BLG335E, Analysis of Algorithms I, Fall 2016 Project Report 4

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Part A. Questions on Hash Tables (20 points)

1) Why do we use Hash Tables as a data structure in our problems? Please explain briefly. **(5 points)**

The data which have an unmatched index value is stored in an array format. If we know the requested data, access to the data is very fast. For this reason, it is a data structure that can be placed and retrieved very quickly and irresistibly. The Hash Table uses a hash technique to create an index where an item can be inserted or contained. To sum up, we can use hash tables as a data structure in our problems.

2) Consider a hash table consisting of M = 11 slots, and suppose nonnegative integer key values are hashed into the table using the hash function `h1()` :

```
int h1 (int key) {
int x = (key + 7) * (key + 7);
x = x / 16;
x = x + key;
x = x % 11;
return x;
}
```

Suppose that collisions are resolved by using linear probing. The integer key values listed below are to be inserted, in the order given. Show the home slot (the slot to which the key hashes, before any probing), the probe sequence (if any) for each key, and the final contents of the hash table after the following key values have been inserted in the given order: **(10+5 points)**

Key Value	Home Slot	Probe Sequence
43	1	0
23	2	0
1	5	0
0	3	0
15	1	3
31	0	0
4	0	6
7	8	0
11	9	0
3	9	1

Final Hash Table:

Slot	0	1	2	3	4	5	6	7	8	9	10
Contents	31	43	23	0	15	1	4		7	11	3

Part B. Implementation and Report (80 points)