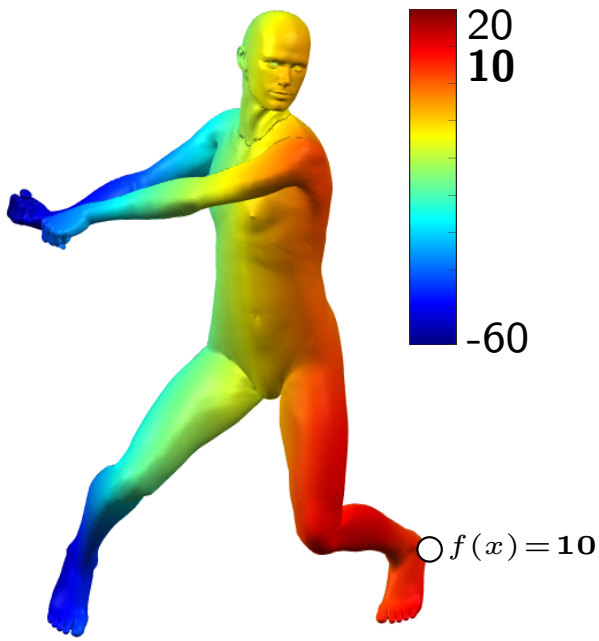
The colors remain fixed, but the mapping from values to colors changes

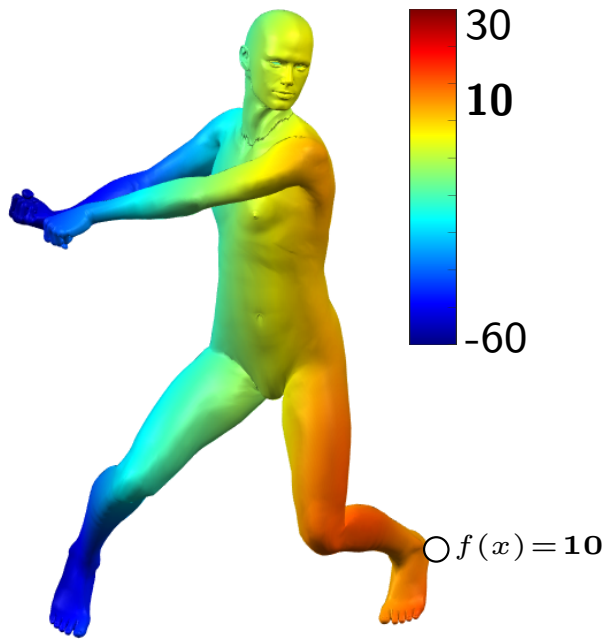
Similarly, we can decrease the max limit:

- Values $\geq$ the max limit are mapped to the max
- Values $\leq$ the min limit are mapped to the min
- Values between min and max are linearly interpolated

Increasing the max limit







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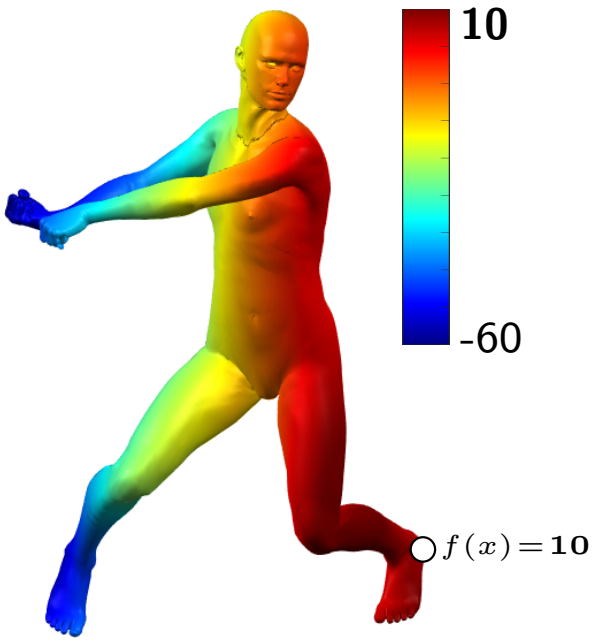

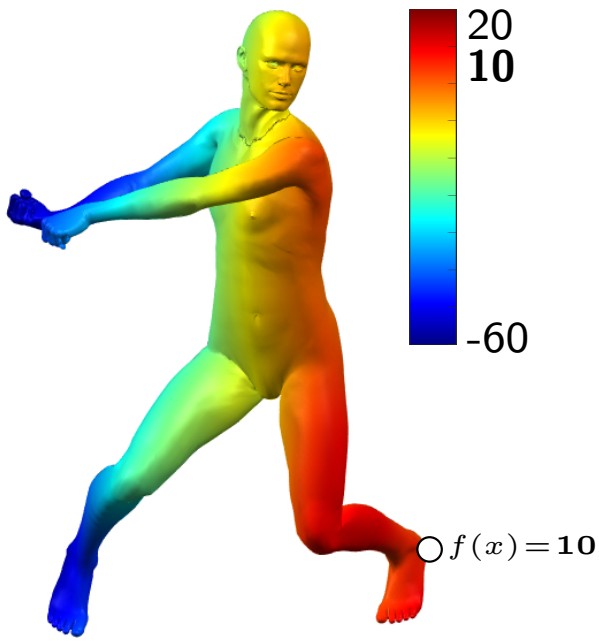

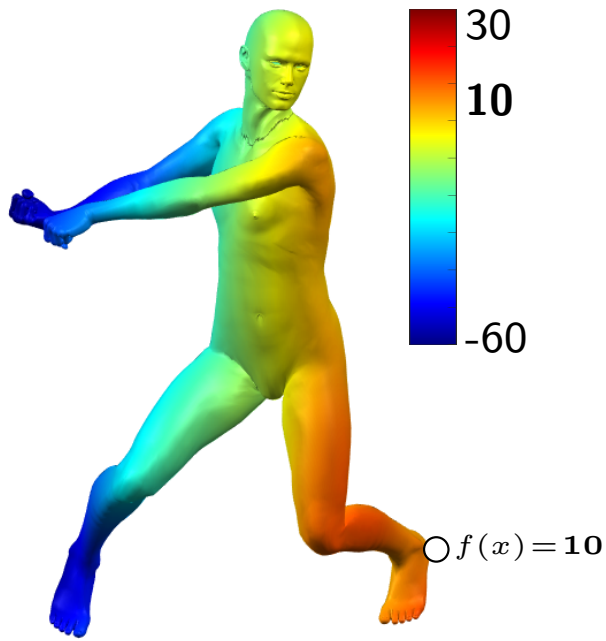

For smooth colormaps, the effect is to "flatten out" the colors and make variations less evident

