Cairo University
Faculty of Engineering
Computer Engineering
Fall 2019

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Design and Analysis of Algorithms

Lab 3

Hashing

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Objectives

After this lab, the student should be able to

- Implement hashing

Requirements

1. **Linear Probing**

Given the file words20k.txt (one word per line, all words unique, 20,000 words in the file):

1) Read the words one by one into a string array A.
2) Create another array (H) of size 24,000, fill with empty strings (i.e. "") first, and then copy items from A into H, using a hash function and linear probing for collision resolution.

The hash function to use, for string s:

- $h'(s) = 39 * int(s[0])$, if s.size() == 1
- $h'(s) = 39 * int(s[0]) + 392 * int(s[1])$, if s.size() == 2
- $h'(s) = 39 * int(s[0]) + 392 * int(s[1]) + 393 * int(s[2])$, if s.size() == 3
- $h'(s) = 39 * int(s[0]) + 392 * int(s[1]) + 393 * int(s[2]) + 394 * int(s[3])$, otherwise, and then:
- $h(s) = h'(s) \% 24000;$

3) Measure the average item insertion time for the first 500 inserted words, for the next 500 inserted words, etc. until the last 500 inserted words.
4) Read 1000 words from array A from index 14000 to 14999. For each word, search and delete it from the hash array H. Track the number of probes needed for each of these 1000 words and use it to find the min, max and average number of probes across the 1000 searches.