

CS 271 Project 3 Analysis

Khoa Nguyen, Niranjana Reji, William Nguyen

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1 Introduction

In this report, our group analyzed the load factor of hash tables created by the Corman Multiplication Method and Most Significant Bits Method. We want to get as close to the ideal load factors as possible (hence, printing out the load factor, but we also included the maximum and minimum number of elements in a linked list to analyze it further. We ran each method twenty times and found each statistic's average. We present our findings below.

2 Corman Multiplication Analysis

Corman's Multiplication Method resulted in the following when 100,001 elements are inserted into a hash table of size 5 (minimum, maximum and range) averaged over 20 trials:

Minimum number of : 8662

Maximum number of elements in a linked list: 17833

Range of elements between the largest and smallest linked list is: 9171

Average Load Factor is: 13526.8. The ideal load factor would be $100,000/5 = 20,000$.

We now reduce the number of elements to be smaller. 501 elements are inserted into a hash table of size 5 (minimum, maximum and range) averaged over 20 trials:

Minimum number of : 53

Maximum number of elements in a linked list: 69

Range of elements between the largest and smallest linked list is: 16

Average Load Factor is: 63.6. The ideal load factor would be $500/5 = 100$.

3 Most Significant Bits Analysis

Cormen's Multiplication Method resulted in the following when 100,001 elements are inserted into a hash table of size 5 (minimum, maximum and range) averaged over 20 trials:

Minimum number of : 0

Maximum number of elements in a linked list: 17833

Range of elements between the largest and smallest linked list is: 9171

Average Load Factor is: 20000.2. The ideal load factor would be $100,000/5 = 20,000$.

We now reduce the number of elements to be smaller. 501 elements are inserted into a hash table of size 5 (minimum, maximum and range) averaged over 20 trials:

Minimum number of elements in a linked list: 0

Maximum number of elements in a linked list: 264

Range of elements between the largest and smallest linked list is: 264

Average Load Factor is: 100.2. The ideal load factor would be $500/5 = 100.2$.

Note that the average load factor (100.2) remained the same and the minimum remained the same (0) throughout all 20 trials.

4 Conclusion and Findings

Overall, we found that the most significant bits is closest to the desired load factor of n/m . Therefore, Most Significant Bits performs better than Cormen Multiplication in terms of load factors, though Most Significant Bits is more spread out (i.e linked lists may have 0 elements or up to half of the number of elements), while the range of numbers in Cormen Multiplication is smaller.