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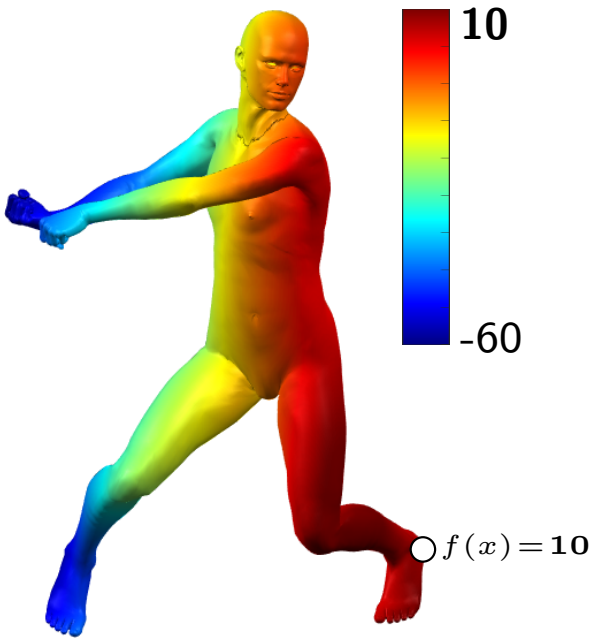
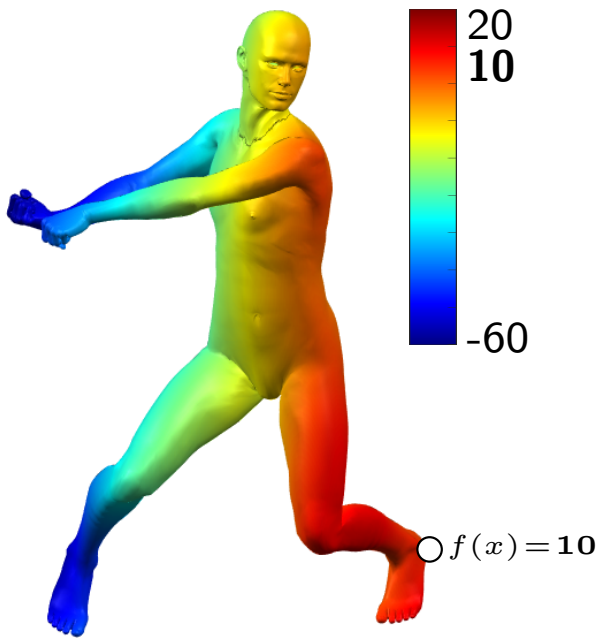
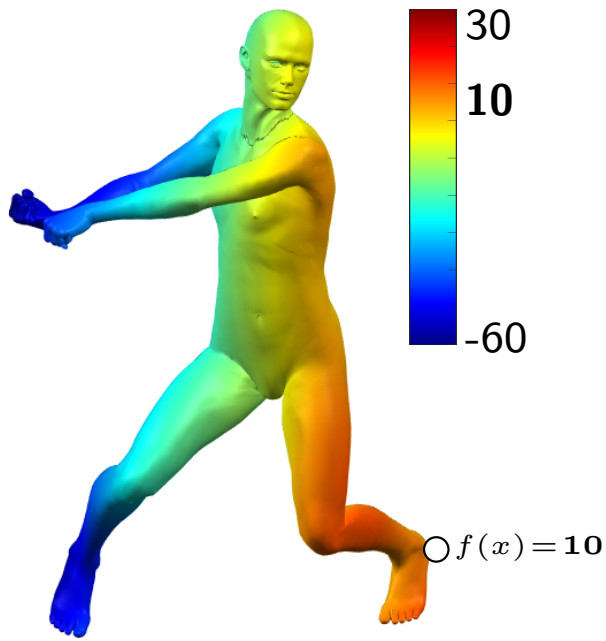


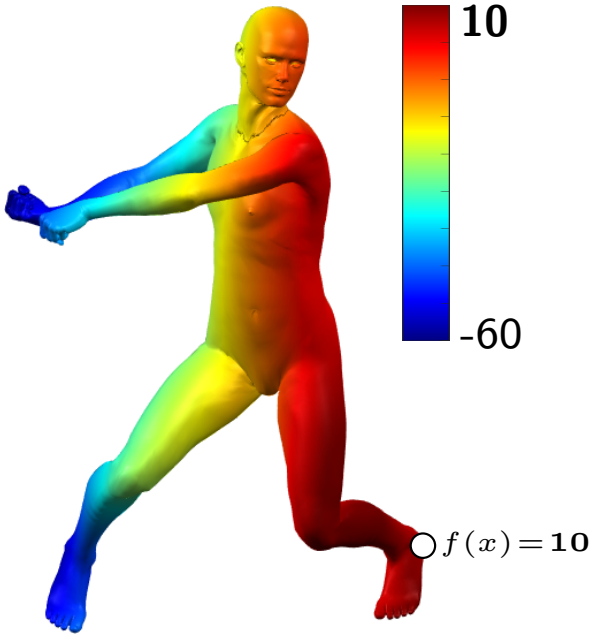


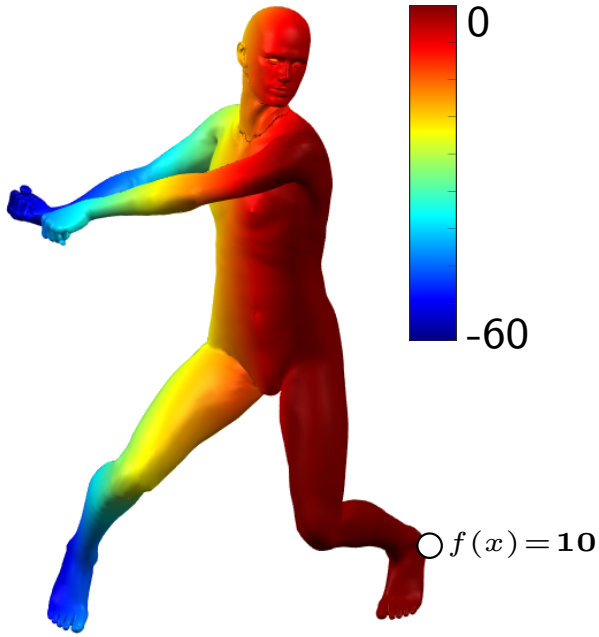


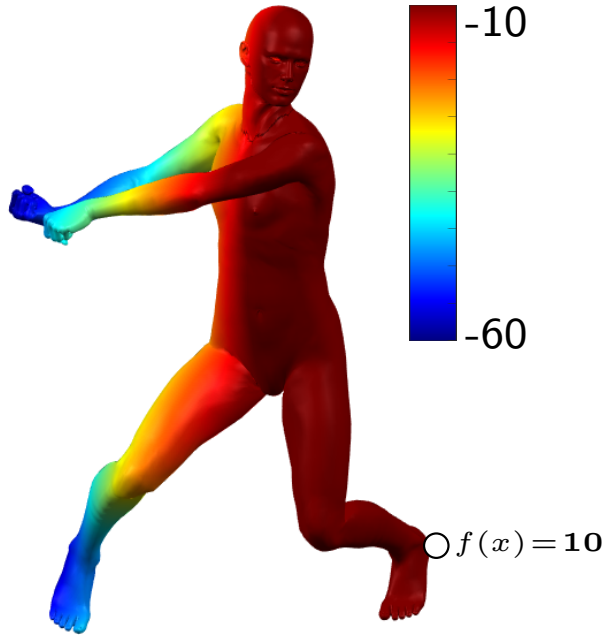
For smooth colormaps, the effect is to "flatten out" the colors and make variations less evident

In Matlab: caxis ([min max]) sets the colormap limits and does all the saturation and interpolation for us

Decreasing the max limit







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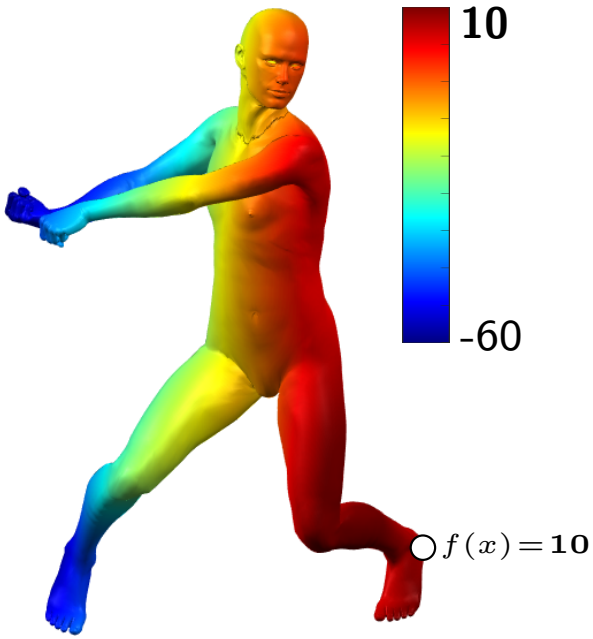
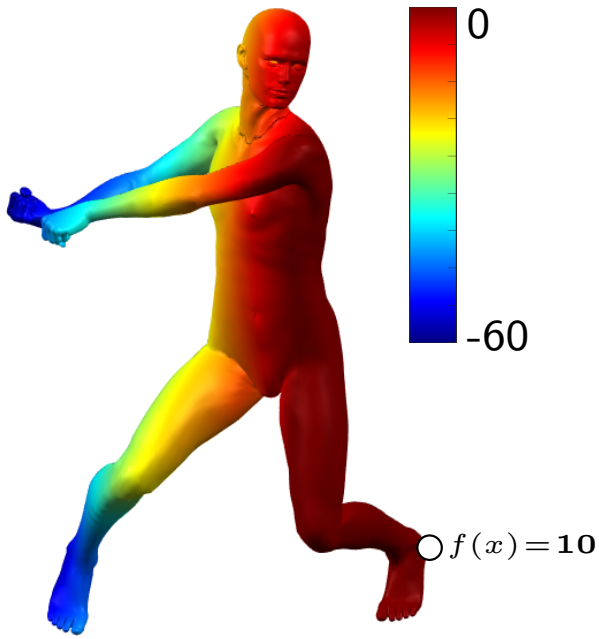
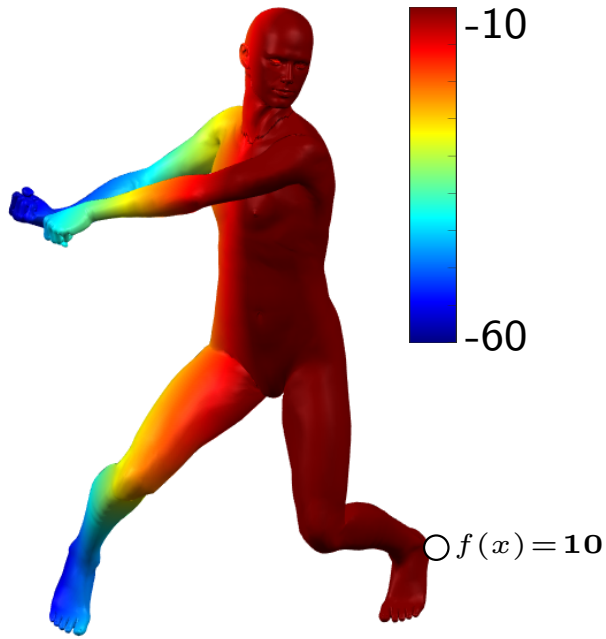


