Indian Institute of Technology Mandi
August-November 2017 Semester

CS202: Advanced Data Structure and Algorithms
Programming Assignment 3

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Date of evaluation of code:

Q-1 Write a separate main programs to evaluate the functions in Chained Hashing, Linear Probing and Double Hashing data structures. The main functions should have the options to read inputs from user and display the contents of hash.

Q-2 Implement the Dictionary data structure using the Dictionary.hpp

Q-3 Implement Chained Hash, Linear Probing and Double Hashing data structures using ChainedMap.hpp, OpenMap.hpp and DoubleHashMap.hpp

Q-4 Use sequential linear list data structure as per the need of the problem assigned to you.

Q-5 Write a separate main programs to evaluate the LRU cache problem. Cache memory can be seen as a hash table. Decide which hashing technique is suitable. Try to optimize as much as you can (Hint: Use HashTable and Doubly Linked List)

Least Recently Used (LRU) cache Problem:

Design and implement a data structure for Least Recently Used (LRU) cache. It should support the following operations: get and set.

- `get(key)` - Get the value (will always be positive) of the key if the key exists in the cache, otherwise return `-1`.
- `set(key, value)` - Set or insert the value if the key is not already present. When the cache reaches its capacity, it should invalidate the least recently used item before inserting the new item.

The LRU Cache will be initialized with an integer corresponding to its capacity. Capacity indicates the maximum number of unique keys it can hold at a time.

Definition of "least recently used" : An access to an item is defined as a get or a set operation of the item. "Least recently used" item is the one with the oldest access time.

Example:

```
Input :
         capacity = 2
         set(1, 10)
         set(5, 12)
         get(5)        returns 12
         get(1)        returns 10
         get(10)       returns -1
         set(6, 14)    this pushes out key = 5 as LRU is full.
         get(5)        returns -1
```