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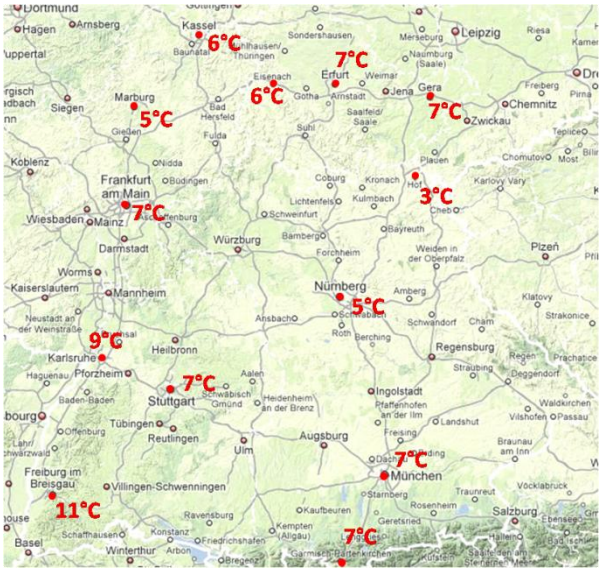
Exercises for Spatial Databases and GIS

Sheet 2 (until 09.11.2012)

Exercise 1 (Delaunay triangulation/Interpolation)

1. Which methods do you know to construct the Delaunay triangulation for a given set of points?
2. Choose one method to construct the Delaunay triangulation for the given points. Why did you choose this method?
3. Interpolate the temperature values using flat shading, i.e. assign the average value of a triangle's three vertices to the whole triangle.
4. What do you think of the result? How could it be improved?



Exercise 2 (Inverse Distance Weighting)

On the picture below you see the GUI of a very simple program to visualize the results of a 1-dimensional variant of the inverse distance weighting.

The input for the program is a file containing the x-coordinate and a value for an arbitrary number of points, that you can chose via a filechoser after clicking the "load points" button. The exponent corresponds to the value u on the formula on slide 154, stepsize defines the distance between the points whose values should be interpolated, e.g. if the input file contains two points x1 = 1 and x2 = 10 and stepsize = 3, the values for x = 4 and x = 7 will be calculated.

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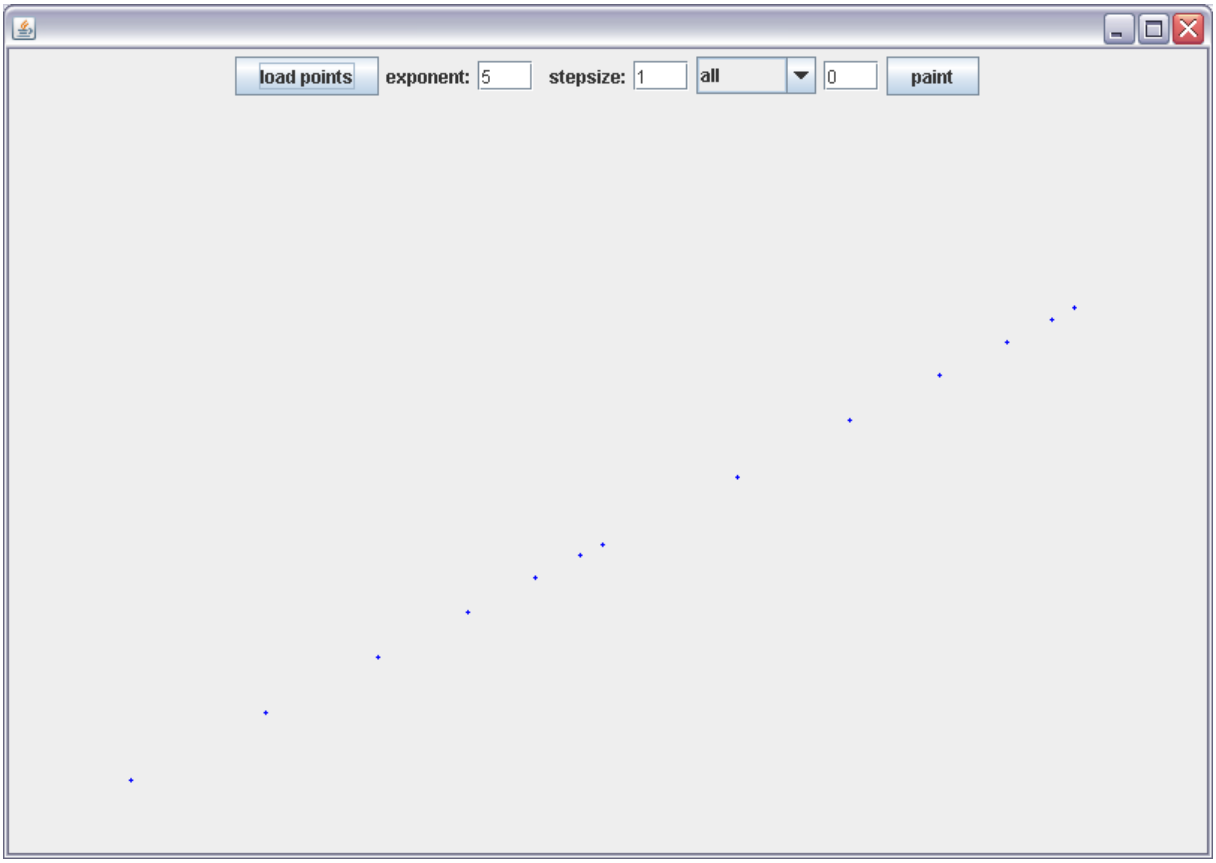