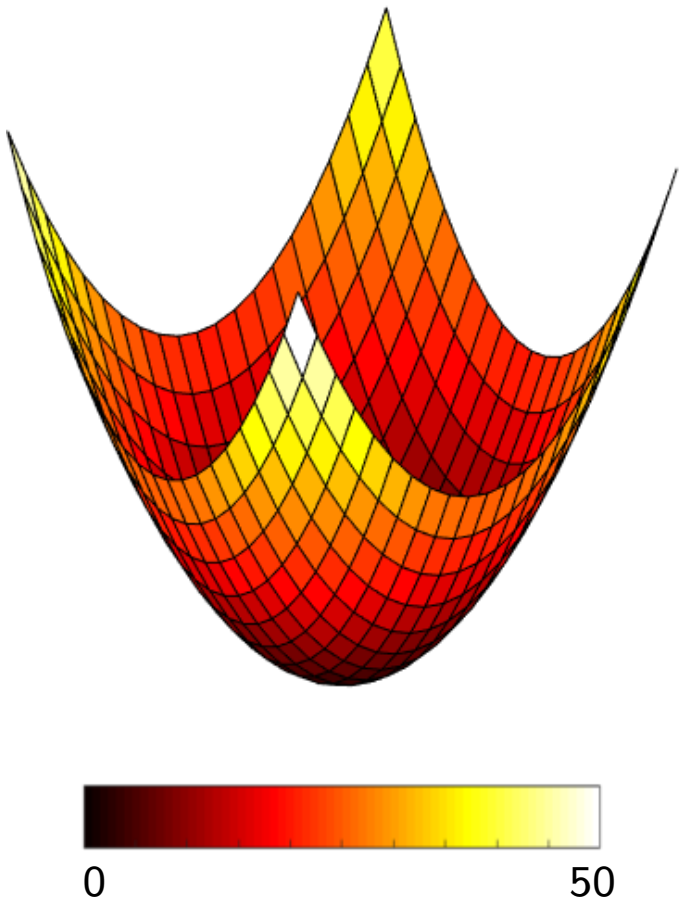


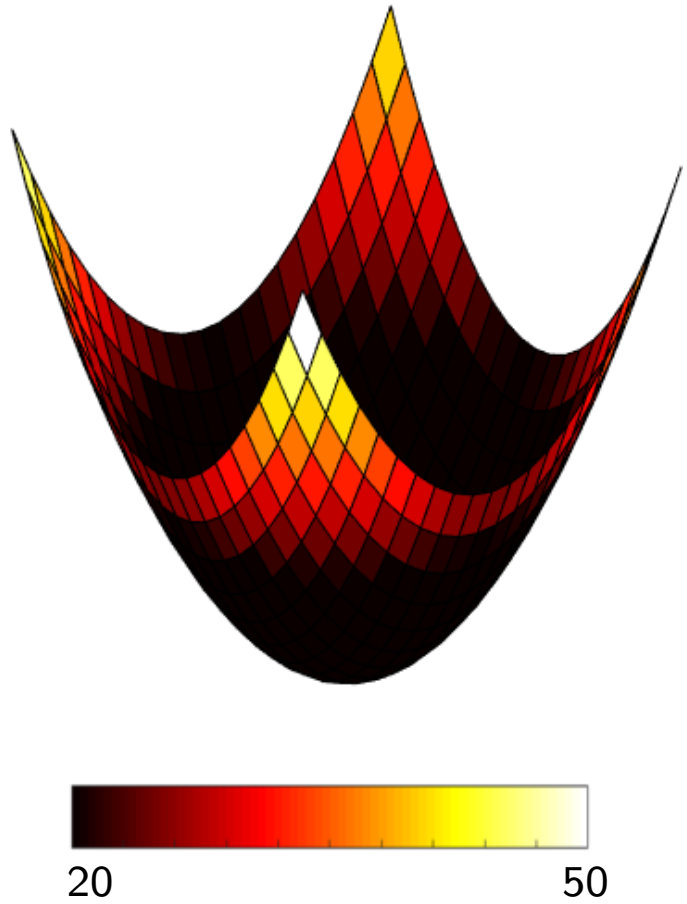


For smooth colormaps, the effect is to saturate the colors and make variations more evident

Example: Visualizing maxima

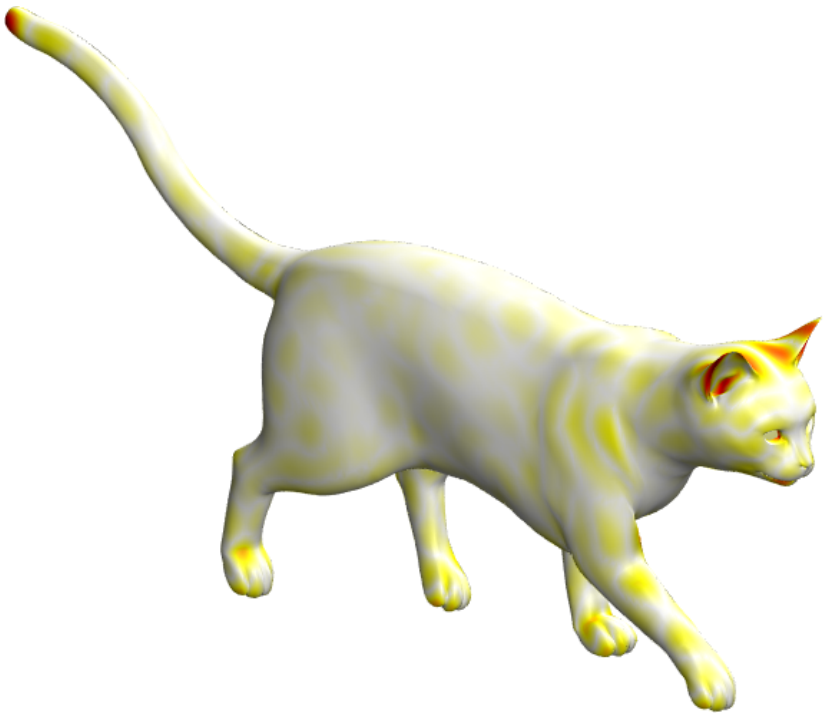
Increasing the min limit can be useful for visualizing maxima





Example: Visualizing point-wise error

Emphasize areas of large error:



