Geometric Searching Applications of BSTs

The **hard deadline** for this quiz is **Sat 12 Dec 2015 8:59 PM PST (UTC -0800)**.

To specify an array or sequence of values in an answer, you must separate the values by a single space character (with no punctuation and with no leading or trailing whitespace). For example, if the question asks for the first ten powers of two (starting at 1), the only accepted answer is:

1 2 4 8 16 32 64 128 256 512

If you wish to discuss a particular question and answer in the forums, please post the entire question and answer, including the seed (which is used by the course staff to uniquely identify the question) and the explanation (which contains the correct answer).

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Question 1

(seed = 62034)
Suppose that you run the orthogonal line segment intersection algorithm
on the following set of segments:

```
A ( 5,  2)  ->  (18,  2)  [ horizontal ]
B (12,  3)  ->  (17,  3)  [ horizontal ]
C ( 0,  1)  ->  (16,  1)  [ horizontal ]
D ( 3, 18)  ->  ( 9, 18)  [ horizontal ]
E ( 2,  5)  ->  ( 2, 19)  [ vertical   ]
F ( 1, 12)  ->  (10, 12)  [ horizontal ]
G ( 6,  8)  ->  (19,  8)  [ horizontal ]
H (14,  9)  ->  (14, 15)  [ vertical   ]
```

Give the set of horizontal line segments in the BST (sorted by y-coordinate) just before the sweep-line algorithm processes the vertical line segment H.

Question 2

(seed = 219031)
Suppose that you insert the following sequence of points into an initially empty kd-tree.
Give the level order traversal of the resulting kd-tree.

```
A (0.05, 0.52)
B (0.53, 0.70)
C (0.31, 0.88)
D (0.26, 0.27)
E (0.55, 0.25)
F (0.15, 0.94)
G (0.96, 0.64)
H (0.75, 0.29)
```

Recall that our convention is to subdivide the region using the x-coordinate at even levels (including the root) and using the y-coordinate at odd levels. Also, we use the left subtree for points with smaller x- or y-coordinates.

Question 3

(seed = 327628)
Consider an interval search tree containing the set of intervals

A [18, 33]
B [8, 34]
C [5, 25]
D [30, 32]
E [19, 27]
F [31, 36]
G [23, 38]
H [10, 21]

and whose level order traversal is: A B D C H E F G

Suppose that you use the search algorithm described in lecture to search for any one interval that intersects [35, 40]. What is the sequence of intervals examined?

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You cannot submit your work until you agree to the Honor Code. Thanks!