PG Software Lab

KD Trees

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Data Sets:

We have considered three datasets:

Dataset A: 3000 points generated in a uniformly random fashion where the x and y coordinates are integers between 0 and 90.

Dataset B: 4000 points generated in a uniformly random fashion where x and y coordinates are integers between 0 and 90.

Dataset C: 5000 points generated in a uniformly random fashion where x and y coordinates are integers between 0 and 90

Points:

1. Alpha is strictly less than the number of points.
2. Input file is named data.txt.
3. Time is in Milliseconds.
4. Alpha = 15.
5. Height of KD Tree starts from 0.

Experiment 1:

Calculating height of KD tree for each DataSet.

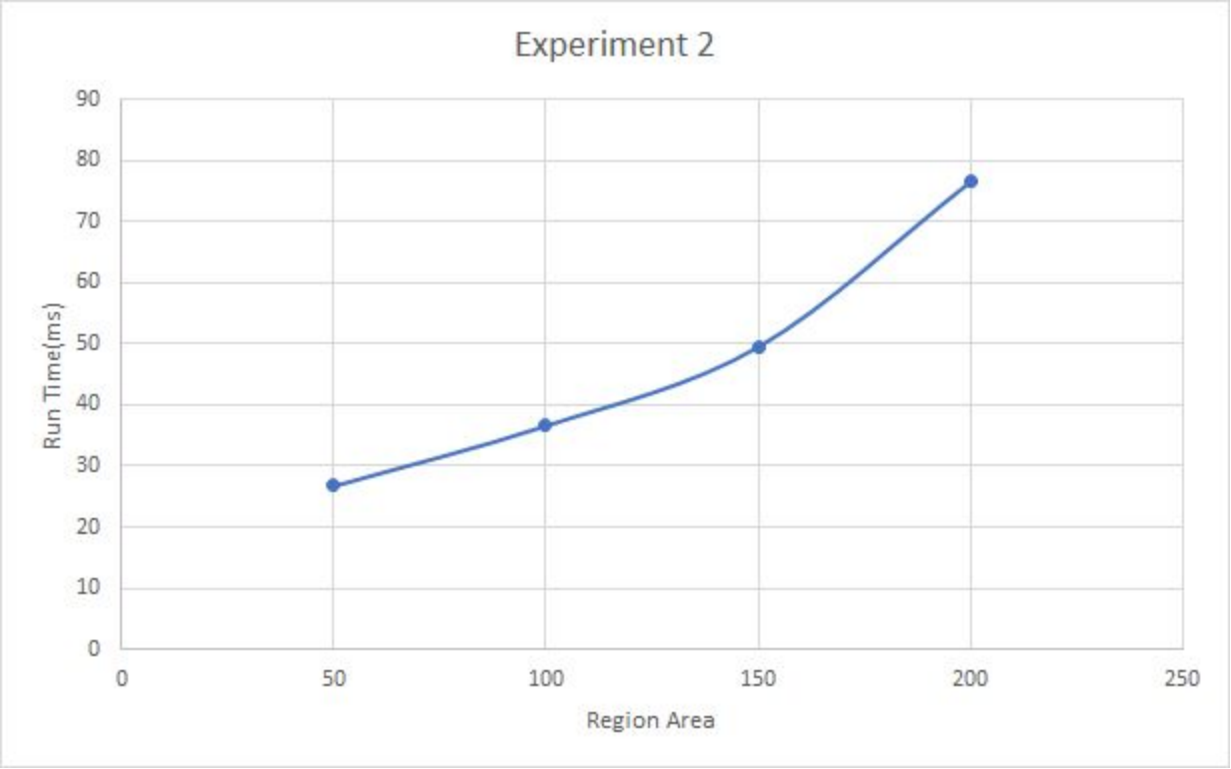
Data Set	Height of KD Tree
A	9
B	10
C	10

Experiment 2:

DataSet - A, Alpha = 15.

To do : Calculate run time for different queries.

Area	Region	RunTime(in ms)	Time Avg(ms)
50	(0,0,1,50) (0,0,50,1) (10,0, 15, 10) (0,10,10,15) (50,50,75,52) (50,50,52,75) (60,10,85,12) (10, 60, 12, 85)	17 110 35 20 4 28 0 0	26.75
100	(0,0,1,100) (0,0,100,1) (10, 50,60,52) (50,10,52,60) (20,30,45,34) (30,20,34,45) (60,10,85,14) (10,60,14,85)	149 54 9 4 57 20 0 0	36.625
150	(0,0,2,75) (0,0,75,2) (10,20,60,23) (10,20,60,23) (40,50,50,65) (40,50,55,60) (70,10,80,25) (10,70,25,80)	92 89 68 84 8 55 0 0	49.5
200	(0,0,100,2) (0,0,2,100) (10,15,14,65) (10,15,60,19) (40,50,65,58) (40,50,48,75) (20,2,40,12) (20,2,30,22)	79 122 10 29 103 10 119 140	76.5