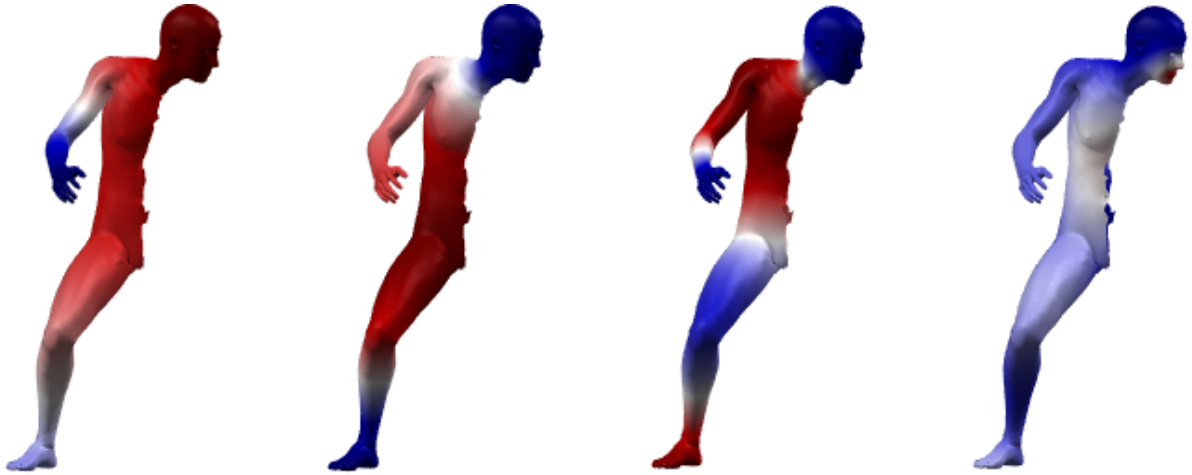
no saturation

saturate at 0.5

Example: Zero-centered functions

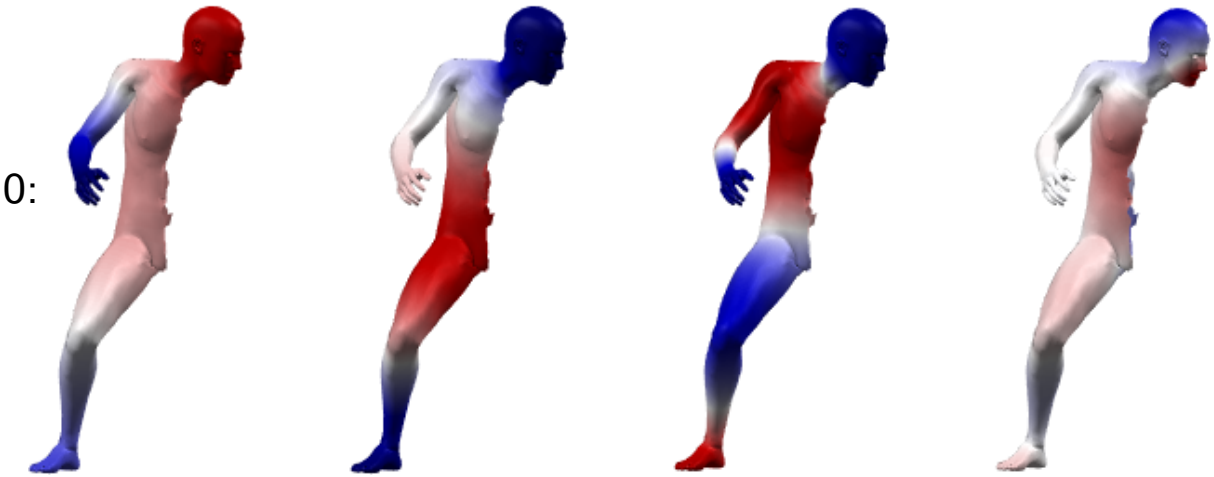
If $f :\to [-1, 1]$ but f is not surjective, it can be useful to recenter colors

not centered:



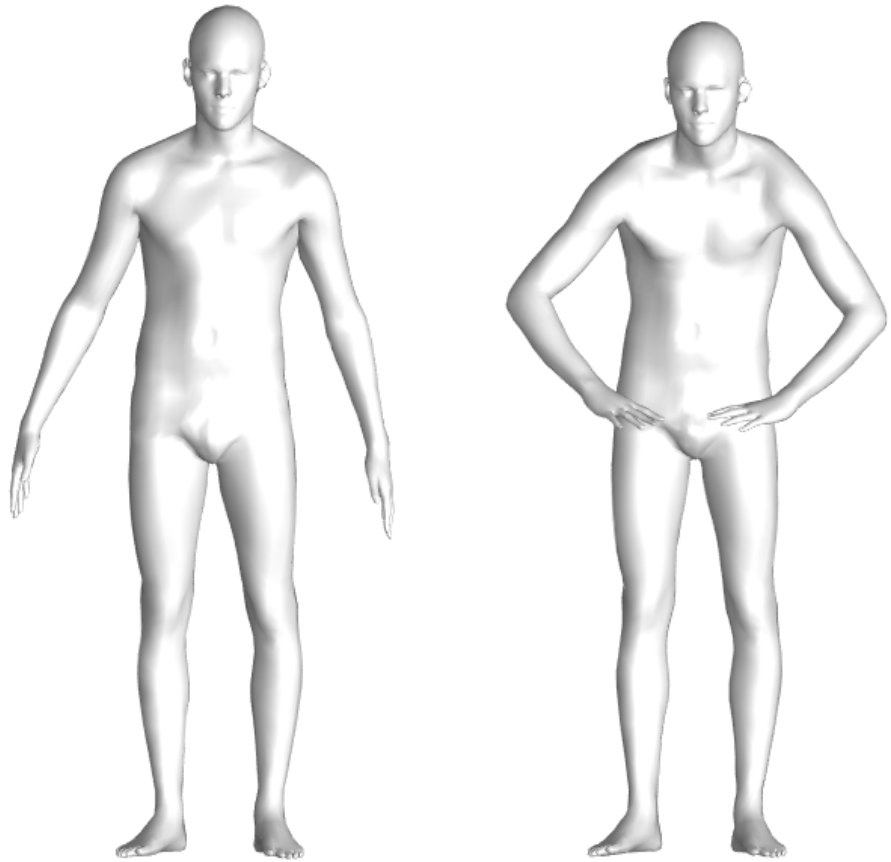
f_1 f_2 f_3 f_4

centered at 0:



Visualizing correspondence

How to visualize correspondence between shapes?



