



# HASHTABLES IMPLEMENTATION

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# INTRODUCTION

## What are hash tables?

- A hash table (hash map) is a data structure which implements an associative array abstract data type, a structure that can map keys to values
- A hash table uses a hash function to compute an index into an array of buckets or slots, from which the desired value can be found

# LINEAR PROBING

**In this strategy, all entry records are stored in the bucket array itself. When a new entry has to be inserted, the buckets are examined, starting with the hashed-to slot and proceeding in some probe sequence, until an unoccupied slot is found. When searching for an entry, the buckets are scanned in the same sequence, until either the target record is found, or an unused array slot is found, which indicates that there is no such key in the table.**

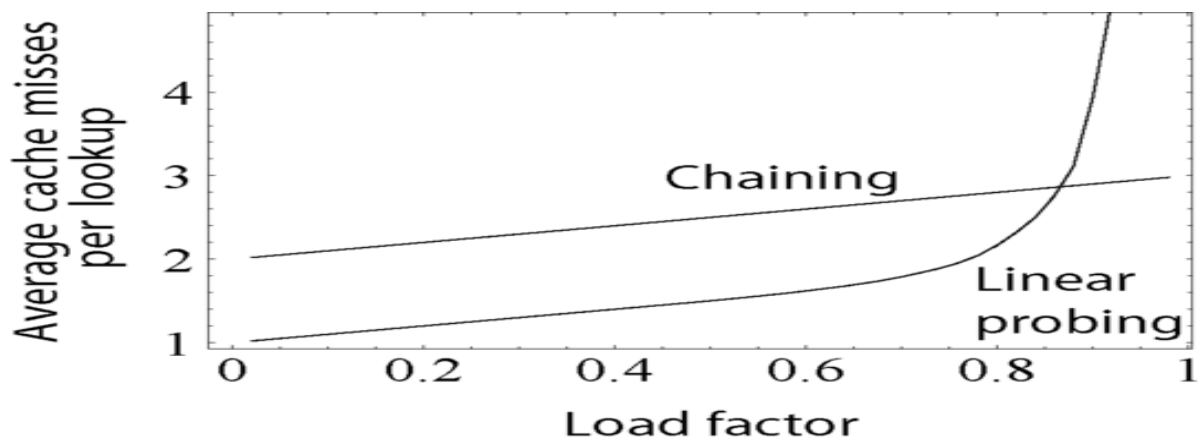
# SEPARATE CHAINING

In the method known as separate chaining, each bucket is independent, and has some sort of list of entries with the same index. The time for hash table operations is the time to find the bucket (which is constant) plus the time for the list operation.

# COMPARISON

- Generally, linear probing is faster than separate chaining
- But, at the worst case (which is a big number of collisions), linear probing starts to consume too much time
- On the other hand, separate chaining keeps its change in time (slope) constant
- So, in case of few collisions, Linear probing is better. But, in case of many collisions, separate chaining has the advantage.

Tab 4



# SAMPLE RUNS

```
"C:\Users\LENOVO\Documents\Code Blocks\DS_Assignment_3(ID_4774)\bin\Debug\DS_Assignment_3(ID_4774).exe"
//*****Getting The Tables Ready*****//
Image Inserted into Hash Table At Index 891 with ID 0 with key 283891
Image Inserted into Hash Table At Index 598 with ID 1 with key 430598
Image Inserted into Hash Table At Index 799 with ID 2 with key 148799
Image Inserted into Hash Table At Index 226 with ID 3 with key 563226
Image Inserted into Hash Table At Index 734 with ID 4 with key 295734
Image Inserted into Hash Table At Index 326 with ID 5 with key 208326
Image Inserted into Hash Table At Index 581 with ID 6 with key 307581
Image Inserted into Hash Table At Index 773 with ID 7 with key 311773
Image Inserted into Hash Table At Index 28 with ID 8 with key 446028
Image Inserted into Hash Table At Index 101 with ID 9 with key 481101
Image Inserted into Hash Table At Index 236 with ID 10 with key 441236
Image Inserted into Hash Table At Index 109 with ID 11 with key 420109
Image Inserted into Hash Table At Index 919 with ID 12 with key 347919
Image Inserted into Hash Table At Index 266 with ID 13 with key 431266
Image Inserted into Hash Table At Index 59 with ID 14 with key 237059
```

Tab 5

```
"C:\Users\LENOVO\Documents\Code Blocks\DS_Assignment_3(ID_4774)\bin\Debug\DS_Assignment_3(ID_4774).exe"
Image Inserted into Hash Table At Index 46 with ID 989 with key 372046
Image Inserted into Hash Table At Index 316 with ID 990 with key 394316
Image Inserted into Hash Table At Index 843 with ID 991 with key 529843
Image Inserted into Hash Table At Index 912 with ID 992 with key 370912
Image Inserted into Hash Table At Index 767 with ID 993 with key 396767
Image Inserted into Hash Table At Index 787 with ID 994 with key 294787
Image Inserted into Hash Table At Index 236 with ID 995 with key 632236
Image Inserted into Hash Table At Index 618 with ID 996 with key 444618
Image Inserted into Hash Table At Index 480 with ID 997 with key 675480
Image Inserted into Hash Table At Index 886 with ID 998 with key 715886
Image Inserted into Hash Table At Index 914 with ID 999 with key 279914
//*****Time Of Linear Probing*****//
----> 0.350000
//****Time Of Separate Chaining****//
----> 0.318000
//*****Initialization Completed*****//
Enter The ImageFile Name:      test_data.txt
```

# SAMPLE RUNS

```
"C:\Users\LENOVO\Documents\Code Blocks\DS_Assignment_3(ID_4774)\bin\Debug\DS_Assignment_3(ID_4774).exe"
//-----Linear Probing Based HashTable-----//
1. Insert a Record
2. Delete a Record
3. Search a Record
4. Back To Main Menu
Enter Your Option:      1

Enter The Image Number: 1

Hash Table Limit Exceeded

//-----Linear Probing Based HashTable-----//
1. Insert a Record
2. Delete a Record
3. Search a Record
4. Back To Main Menu
Enter Your Option:      2

Enter The Image Number: 1

Image Not Found

//-----Linear Probing Based HashTable-----//
1. Insert a Record
2. Delete a Record
3. Search a Record
4. Back To Main Menu
Enter Your Option:      3

Enter The Image Number: 1

Image Not Found
```

```
"C:\Users\LENOVO\Documents\Code Blocks\DS_Assignment_3(ID_4774)\bin\Debug\DS_Assignment_3(ID_4774).exe"
//-----Separate Chaining Based HashTable-----//
1. Insert a Record
2. Delete a Record
3. Search a Record
4. Back To Main Menu
Enter Your Option:      1

Enter The Image Number: 2

Duplicate image (an image with the same key already exists)

//-----Separate Chaining Based HashTable-----//
1. Insert a Record
2. Delete a Record
3. Search a Record
4. Back To Main Menu
Enter Your Option:      3

Enter The Image Number: 2

Image Found at with ID: 91

//-----Separate Chaining Based HashTable-----//
1. Insert a Record
2. Delete a Record
3. Search a Record
4. Back To Main Menu
Enter Your Option:      2

Enter The Image Number: 2

Image Deleted Successfully. ID is 91

//-----Separate Chaining Based HashTable-----//
1. Insert a Record
2. Delete a Record
3. Search a Record
4. Back To Main Menu
Enter Your Option:      3

Enter The Image Number: 2

Image Not Found
```