|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Average Time | Insert | Search | Delete | Access |
| Hash | O(1) | O(1) | O(1) | N/A |
| Linked List | O(1) | O(n) | O(1) | O(n) |
| Sorted Array(not listed) | O(n) | O(n) | O(n) | O(1) |
| Balanced Tree | O(log(n)) | O(log(n)) | O(log(n)) | O(log(n)) |
| Unsorted Array | O(1) | O(n) | O(n) | O(1) |
| Sorted Set | O(nlog(n)) | O(nlog(n)) | O(nlog(n)) | O(nlog(n)) |

Use <http://bigocheatsheet.com/> to complete the following table.

Lab: Using Data Structures in C# and investigating differences.

Read in strings from the keyboard. Line 1 will be the number of strings followed by those strings.

1. To test we will redirect the file r45\_10.g6 as keyboard input (similar to lab 1). r45\_10.g6 (file of strings on each line representing graphs used in my research). Smaller examples file on D2L and format (we will use this later): <http://cs.anu.edu.au/~bdm/data/ramsey.html>
2. Place the strings line by line into array, sort the array, and remove duplicates. Time how long this takes. Output the time it took to sort on line 1, the total number of strings on line 2, and using an iterator, print the strings line by line.
3. Redo #1 and #2 using HashSet, LinkedList, List, and Sorted Set.
4. Which is faster for the particular problem?

String[] = 82.72 seconds

HashSet = 13.14

1. Use a Dictionary< string, int>. Insert each string in the dictionary as the key. Let the value be the number of times that string was in the data. Using an iterator find how many unique strings where in the data.

Extra) Using sort and unique on command line:

* 1. sort fileinname > fileoutname
  2. unique (must download for windows, standard for unix)

6) Add Search for string to each item in the Data Structures Lab (including Dictionary (or SortedDictionary if necessary) ). Compare the search time to find the string (after the list is sorted). Compare the insertion, search, and delete time for each of the above data structures. Which has the fastest lookup time?

What is the largest size integer available in C# (a standard integer without using the BigInteger Class)?

Research to see what the largest standard integer class is for C++ in Unix?

What is the difference between an Array and a List?

What advantages does a List have over a LinkedList?

What advantages does Linked List have over List?

What advantages does a HashSet have over a SortedSet?

What advantages does a SortedSet have over a HashSet?

Dictionary is similar to map in C++ where the Key, value must be unique. C++ also has MultiMap where the Key, Value pair does not have to be Unique. For example (cat, 1) (cat, 2) would not be allowed in a Dictionary, but would be in a MultiMap. How could one implement a MultiMap in C#.

Explain the differences between Dictionary, SortedDictioary, HybridDictionary, ListDictionary, StringDictionary, and OrderedDictionary.