

ECAP770

ADVANCE DATA STRUCTURES

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Learning Outcomes



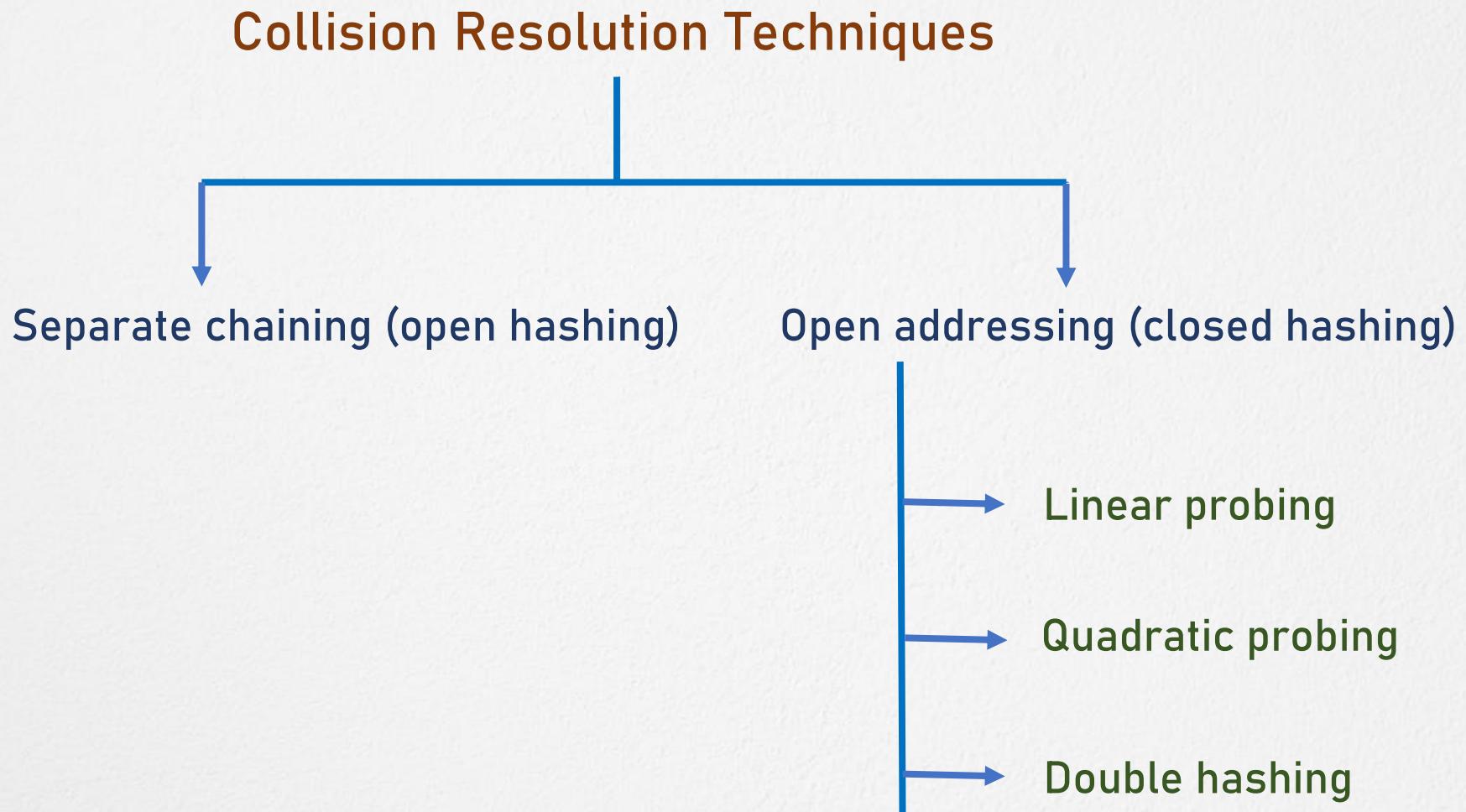
After this lecture, you will be able to

- understand Collision Resolution Techniques

Collision Resolution

- When two keys or hash values compete with a single hash table slot, then Collision occur.
- To resolve collision we use collision resolution techniques.
- Collisions can be reduced with a selection of a good hash function.

Collision Resolution Techniques



Separate Chaining

- In this technique, a linked list is created from the slot in which collision has occurred, after which the new key is inserted into the linked list.
- This linked list of slots looks like a chain, so it is called separate chaining.