The combobox contains three values meaning:

all: every point will be considered for the interpolation

distance: only points within the distance given in the following textfield are considered for the interpolation

number: only the k-nearest neighbours will be considered for the interpolation, where k is given by the value in the following textfield

The paint button starts the interpolation by calling the method idw of the Class IDW.

Your task is to implement this method. On our website you will find one zip-archive containing three java classes (IDW.java, IDWgui.java, IDWcanvas.java) and three files that can be used as input files (points1.txt, points2.txt, points3.txt).

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Exercise 3 (Geometric Operations)

1. Determine the intersection and the union of the Polygons P1 and P2 without drawing them.
    a. Vector geometry :
    P1((2,1), (7,1), (7,3), (3,3), (3,6), (11,6), (11,8), (9,8), (9,13), (2,13))
    P2((6,2), (10,2), (10,7), (8,7), (8,9), (12,12), (12,14), (5,14), (5,10), (1,10), (1,8), (4,8))
    b. Raster geometry
    P1((3,2), (4,2), (5,2), (6,2), (7,2), (3,3), (4,3), (5,3), (6,3), (7,3), (3,4), (3,5), (3,6), (3,7), (4,7), (5,7), (6,7), (7,7), (8,7), (9,7), (10,7), (11,7), (3,8), (4,8), (5,8), (6,8), (7,8), (8,8), (9,8), (10,8), (11,8), (3,9), (4,9), (5,9), (6,9), (7,9), (8,9), (9,9), (3,10), (4,10), (5,10), (6,10), (7,10), (8,10), (9,10), (3,11), (4,11), (5,11), (6,11), (7,11), (8,11), (9,11), (3,12), (4,12), (5,12), (6,12), (7,12), (8,12), (9,12), (3,13), (4,13), (5,13), (6,13), (7,13), (8,13), (9,13))
    P2((7,3), (8,3), (9,3), (10,3), (7,4), (8,4), (9,4), (10,4), (6,5), (7,5), (8,5), (9,5), (10,5), (6,6), (7,6), (8,6), (9,6), (10,6), (5,7), (6,7), (7,7), (8,7), (9,7), (10,7), (5,8), (6,8), (7,8), (8,8), (2,9), (3,9), (4,9), (5,9), (6,9), (7,9), (8,9), (2,10), (3,10), (4,10), (5,10), (6,10), (7,10), (8,10), (9,10), (6,11), (7,11), (8,11), (9,11), (10,11), (6,12), (7,12), (8,12), (9,12), (10,12), (11,12), (6,13), (7,13), (8,13), (9,13), (10,13), (11,13), (12,13), (6,14), (7,14), (8,14), (9,14), (10,14), (11,14), (12,14))
    c. Was a. or b. easier to calculate?

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Template for exercise 1.2