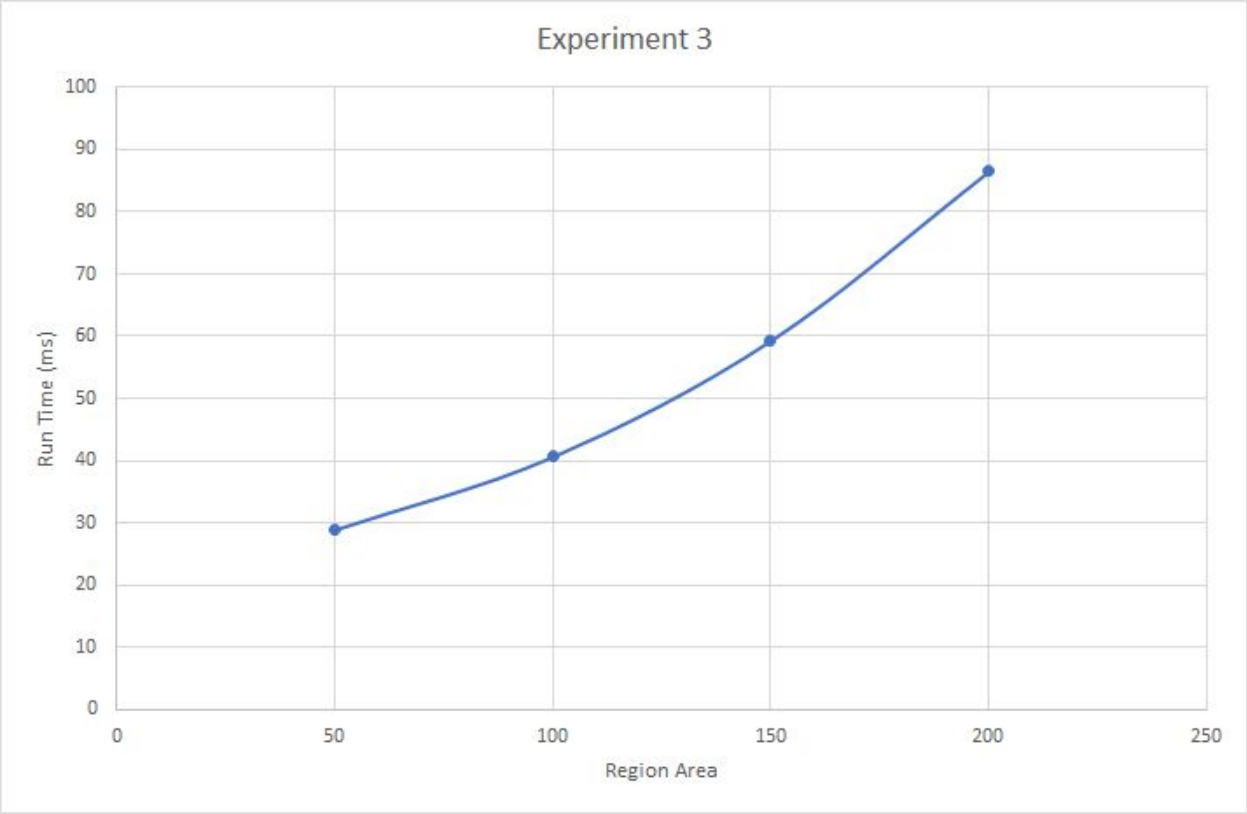

Experiment 2
Run Time(ms)
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
Region Area

Experiment 3:

DataSet - B, Alpha = 15.

To do : Calculate run time for different queries.

Area	Region	RunTime(in ms)	Time Avg(in ms)
50	(0,0,1,50) (0,0,50,1) (10,0, 15, 10) (0,10,10,15) (50,50,75,52) (50,50,52,75) (60,10,85,12) (10, 60, 12, 85)	37 60 39 40 16 39 0 0	28.875
100	(0,0,1,100) (0,0,100,1) (10, 50,60,52) (50,10,52,60) (20,30,45,34) (30,20,34,45) (60,10,85,14) (10,60,14,85)	106 50 10 0 99 60 0 0	40.625
150	(0,0,2,75) (0,0,75,2) (10,20,60,23) (10,20,13,70) (40,50,50,65) (40,50,55,60) (70,10,80,25) (10,70,25,80)	128 111 110 8 46 72 0 0	59.375
200	(0,0,100,2) (0,0,2,100) (10,15,14,65) (10,15,60,19) (40,50,65,58) (40,50,48,75) (20,2,40,12) (20,2,30,22)	80 170 50 57 100 18 60 153	86