Performance of Chaining

Load factor $\alpha = n/m$

m = Number of slots in hash table

n = Number of keys to be inserted in hash table

Expected time to search = $O(1 + \alpha)$

Expected time to delete = $O(1 + \alpha)$

Time to insert = $O(1)$

Time Complexity

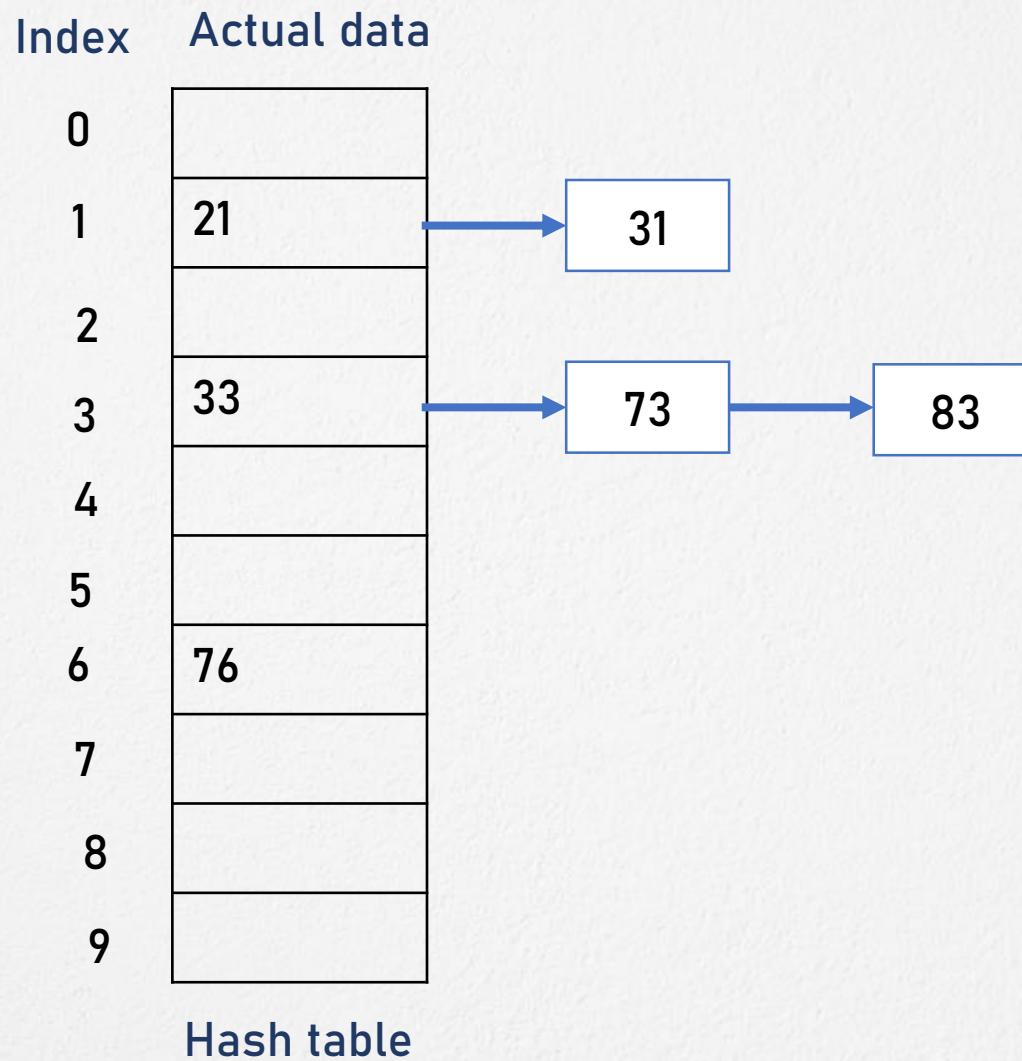


Worst case complexity for searching is $O(n)$.



Worst case complexity for deletion is $O(n)$.

Separate chaining



Example: Separate chaining

$$h(k) = k \bmod 10$$

$$5 \% 10 = 5$$

$$10 \% 10 = 0$$

$$15 \% 10 = 5$$

$$18 \% 10 = 8$$

$$13 \% 10 = 3$$

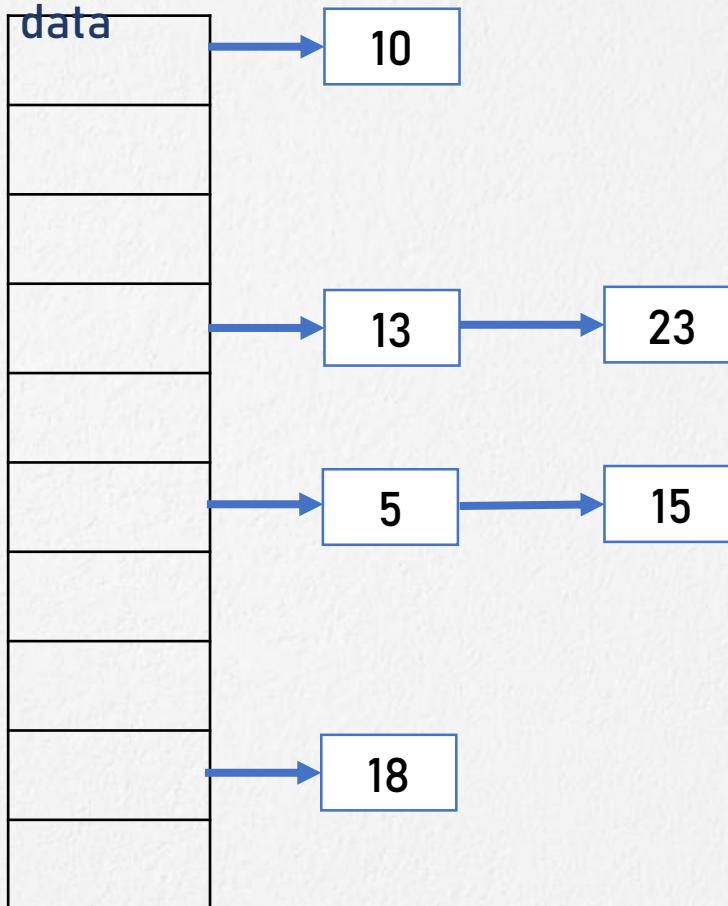
$$23 \% 10 = 3$$

Key

Index

0
1
2
3
4
5
6
7
8
9

Actual
data



Hash table

Advantages of Separate Chaining

- It is easy to implement.
- The hash table never fills full, so we can add more elements to the chain.
- It is mostly used when it is unknown how many and how frequently keys may be inserted or deleted.
- It is less sensitive to the function of the hashing.

Disadvantages of Separate Chaining

- The cache performance of chaining is not good.
- The memory wastage is too much in this method.
- It requires more space for element links.
- If the chain becomes long, then search time can become $O(n)$ in the worst case.

That's all for now...