The application visualizes hierarchically clustered set of points. The points are separated into clusters first by category and then by mutual proximity.

The application window is divided into view and configuration. View contains visualization of hierarchy, point cloud visualization and density visualization. Visualizations of density and visualization of point are connected. View can be zoomed using the mouse wheel. Clusters can be selected in the point visualization and the hierarchy visualization. Multiple clusters can be selected using the shift key. The configuration is separated into three parts, first one contains settings shared by all three visualizations, second one settings of the point visualiztion and the last one settings of the density visualization.
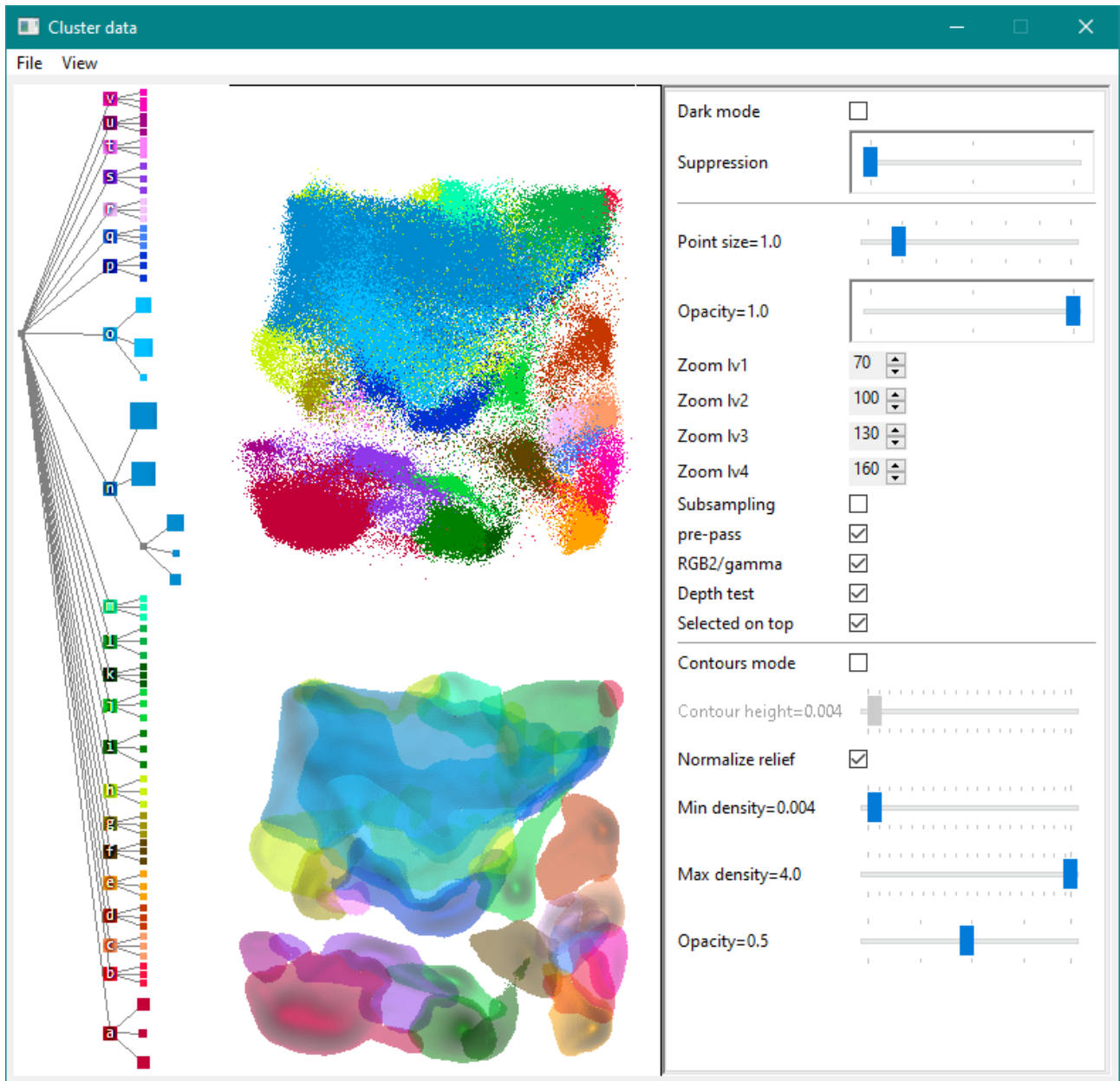
The point visualization has two modes – mode of cluster discernability and for density discernability. In the cluster discernability mode, the luminance color channel is used and point are drawn in random order. This way, when two clusters overlap, points of both clusters are represented at the place of overlap. In the density mode, point are drawn with transparency. To be able to discern the density distribution, the point transparency needs to be set very low, around 0.1. Cluster can be selected by clicking into the point visualization or to the hierarchy visualization. Multiple clusters can be selected or unselected with clicking and holding the shift key.

The setting s of the point visualization allow to control the size of points and their transparency. If the transparency is set lower than 1, density mode is used, otherwise, the discernability mode is used. Next, there are settings of levels of zoom, where coloring at next level of hierarchy should be activated. Next is the setting of point subsampling. This will reduce the number of points drawn. The number of points will increase when zooming in. Other settings are only for development purposes.

