CS314H CSB FA24 Class Notes
Lecture 10: Open Addressing

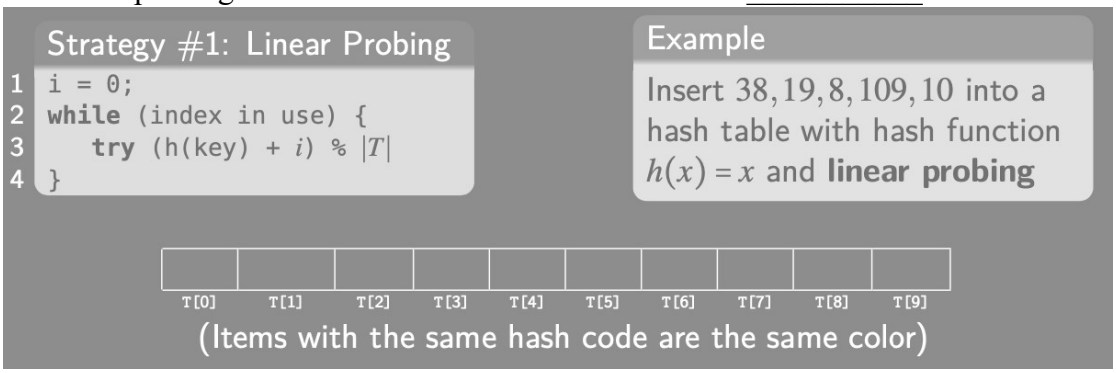
Open addressing

1. Open addressing resolves collision by choosing a different location when the default hashed position is full. We will be talking about 3 types of open addressing

   - L_____ probing
   - Q_____ probing
   - D_____ hashing

Linear probing

2. Linear probing searches for the next available slot in a _____ manner.



3. Time complexity Find:

Insert:

Delete:

4. How would you delete an item? (This also changes the behavior for find and insert. How?)
   Lazy delete:

5. Circle what linear probing satisfies well.
   1) We should be able to reproduce the path
   2) We want to use most of the spaces in the table
   3) We should avoid putting keys close together

Which criteria is not met by linear probing?

6. P_____ c_____ is when different keys collide to form one big group.

7. Which one is worse in terms of number of probes? (Successful find, unsuccessful find) Why?

Mathematical analysis of primary clustering

P_s: the average number of probes for successful find

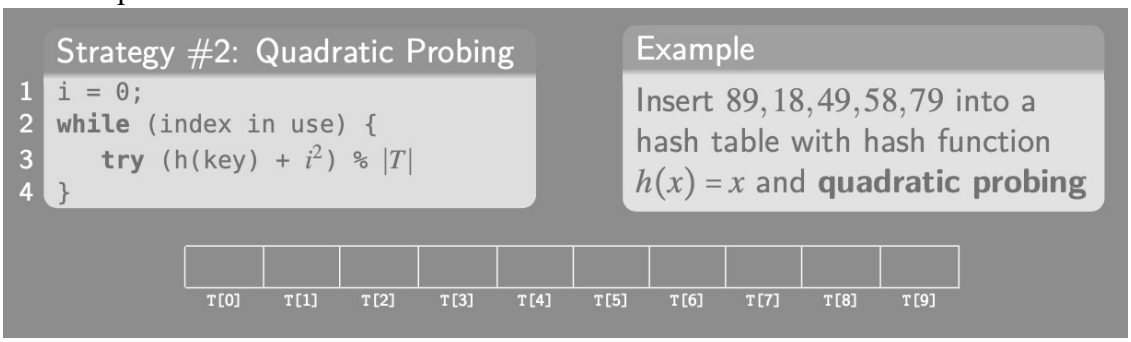
$$P_s = \frac{1}{2}\left(1 + \frac{1}{1-\lambda}\right)$$

P_u is the average number of probes for unsuccessful find

$$P_u = \frac{1}{2}\left(\frac{1}{(1-\lambda)^2}\right)$$

Quadratic Probing

8. Example



Can you insert 47?

9. (True/False) Quadratic probing can always insert element as long as there exists an empty slot.

10. Quadratic probing will always find an empty slot in at most _____ probes given two conditions below. (Optional reading: formal proof)

    - m is a _____ number.
    - Load factor < _____.

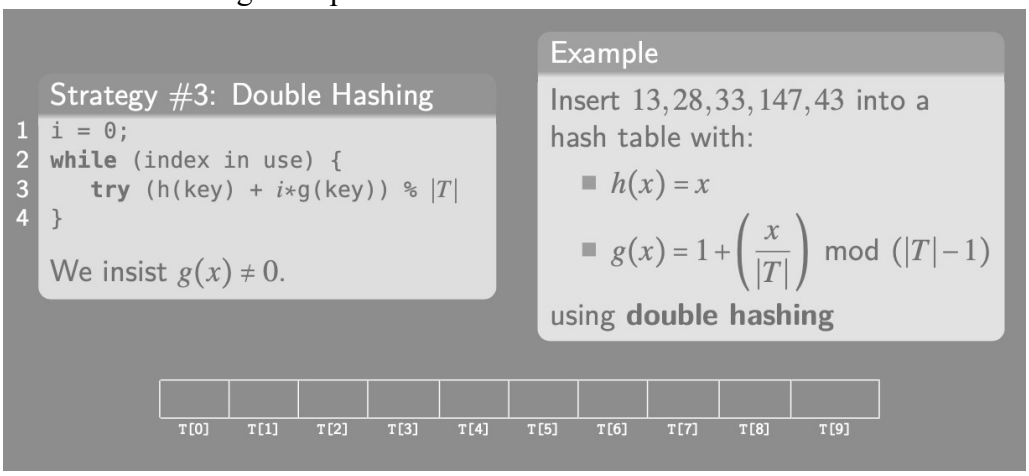
11. What is secondary clustering? Why is bad?

12. How can we avoid secondary clustering? To have a probing function that depends on _____. That way each key will have a different probing sequence avoiding secondary clustering.

Double Hashing

13. Double hashing's basic idea: each key "jumps" in their own way by using another _____ as a probe function to handle collision.

14. Double hashing example



Can you insert 43?

15. We will not have such cycle with two _____ numbers p, q such that 2<q< p:
    - h(key) = key mod ____
    - g(key)=___ − (key mod ___)