Today's announcements:

MP6 available, due 4/12, 11:59p.

Exam 2: returned in section this week.

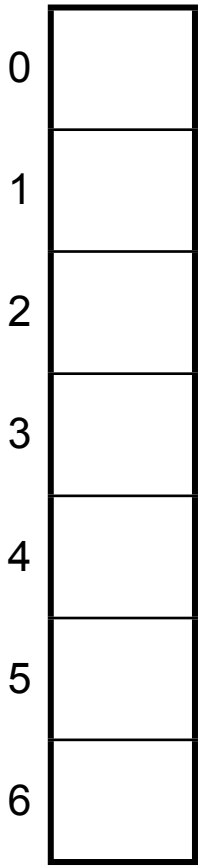
HASHING - a brief conversation about the keyspace...

Balanced BST vs Hash Tables

http://groups.engin.umd.umich.edu/CIS/course.des/cis350/hashing/WEB/HashApplet.htm

Probe based hashing: (double hashing)

S = {16, 8, 4, 13, 29, 11, 22} |S| = n $H(k,i) = h_1(k) + ih_2(k)$



Hash table performance: expected # of probes for Find(key) under SUHA

Linear probing -

successful: $\frac{1}{2}(1 + 1/(1-\alpha))$

unsuccessful: $\frac{1}{2}(1 + 1/(1-\alpha))^2$

Double hashing -

successful: $-\ln(1-\alpha)/\alpha$

unsuccessful: $1/(1-\alpha)$

Separate chaining -

successful: $1 + \alpha/2$

unsuccessful: $1 + \alpha$

Do not memorize these!

Observe:

- As α increases, running times increase…
- If α is held constant then running times are constant…

ReHashing:

What if the array fills?

Miscellaneous Discussion –

Which hash table implementation is better?

•Big records –

•Structure speed –

What structures do hash tables replace for us?

Why do we talk about balanced BST if hashing is so great?

Applications of hashing?

Area of active research in mathematics to develop general purpose hash functions.

Interview questions!

Consider a stream of integers... you want to know immediately if the stream stops producing unique values.

0	1	2	3	4	5	6	7

Consider a stream of integers... you want to know immediately if you have seen a pair of numbers that sum to 225.

0	1	2	3	4	5	6	7

Interview questions!

Consider an array of n integers... determine if there are 3 integers whose sum is 0, and do it in $O(n^2)$ time.

.

0	1	2	3	4	5	6	7

http://www.ardendertat.com/2012/01/09/programming-interview-questions/

Secret mystery data structure

ADT - _____

insert

remove

getSize

Priority Queue ADT:

insert	removeMin	implementation
O(n)	O(n)	unsorted
O(1)	O(n)	
O(log n)	O(1)	sorted
O(log n)	O(1)