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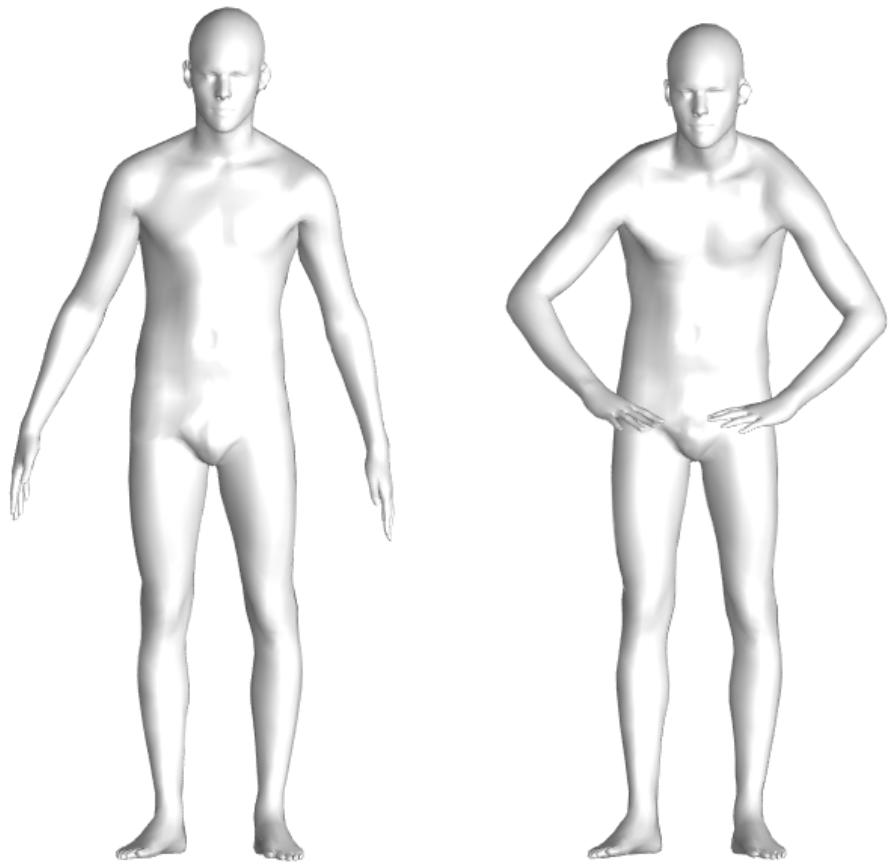
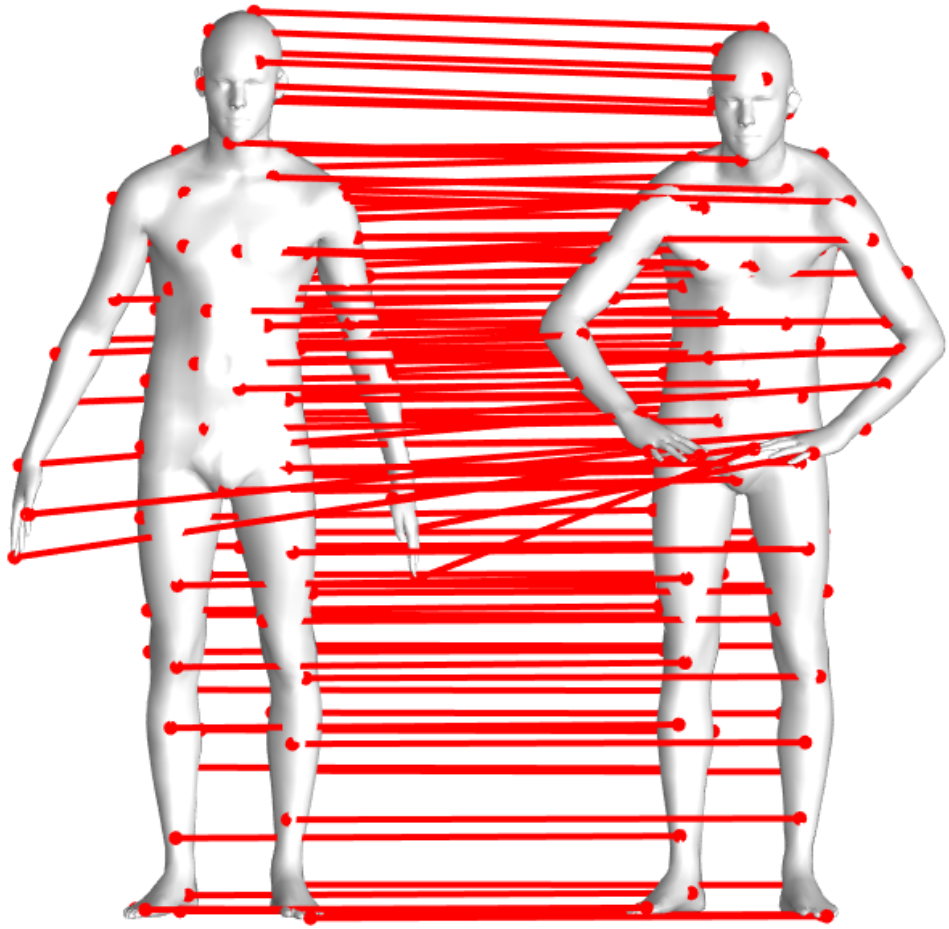


- It might be not one-to-one
- It might be not surjective (formally, not a correspondence)
- It might be sparse

Visualizing correspondence: Points and lines



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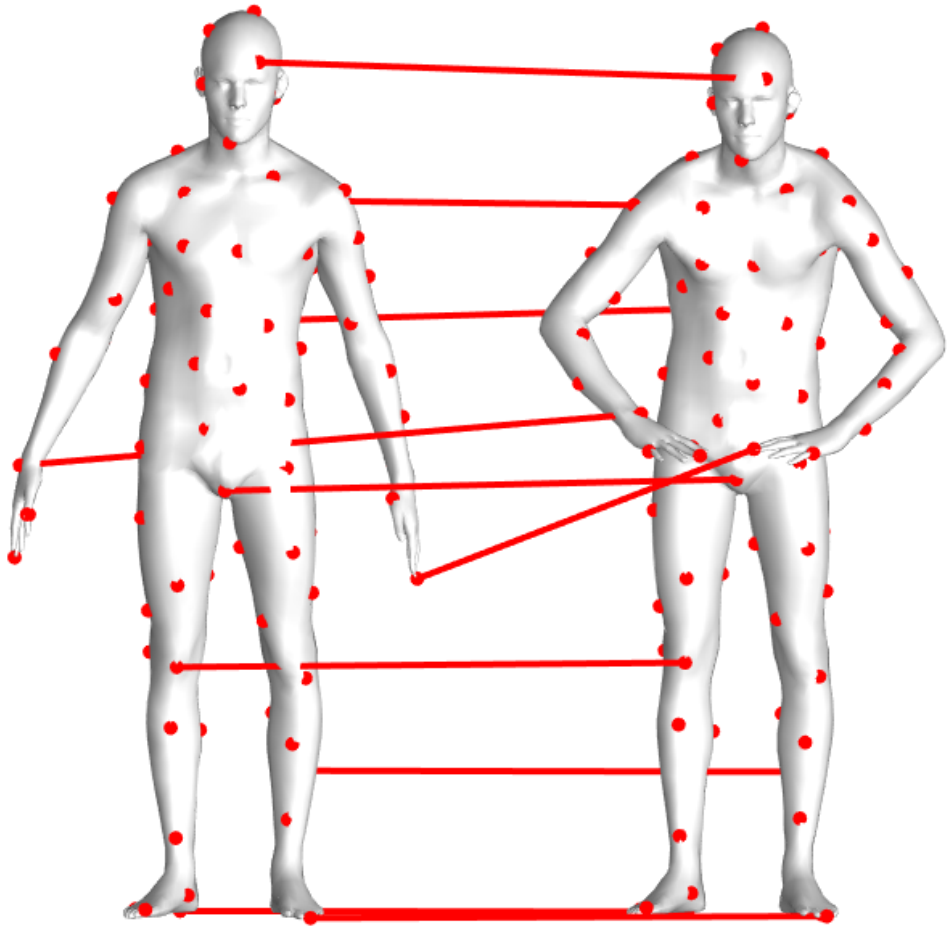
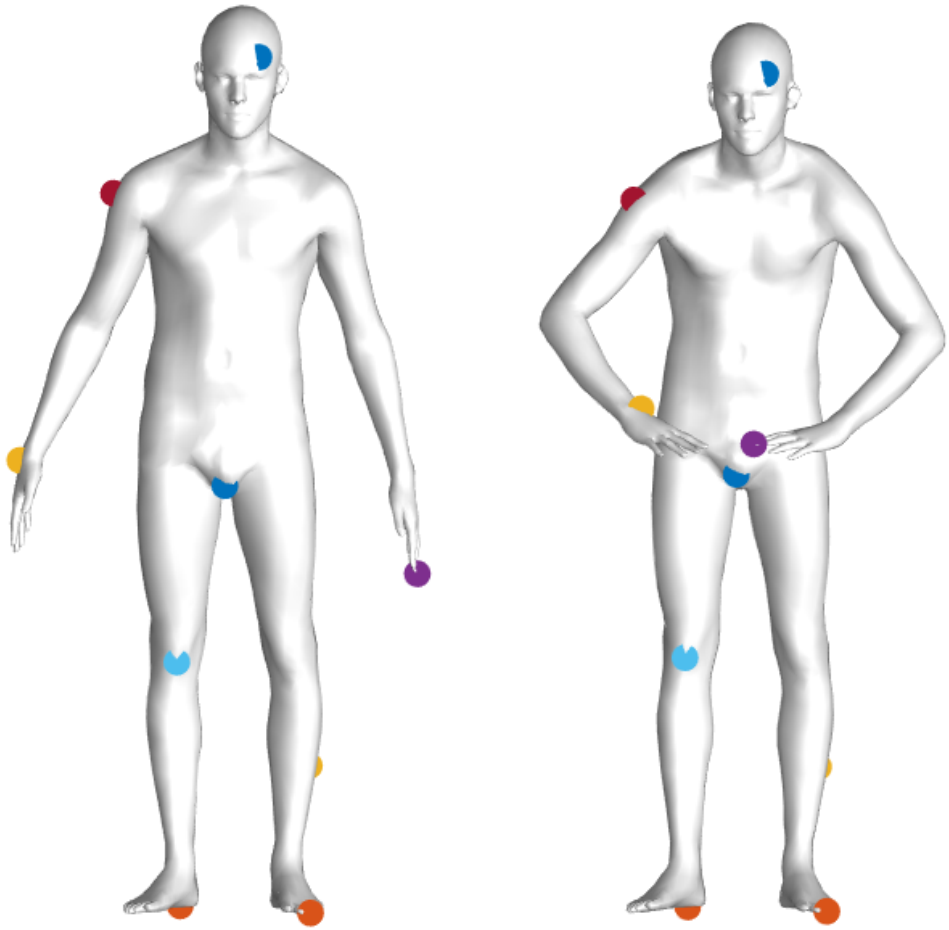


