

## HW9: Hash Tables

1

Open addressing is an approach to hash tables that stores values in an array. The strategy to open addressing is that when there is a collision, the algorithm will try to find another location to put the value in. There are many approaches to handling this collision problem which are called collision-resolution policies. Linear probing is one of the policies that helps with collision diversion. A big problem with linear probing is that it can cause primary clustering. Linear probing probes the array until it finds the next empty space to put the new entries. (LOOK AT NOTES TO EXPLAIN BETTER)

Using pseudo-random probing could help prevent clustering because it uses a pseudo-random function to give the next stride. It is a pseudo-random function of  $K$ , or the first space it finds that is a collision. The probe sequence for pseudo-random probing tends to go like this  $K$ ,  $K + p$ ,  $K + 2 * p$ ,  $K + 3 * p$ , and so on until it finds a space for the entry. Finding a space with this way or moving around the array can be hard. Sometimes the algorithm can easily jump over empty spaces in the array and decide that it has not found any spaces to put the entry. This can leave lots of holes in the array for entries to go.

Although I don't know exactly how pseudo-random probing goes back to find elements in the future, but it would have to track the path for each entry in order to find the element again when it goes back to get the element. Since it is pseudo-random, will that pseudo-random function give the same number again when trying to find the path to the element it needs to find? I think it would be extremely difficult to implement this so that it works efficiently. Clustering with linear probing may have to be the trade off.

2a

Probe sequence for finding Jasmine's phone number:

$J = 9$

$9 \bmod \text{table size} = 9 \bmod 5$  so look at 4

4 is not Jasmine. Wrap around to 0.

0 is not Jasmine.  $0 + 1$ .

1 is not Jasmine.  $1 + 1$ .

2 is not Jasmine.  $2 + 1$ .

3 is not Jasmine.  $3 + 4$ .

Already looked at 4, Jasmine not found.

**2b**

The sequence of probes used to add Dennis with phone number (802) 555-5555:

$D = 3$

3 is occupied.  $3 + 1$ .

4 is occupied. Wrap around to 0.

0 is occupied.  $0 + 1$ .

1 is not occupied, put Dennis there with value (802) 555-5555.