Density visualization has two modes too – the relief shading mode and contouring mode. Relief mode shades the density function of individual clusters. Contouring mode will create contour line at given level of density. The modes can be switched using the Contours mode checkbox. The contour height and the density range drawn in the relief mode can be adjusted by sliders. The Normalize relief checkbox will set the shading to be proportionate to relative change of density reather to the absolute one. Normalization of relief will distort the perception of density, but will reveal more detail in the changes of the density.

There are two datasets available, Hammer_export.zip and Liechti_export.zip. The datasets to be used with individual tasks are stated in brackets at each task. Loading of the dataset liechti will take about a minute.

Get yourself familiar with the visualization and its configurations before you start working on the tasks.

Cluster data

File   View

Dark mode ☐

Suppression

Point size=1.0

Opacity=1.0

Zoom lv1   70
Zoom lv2   100
Zoom lv3   130
Zoom lv4   160
Subsampling   ☐
pre-pass   ☑
RGB2/gamma   ☑
Depth test   ☑
Selected on top   ☑

Contours mode   ☐

Contour height=0.004

Normalize relief   ☑

Min density=0.004

Max density=4.0

Opacity=0.5

Tasks

1. Are these pairs of clusters of same category? Do not use cluster selection. (Hammer_export)
1a, b.
2a, b.
3a, b.
4a, b.
5a, b.
6a, b.
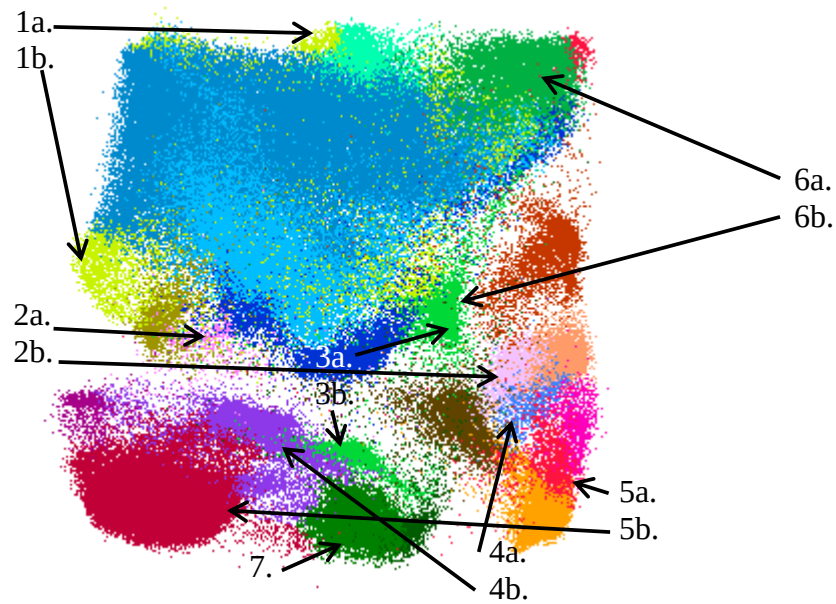
2. Find category of these clusters. Do not use cluster selection. (Hammer_export)
1a.
2a.
3a.
4a.
5a.
6a.
7.

3. Points of some clusters are unevenly distributed, with most of the points located in small part of the cluster's area, while the remaining area is very sparse. These cluster can be characterised as a center and outliers. What clusters exhibit this property the most? Find top five. Sort descending. (hammer)

1.
2.
3.
4.
5.

4. Judging by average density, what are the densest and sparsest clusters? If densities of some clusters appear to be equal, write all of them. (Hammer_export)

1.
2.
5.What clusters are overlapping with cluster of category 'o'? Sort by area of overlap descending. Write how many subclusters of 'o' they overlap. (Hammer_export)

6. What cluster is the most prevalent at the pointed position? What other clusters can be found there? Sort by density descending. (Liechti_export)
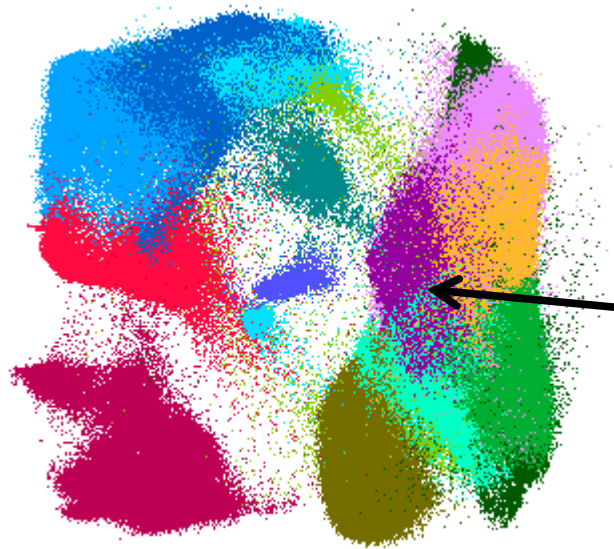
7. Find clusters with unusual shape or density distribution, or multiple centers. (Liechti_export)

8. What cluster spatially correlates the most with the 'f' cluster? (Liechti_export)

9. Find groups of clusters with correlating shape, position, density distribution. There may be multiple such groups. (Liechti_export)

Rate the tasks 1-9 by difficulty (1-easiest, 5-hardest)
1.
2.
3.
4.
5.
6.
7.
8.
9.

Your (optional) comment to the visualization or the tasks.