Exercise Multimedia Technology
WS 2004/2005

Sheet 11 (January 28th, 2005)

Exercise 10.1 K-means

The following file contains 4D vectors forming two distinct clusters.

http://www.informatik.uni-mannheim.de/pi4/lectures/ws0405/mmtechnik/ueb/data/data_kmeans.asc

Write a small script or program to find out the centers of the clusters.

- What kind of trivial solution do you encounter?
- What precautions do you have to take to avoid them?
- Where is the center of each cluster?

Exercise 10.2 The Hough-Transform

(1) What does a single point in the spatial domain look like in the Hough-domain? Given only the Hough-representation of the point, is it possible to find the point in the spatial domain? How could that work in theory and practice?

(2) What would a medium gray (in-between black and white) line look like in the Hough-space?

(3) Does every image in the spatial domain map to an image in the Hough-domain and vice versa?

(4) Can a rectangle in the spatial domain be detected in the Hough-domain?

(5) What is the representation of a (spatial) circle in the Hough-space (roughly speaking) and how does that representation change with the radius of the circle?

You may use the applet to answer the questions.

Exercise 10.3 Graph-based edge detection

What happens if we replace the cost function by the following term?

$$c(T)=\sum_{t\in T} 1$$

where T denotes the set of pixels t of a trajectory.