Useful for visualizing sparse matches

Visualizing correspondence: Points and colors



Useful for visualizing sparse matches (e.g., between landmarks)

Visualizing correspondence: Dense colors

Dense matches (∼all points) can be used to color the entire mesh

- Create a colormap with one color for each point ($n \times 3$ matrix)

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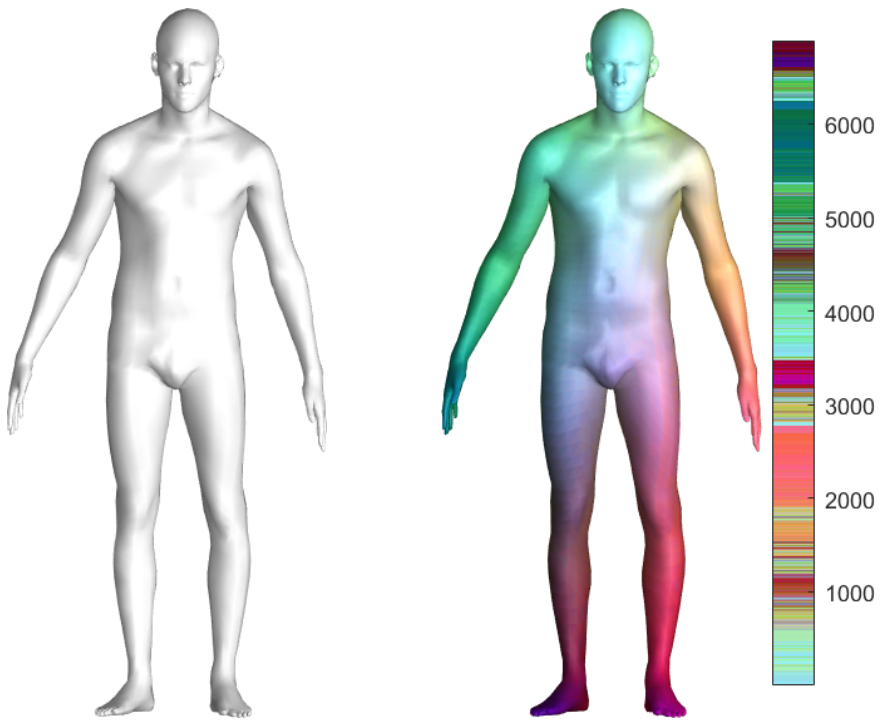
- Plot the vector $(1, 2, \ldots, n)$



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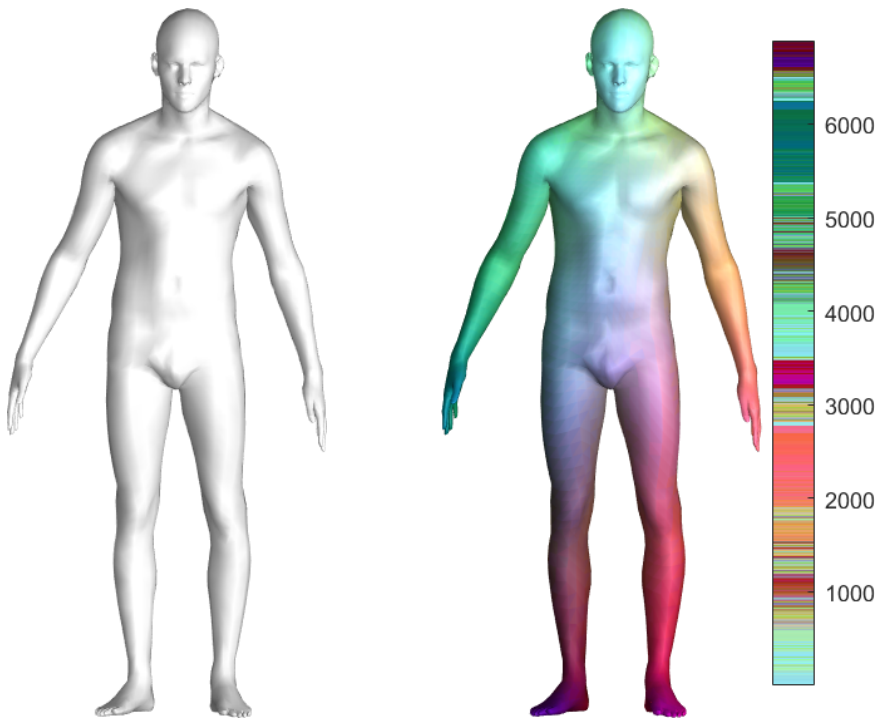
- For smooth colors: interpret x, y, z as R, G, B



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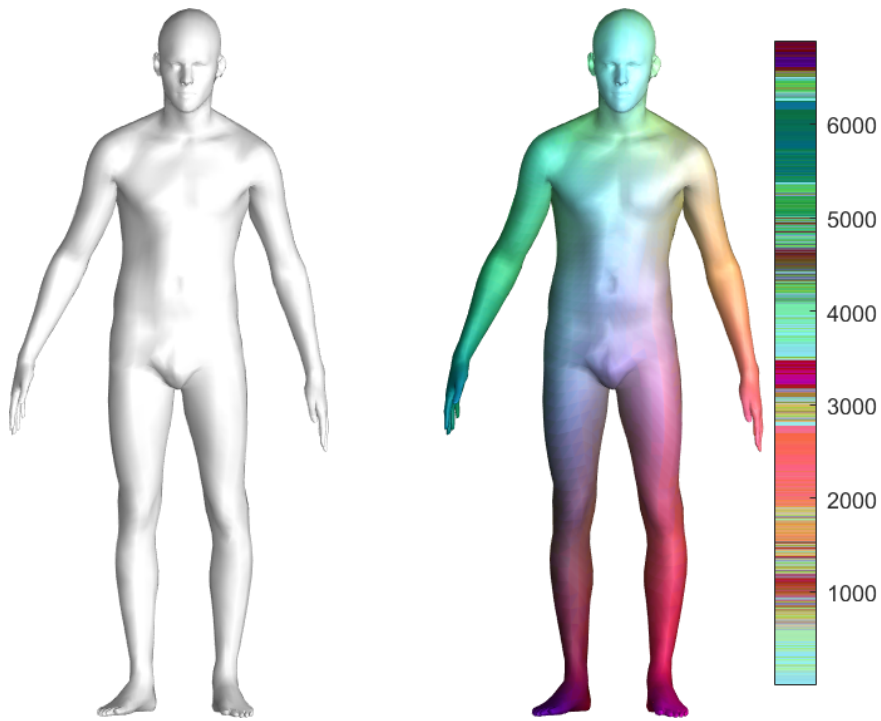
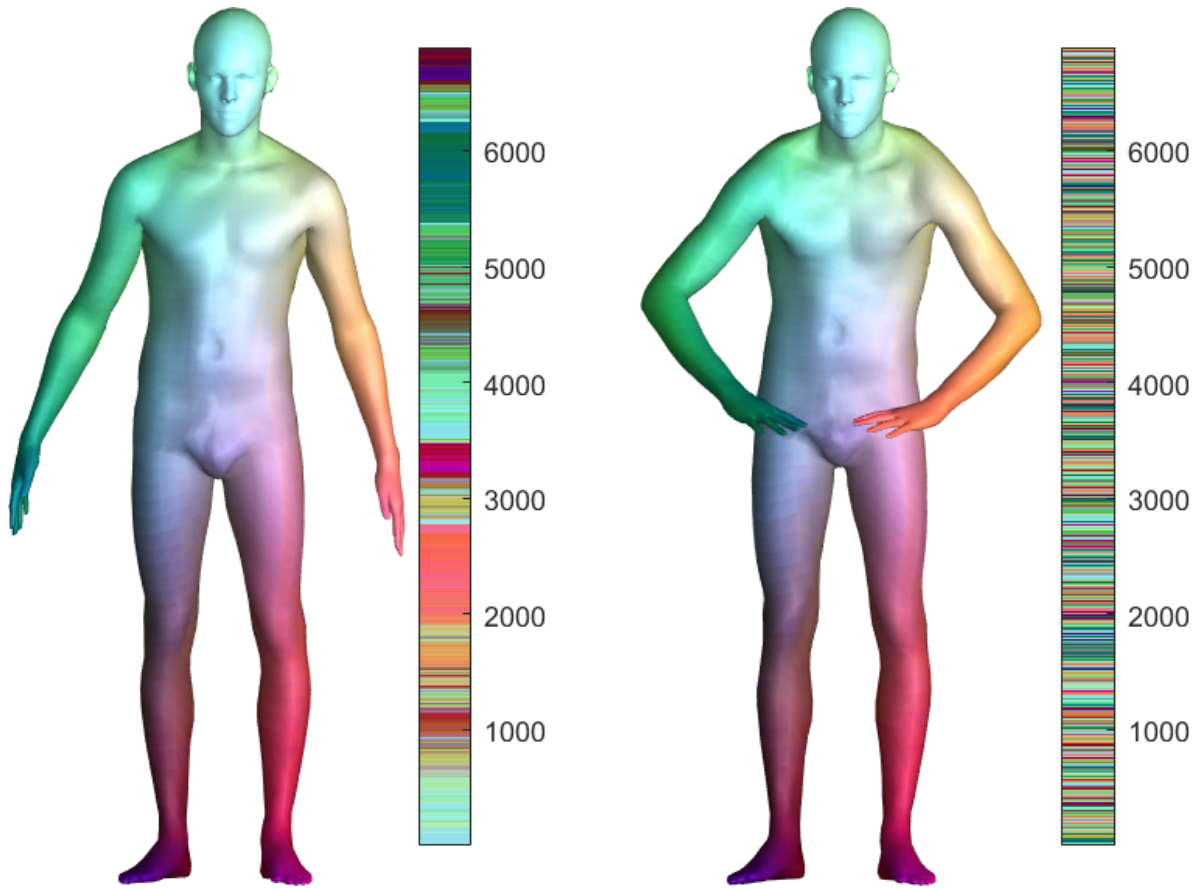