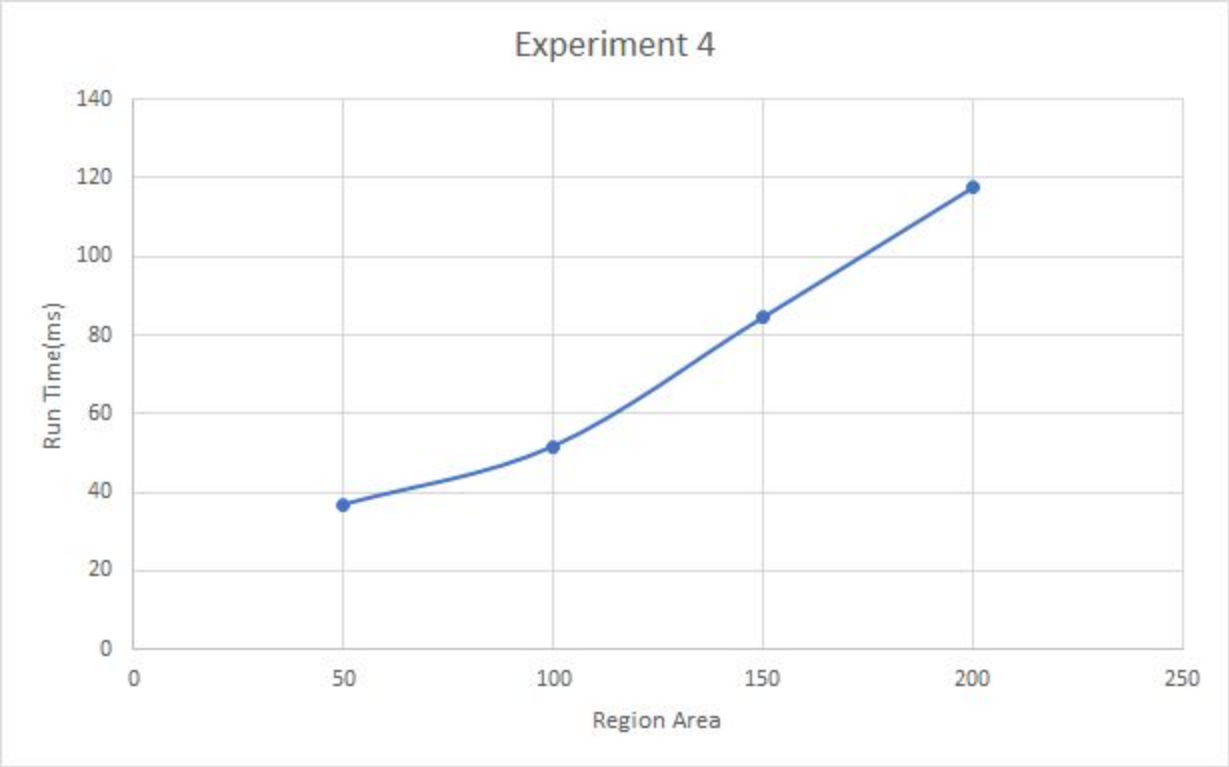

Experiment 3
Run Time (ms)
Region Area
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250

Experiment 4:

DataSet - C, Alpha = 15.

To do : Calculate run time for different queries.

Area	Region	RunTime(in ms)	Time Avg(in ms)
50	(0,0,1,50) (0,0,50,1) (10,0, 15, 10) (0,10,10,15) (50,50,75,52) (50,50,52,75) (60,10,85,12) (10, 60, 12, 85)	47 86 63 66 23 55 0 0	36.25
100	(0,0,1,100) (0,0,100,1) (10, 50,60,52) (50,10,52,60) (20,30,45,34) (30,20,40,30) (60,10,85,14) (10,60,14,85)	116 94 27 16 71 91 0 0	51.875
150	(0,0,2,75) (0,0,75,2) (10,20,60,23) (10,20,13,70) (40,50,50,65) (40,50,55,60) (70,10,80,25) (10,10,25,20)	188 103 111 16 31 116 0 112	84.625
200	(0,0,100,2) (0,0,2,100) (10,15,14,65) (10,15,60,19) (40,50,65,58) (40,50,48,75) (20,2,40,12) (20,2,30,22)	100 201 53 50 181 0 185 169	117.375


Experiment 4
Run Time(ms)
Region Area
0
20
40
60
80
100
120
140
0
50
100
150
200
250

References:

- To calculate run time of a function.

  https://www.geeksforgeeks.org/measure-execution-time-with-high-precision-in-c-c/

- Reading a file in C++.

  https://www.geeksforgeeks.org/cpp-program-read-file-word-word/

- Sorting 2D Vector by column.

  https://www.geeksforgeeks.org/sorting-2d-vector-in-c-set-1-by-row-and-column/