Assignment 5 - CS618A

Sumedh Masulkar
sumedh@,11736

March 16, 2015

1 System Configuration

- Processor: Intel(R) Core(TM) i3-2310M CPU @ 2.10GHz
- Memory: 3 GB

2 Results

Following table shows time statistics for GH Tree and VP Tree after insertion of 10^6 nodes in each tree and followed by 2000 queries. All values are in milliseconds.

- GH Tree

Table 1: Using Euclidean distances

	Minimum	Maximum	Mean	Standard Deviation
Range Query	0	10	0.01	0.31607
Distance calculations in range query	96	369	144.871	39.1832
kNN Query	0	300	103.69	76.1675
Distance calculations in knn query	0	2.02626E6	703175	521107

Table 2: Using Mahalanobhis distances

	Minimum	Maximum	Mean	Standard Deviation
Range Query	0	10	0.03	0.5469
Distance calculations in range query	96	206	119.637	14.888
kNN Query	0	350	130.49	88.0356
Distance calculations in knn query	0	2.03485E6	748337	507228

- VP Tree

Table 3: Using Euclidean distances

	Minimum	Maximum	Mean	Standard Deviation
Range Query	0	10	0.05	0.705337
Distance calculations in range query	4.19611E8	1.06231E9	7.496E8	1.86733E8
kNN Query	0	310	105.85	75.8649
Distance calculations in knn query	4.19647E8	1.06231E9	7.41016E8	1.86896E8

Table 4: Using Mahalanobhis distances

	Minimum	Maximum	Mean	Standard Deviation
Range Query	0	10	0.02	0.446766
Distance calculations in range query	4.19611E8	1.17093E9	8.0395E8	2.19302E8
kNN Query	0	480	143.43	107.629
Distance calculations in knn query	4.20184E8	1.17093E9	7.938E8	2.19427E8

3 Observations

- For GH Tree, we observe,

$$\text{kNN Query} > \text{Range Query}.$$

- For VP Tree, we observe,

$$\text{kNN Query} > \text{Range Query}.$$

- This can be justified as the number of distance computations are lot more for kNN queries than in range queries. Also, the implementation of priority queue should be adding some cost to kNN queries.
- For VP tree and GH Tree, we observe that VP tree is better than GH tree for both th queries. The reason may be that pruning is more effective in case of VP tree, as the lower bound and upper bound both are present. Another point in favor of VP tree is that it is more balanced than GH tree.