Programming Paradigms Haskell Homework

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Download the file `spatial.hs` from the course webpage. In the file two types are declared: a type `Point` as a tuple of two doubles and a type `Rectangle` as a tuple of two points (p_1, p_2). Point p_1 indicates the bottom left coordinate defining the rectangle while p_2 indicates the upper right coordinate defining the rectangle. Also `myDatapoints` is a variable assigned with a list of points which contains all datapoints in the table below:

id	x	y
1	2.3	5.4
2	3.4	4.8
3	6.3	9.4
4	7.1	5.4
5	1.1	8.5
6	8.7	3.3
7	9.3	2.3
8	4.6	5.8
9	7.6	4.9
10	2.4	2.8
11	3.9	1.1
12	8.2	2.3
13	4.4	7.2
14	5.5	2.3
15	9.1	9.8
16	9.6	7.1

Table 1: Sample datapoints.

1. Write a function `boundingbox` which given a list of points and a rectangle, it returns all the datapoints contained inside the given rectangle.

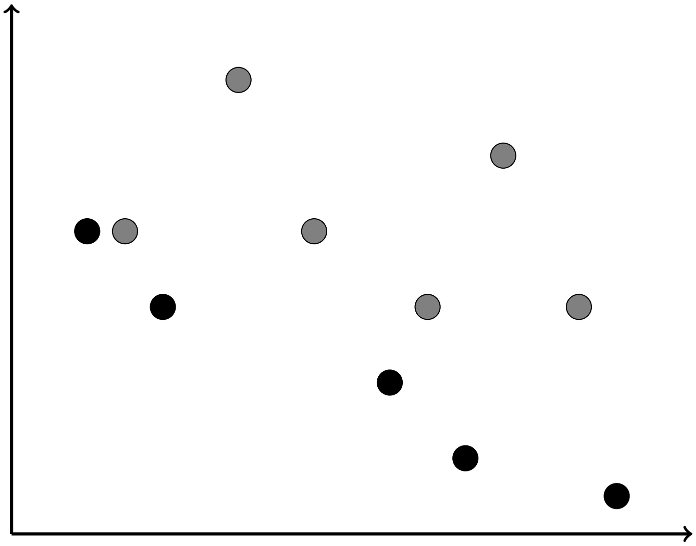
2. The Manhatten distance between two points (x_1, y_1) and (x_2, y_2) is defined as $|x_1 - x_2| + |y_1 - y_2|$. Write a function `mindist` which given a point P and a list of points returns the minimal Manhatten distance between P and any point in the list. For example,

```
mindist (1.0,1.1) [(0,0.1),(2,1.9),(1.1,2.1)]
1.1
```

3. Write a function `nearestneighbors` which returns the k nearest neighbors (with respect to the Manhatten distance) for a given point (x, y) in a given list of points. For example

```
nearestneighbors (1.0,1.1) 2 [(0,0.1),(2,1.9),(1.1,2.1)]
[(1.1,2.1),(2,1.9)]
```

4. A point (x_1, y_1) *dominates* another point (x_2, y_2) if it both holds that $x_1 < x_2$ and $y_1 < y_2$. Write a function `nondominiated` that computes the subset of all non-dominated points of a given set of points. You can assume that all x-coordnates of the given points are pairwise distinct.



Hint: First sort the list of points by their x-coordinate and then look at the points in this order (from smallest to largest x-coordinate). It suffices to look at every point exactly once.

Deadline: 18.12.2018, 23:55 (OLE)