

Assignment No. 2 - Theoretical Questions

6.1

We chose to implement the DataStructure with 2 doubly-linked lists (called Axis), one sorted by the point's X values, and the other one by the Y values.

Axis class

The Axis is a doubly linked list, which has First, Last and Median pointers, a Size field, and a PointComparator.

The Axis constructor accepting a PointComparator as input, which defines its sorting behavior (by X's or Y's). the constructor initializes an empty list.

Methods

1. void Add (Container toAdd) – adds the Container to the list in the sorted place. – $O(n)$
2. void Remove (Container toRemove) – removes the input Container from the list. – $O(1)$
3. Container getMedian() – the list maintaining a median field in each add or delete operations, so the method run time complexity is – **$O(1)$**
4. Axis getRange (int min, int max) – returns a new Axis only with values between min and max – $O(n)$
5. Axis getFitRange - (int min, int max, PointComparator comp) - returns a new Axis only with values between min and max, but sorted the specific comparator way – $O(n)$

Container class

The Container serves as a Node for the linked list. The class has a data pointer to the Point, next and prev pointers to the neighbor Containers, and a twin pointer, which points to a Container with the same point as data.

PointComparator

The PointComparator is an abstract class implementing the Java's Comparator interface. xComparator and yComparator extends this class, and implements the "compare" method, which compare between 2 Points, and the "compareByInt" method, which compares between a Point X or Y date, and the input value.

DataSet class

The main Data Structure, stores 2 Axis's.

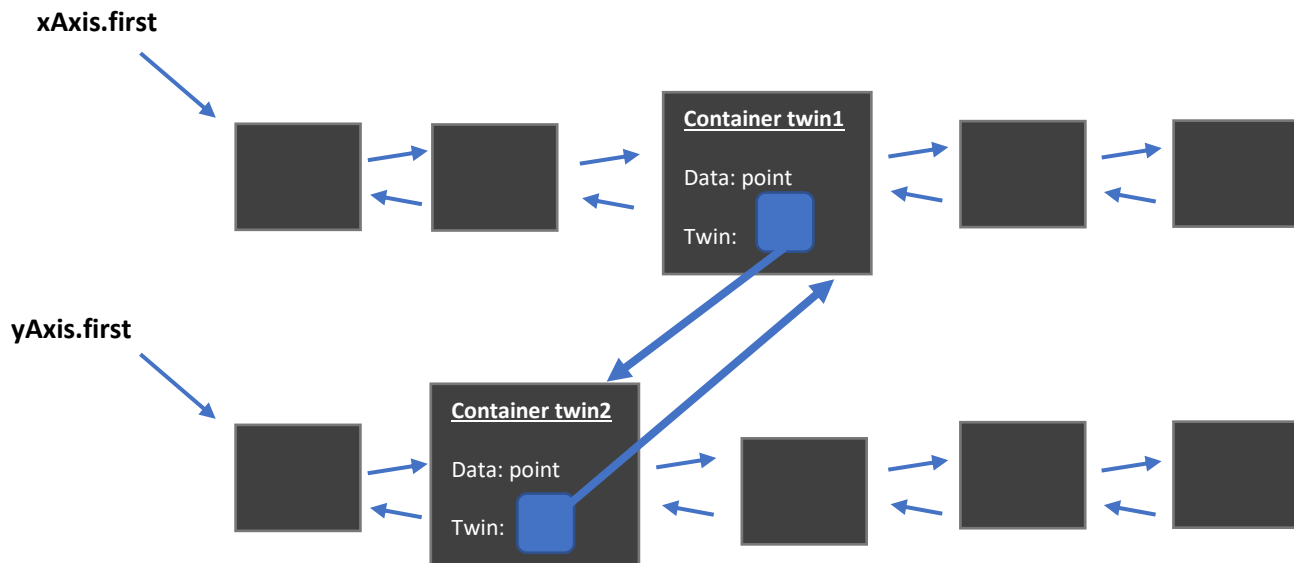
The constructor initializes 2 empty Axis's.

The addPoint(Point point) Method works this way:

1. Creates 2 new Containers, each "twin" field points to the other one.



2. Inserts twin1 to the Axis sorted by the X values, and twin2 to the Axis sorted by the Y values:



3. Updates the Median pointer accordingly.