Hash Table Runtimes

Learning Objectives

1. Know the runtimes of hashtables

Hash Table Runtimes

	HashTable	
	Expected	Worst Case
Find/Remove		
Insert		
Storage Space		

Simple Uniform Hash Assumption (SUHA)

Given table of size m, a simple uniform hash, h, implies

$\forall k_1, k_2 \in U$ where $k_1 \neq k_2$, $Pr(h[k_1] = h[k_2]) =$

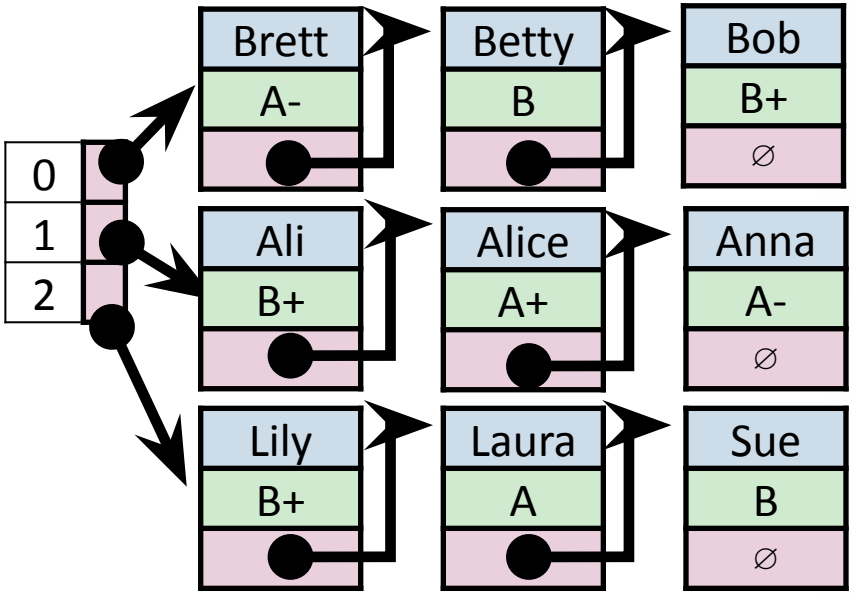
Uniform:

Independent:

Separate Chaining

Given Table of size m with n entries

Claim: With SUHA, expected length of chain is n/m



Resizing (Load Factor)

Select load factor **α**

When n/m > **α**, resize

Runtimes

Linear Probing:

- Successful: **½(1 + 1/(1-α))**
- Unsuccessful: **½(1 + 1/(1-α))^2**

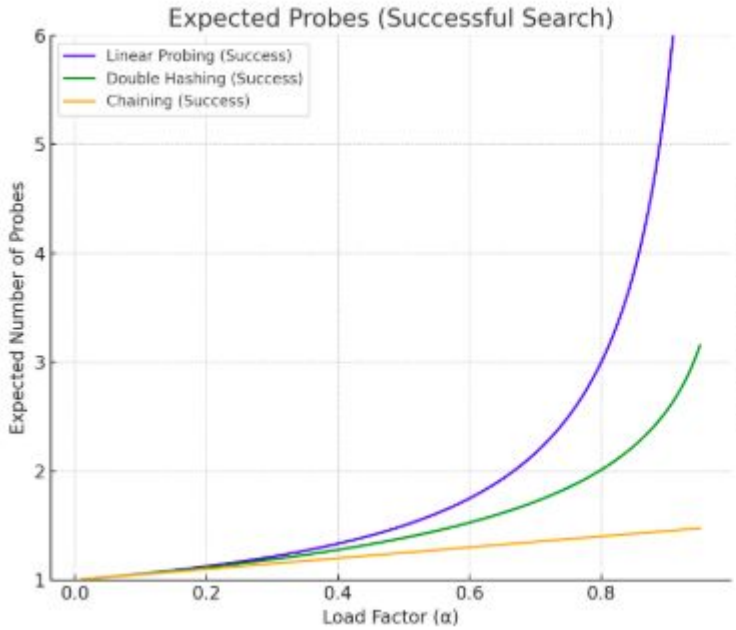
Double Hashing:

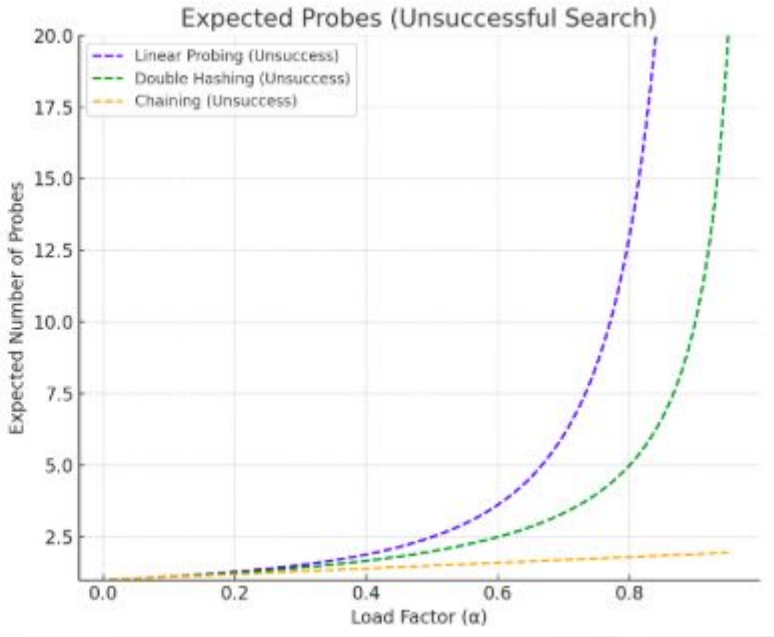
- Successful: **1/α * ln(1/(1-α))**
- Unsuccessful: **1/(1-α)**

Separate Chaining:

- Successful: **1 + α/2**
- Unsuccessful: **1 + α**

Runtimes


Expected Probes (Successful Search)
Linear Probing (Success)
Double Hashing (Success)
Chaining (Success)
Expected Number of Probes
Load Factor (α)
1
2
3
4
5
6
0.0
0.2
0.4
0.6
0.8


Expected Probes (Unsuccessful Search)
Linear Probing (Unsuccess)
Double Hashing (Unsuccess)
Chaining (Unsuccess)
Expected Number of Probes
Load Factor (α)
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
0.0
0.2
0.4
0.6
0.8