Warning: New versions of Matlab require shading flat (not interp)

Visualizing correspondence: Dense colors

Case 1: One match for each source point, surjective (one-to-one map)

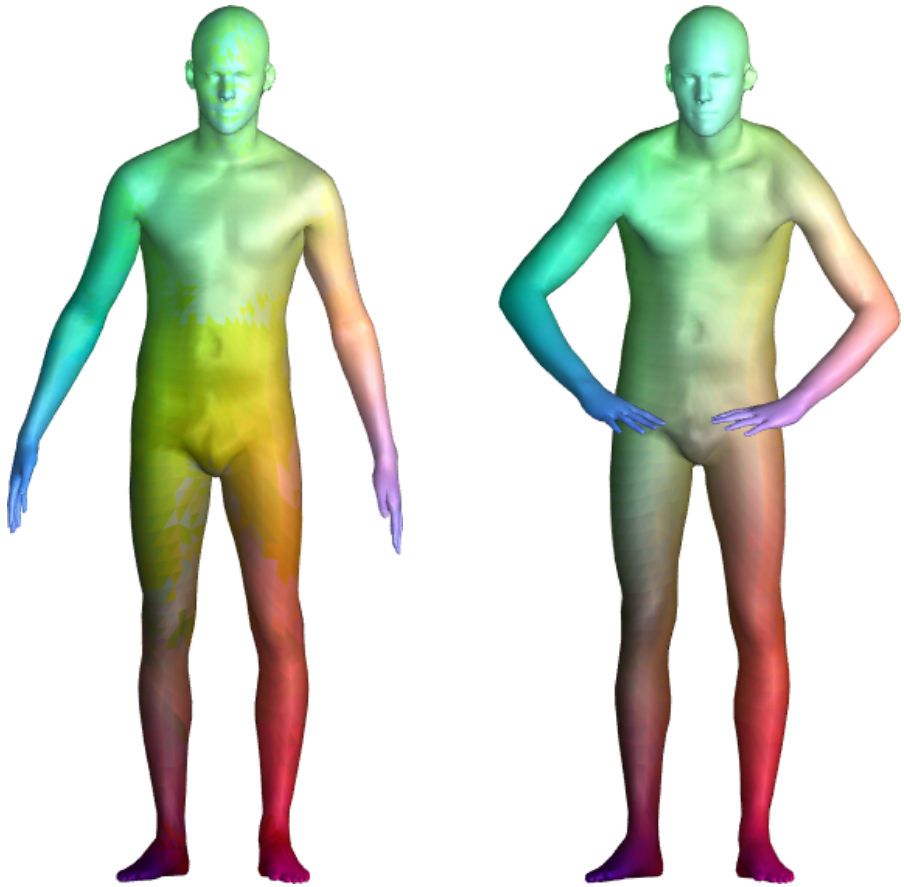
Obtain the target colormap by permuting the rows of the source colormap



Visualizing correspondence: Dense colors

Case 2: One match for each source point, not surjective

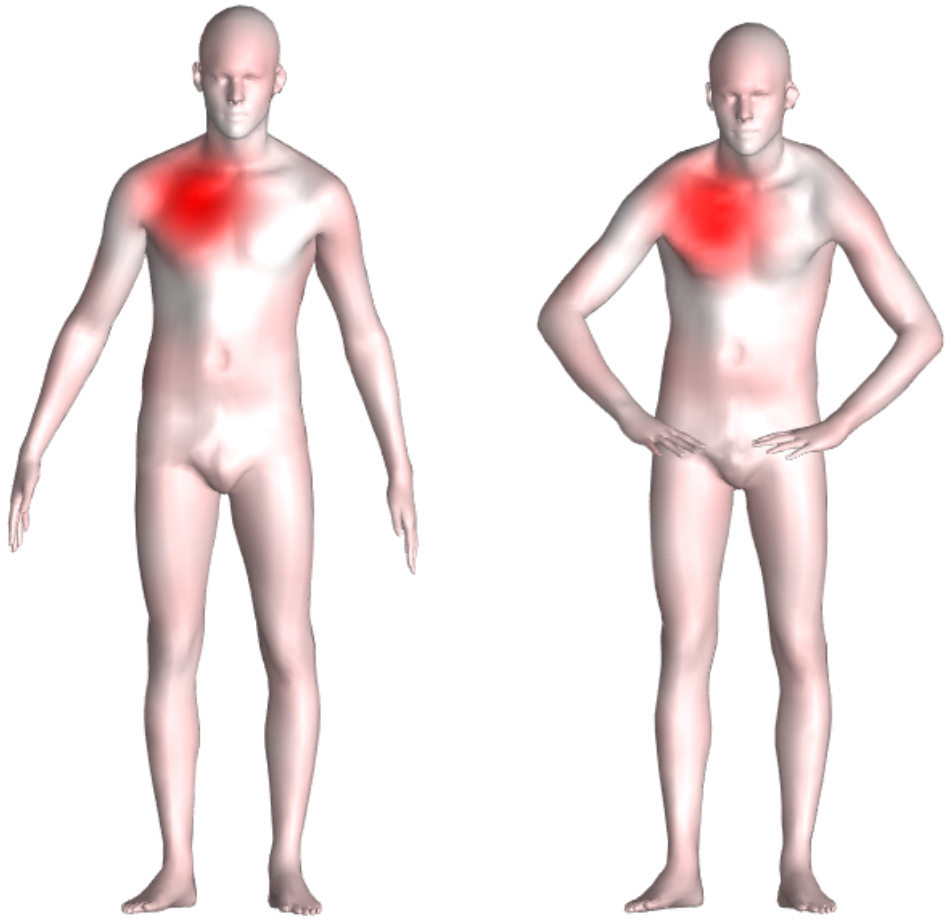
Obtain the source colormap by pulling back the target colormap



