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CS 6301.011 Implementation of Data Structures and Algorithm

Short project 8 Cuckoo Hashing

Run command : javac HashDriver.java to compile the file.

Run command : java HashDriver to run the file.

Load factor can be changed in the Cuckoo\_Hash.java file at line 10. The number of operations can be changed by changing the value of variable n in HashDriver.java at line 26.

Note: Load Factor for Java HashSet is always 0.75

Report for running time for Load Factor = 0.5 for Cuckoo Hash:

|  |  |  |  |
| --- | --- | --- | --- |
| No. of Operations | Hash type - Operation | Time(msec) | Memory |
| 10M | Cuckoo Hash - Add | 12428 | 1827 MB / 1918 MB |
| Cuckoo Hash - Contains | 1798 | 1621 MB / 2016 MB |
| Cuckoo Hash - Remove | 3325 | 1629 MB / 2016 MB |
| HashSet - Add | 4499 | 1557 MB / 2016 MB |
| HashSet - Contains | 752 | 1575 MB / 2016 MB |
| HashSet - Remove | 1090 | 1584 MB / 2016 MB |
| 1M | Cuckoo Hash - Add | 804 | 143 MB / 624 MB |
| Cuckoo Hash - Contains | 244 | 223 MB / 624 MB |
| Cuckoo Hash - Remove | 218 | 228 MB / 1181 MB |
| HashSet - Add | 245 | 212 MB / 624 MB |
| HashSet - Contains | 79 | 238 MB / 624 MB |
| HashSet - Remove | 112 | 244 MB / 1181 MB |

Report for running time for Load Factor = 0.75 for Cuckoo Hash:

|  |  |  |  |
| --- | --- | --- | --- |
| No. of Operations | Hash type - Operation | Time(msec) | Memory |
| 10M | Cuckoo Hash - Add | 11710 | 1150 MB / 1815 MB |
| Cuckoo Hash - Contains | 2182 | 1750 MB / 1926 MB |
| Cuckoo Hash - Remove | 2746 | 1508 MB / 1926 MB |
| HashSet - Add | 4070 | 1692 MB / 1896 MB |
| HashSet - Contains | 909 | 1440 MB / 1926 MB |
| HashSet - Remove | 1404 | 1584 MB / 2016 MB |
| 1M | Cuckoo Hash - Add | 969 | 158 MB / 605 MB |
| Cuckoo Hash - Contains | 162 | 241 MB / 605 MB |
| Cuckoo Hash - Remove | 201 | 257 MB / 1115 MB |
| HashSet - Add | 296 | 225 MB / 605 MB |
| HashSet - Contains | 142 | 242 MB / 1115 MB |
| HashSet - Remove | 167 | 273 MB / 1115 MB |

Cuckoo Hash with Load Factor = 0.9:

|  |  |  |  |
| --- | --- | --- | --- |
| No. Of Operations | Hash Type - Operation | Time(msec) | Memory |
| 10M | Cuckoo Hash - Add | 15085 | 1244 MB / 1768 MB |
| Cuckoo Hash - Contains | 2613 | 1777 MB / 1911 MB |
| Cuckoo Hash - Remove | 3102 | 1579 MB / 1911 MB |
| 1M | Cuckoo Hash - Add | 1348 | 165 MB / 445 MB |
| Cuckoo Hash - Contains | 196 | 247 MB / 997 MB |
| Cuckoo Hash - Remove | 268 | 253 MB / 997 MB |

It can be seen evidently that HashSet outperforms Cuckoo Hash on every type of operation.

But for load factor = 0.75 the cuckoo hash works better than for load factor = 0.5 when the input size is very large (on the scale of 10 million), while they are quite comparable when input is in the scale of million.

Also, for the load factor = 0.9 the performance deteriorates as the number of collisions rise, this can be solved my using more than 2 cells and hash functions for a given key.