

HOMework 9

ALGORITHMS AND DATA STRUCTURES (CH08-320201)

Spring 2018

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Due on Monday, Apr 23, 2018, 23:55.

Problem 1: Hash Tables

(5+8 = 13 points)

- (a) Given the sequence $\langle 3, 10, 2, 4 \rangle$, apply the double-hashing strategy for open addressing to store the sequence in the given order in a hash table of size $m = 5$ with hash functions $h_1(k) = k \bmod 5$ and $h_2(k) = (7 \cdot k) \bmod 8$. Document all collisions and how they are resolved (provide computations).
- (b) *Implement* a hash table that supports insertion and querying with open addressing using linear probing. The implementation should be consistent with the following class specification:

```
class Node{
public:
    int key;
    int value;
    Node(int key, int value);
}

class HashTable{
private:
    Node **arr;
    int maxSize;
    int currentSize;
public:
    HashTable();
    hashCode(int key);
    void insertNode(int key, int value);
    int get(int key);
    bool isEmpty();
}
```

Problem 2: Greedy Algorithms

(2 + 6 = 8 points)

- (a) Show that a greedy algorithm for the activity-selection problem that makes the greedy choice of selecting the activity with shortest duration may fail at producing a globally optimal solution.
- (b) Assuming an unsorted sequence of activities, derive a greedy algorithm for the activity-selection problem that selects the activity with the final starting time. Your solution should not simply sort the activities and then select the activity.

Remarks

- Solutions have to be handed in via Moodle by the due date. For late submissions you need to get in contact with the TAs directly. You need to upload one zip-file that contains a PDF-file for the theoretical parts and source files (no executables or object files) for the programming assignments. The source files need to include a makefile. Programming assignments need to be handed in as C++ or Python code. **Please write your own code.** It is ok to take snippets from online resources, but they need to be clearly marked.
- Exercises marked with a * are bonus problems. These count towards your number of points for this homework. The maximum number of official points can not be exceeded.