CS163 – Data Structures & Algorithms

Lab 02
Hash table

Department of Software Engineering-FIT-VNU-HCMUS

1 Notes

Create a single solution/folder to store your source code in a week.

Then, create a project/sub-folder to store your source code of each assignment.

The source code in an assignment should have at least 3 files:

- A header file (.h): struct definition, function prototypes/definition.
- A source file (.cpp): function implementation.
- Another source file (.cpp): named YourID_Ex01.cpp, main function. Replace 01 by id of an assignment.

Make sure your source code was built correctly. Use many test cases to check your code before submitting to Moodle.

Name of your submission: **StudentID_XXX_YY.zip**. XXX: week. XX: number of complete assignments. For example: 18127100_W01_02.zip

2

Content

In this lab, we will review the following topics:

- What is a hash function?
- What is a hash table?
- Different ways of collision resolution: separate chaining (using linked list) vs open addressing (linear probing, quadratic probing, double hashing)
- How to implement a hash table in C++.

3

Assignments

A: YY: 01

H: YY: 06

3.1. Assignment 1 – Paper assignment

Given the list of numbers as follow: 74, 12, 217, 36, 61, 77, 286, 153, 337, 93, 121, 47, 463, 248 and 146. You are asked to put those numbers into a hash table of 23 slots (m = 23), using the hash function as follows: h1(k) = k mod m.

Collision resolution:

1. Chaining using a linked list.
2. Linear probing.
3. Quadratic probling.
4. Double hashing: h2(k) = (k mod (m-1)) + 1 → h(k,i) = h1(k) + i * h2(k)).

3.2. Assignment 2 – Hash table with chaining

https://leetcode.com/problems/design-hashset/

3.3. Assignment 3 – Hash table with linear probing

https://leetcode.com/problems/design-hashset/

3.4. Assignment 4 - unordered_set

Write a report to demonstrate and explain at least 5 main functions in the unordered_set.

3.5. Assignment 5

https://www.hackerrank.com/challenges/ctci-ransom-note/problem

3.6. Assignment 6

https://www.hackerrank.com/challenges/ctci-ice-cream-parlor/problem