This hides the lack of surjectivity in the correspondence

Visualizing correspondence: Function mapping

The correspondence can be used to map functions to functions



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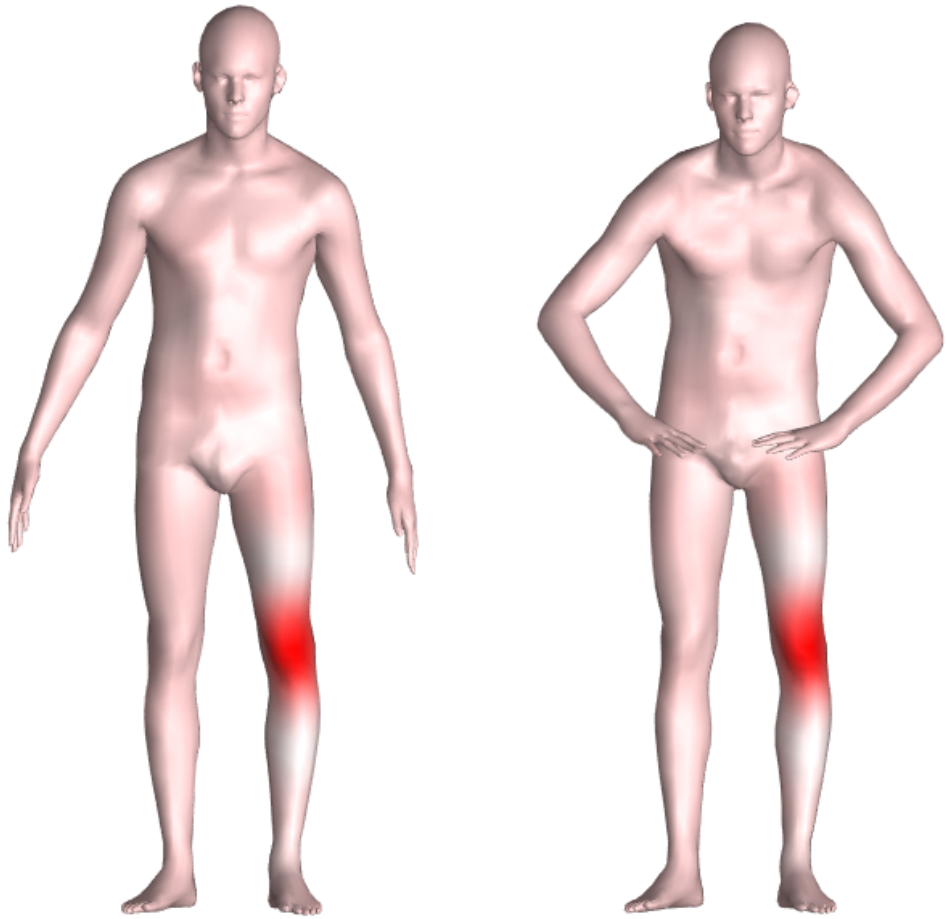

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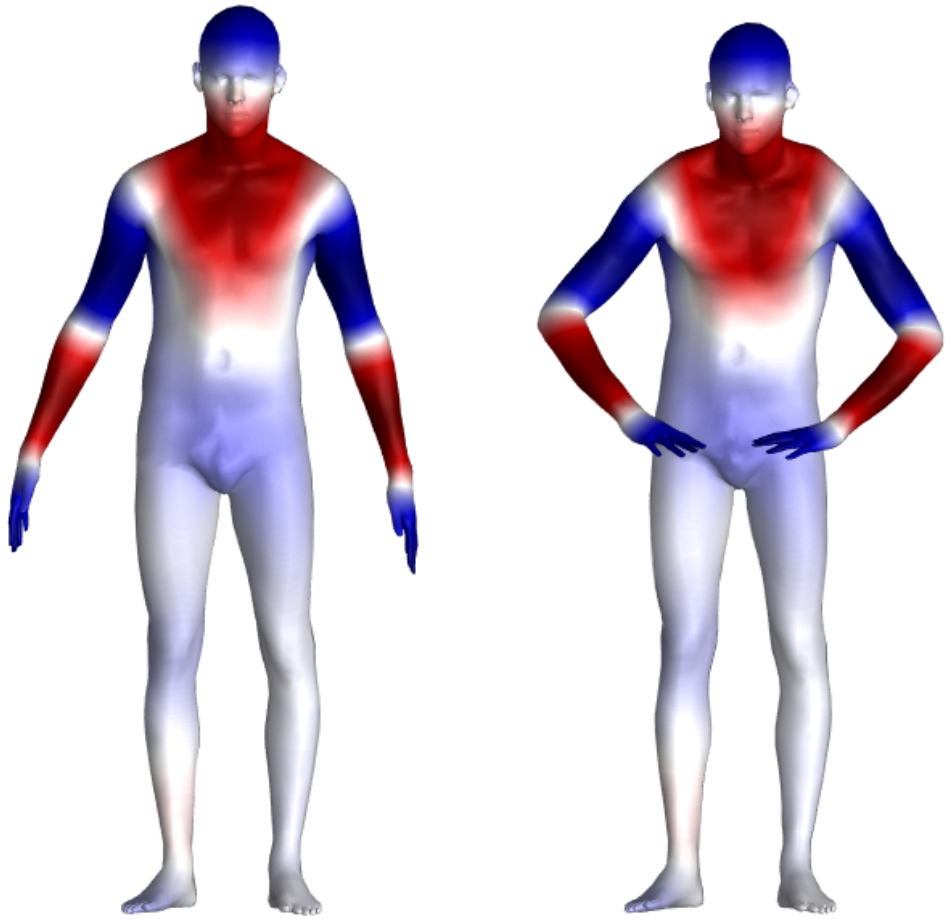

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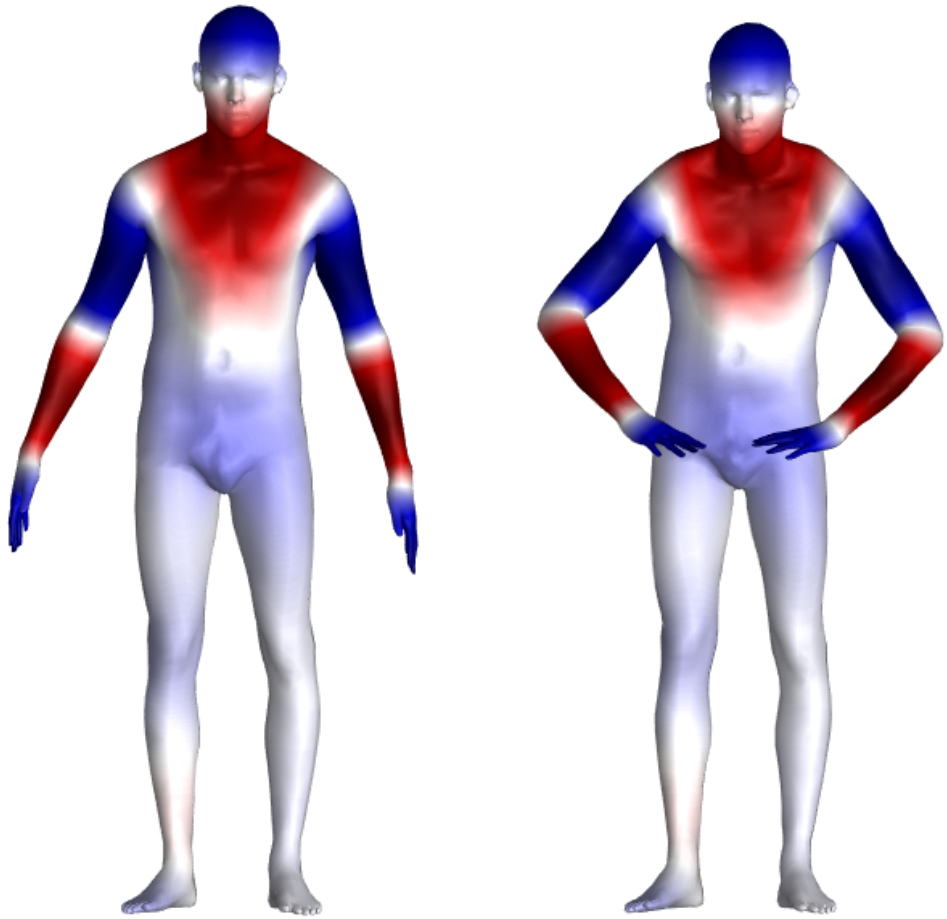

This also works for non-surjective and in general soft maps

Pov-RAY

Exercise: Rendering of 1d Euclidean embedding

Replicate in Pov-RAY the rendering from the last exercise of the Oct 04 lecture

- You must use the bluewhitered colormap
- Remember to extend the solution from FPS to entire mesh using the Voronoi regions

Use materials and lights as you like.

Send your renderings in .png format to rodola@di.uniroma1.it, using [FundCG] as the email subject.