

CSCI 303 Introduction to Algorithms
Spring 2007
February 7th, 2007 class notes

Data Structures & Dynamical Sets:

A dynamical set is a changing set of values. E.g. an inventory in a store.

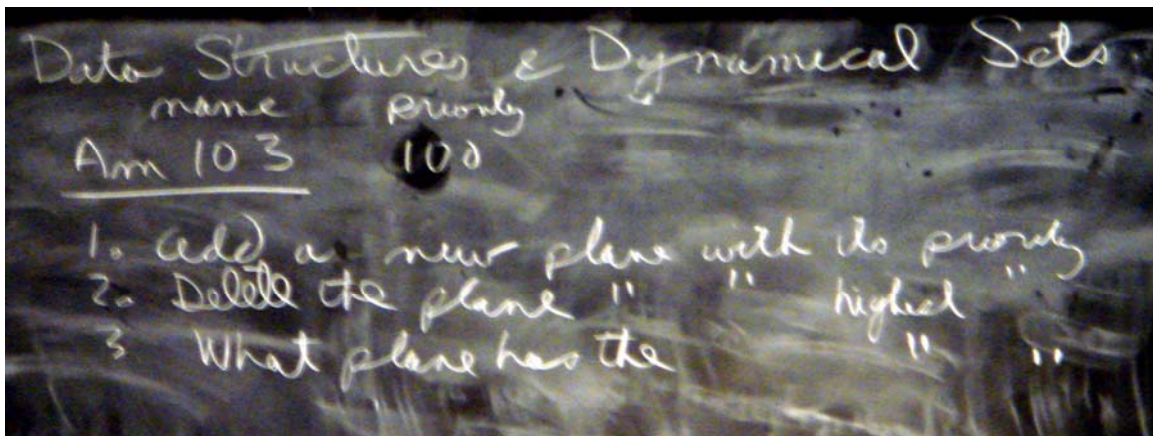
Airport example:

Each plane has a priority (number).

Op₁. Add a new plane with its priority.

Op₂. Delete the plane with the highest priority.

Op₃. What plane has the highest priority?



There are n planes in the database:

Possible implementations:

Operations	Sorted Array	Sorted Linked List
Op ₁	$\Theta(n)$	$\Theta(n)$
Op ₂	$\Theta(n)$	$\Theta(1)$
Op ₃	$\Theta(1)$	$\Theta(1)$

n planes in the Data base P

	Sorted List	Linked List
θ_1	$\theta(m)$	$\theta(m)$
θ_2	$\theta(m)$	$\theta(1)$
θ_3	$\theta(1)$	$\theta(1)$

Plane	Priority
S1	2
U72	6
Am	10
H	1
R6	9

Heaps:

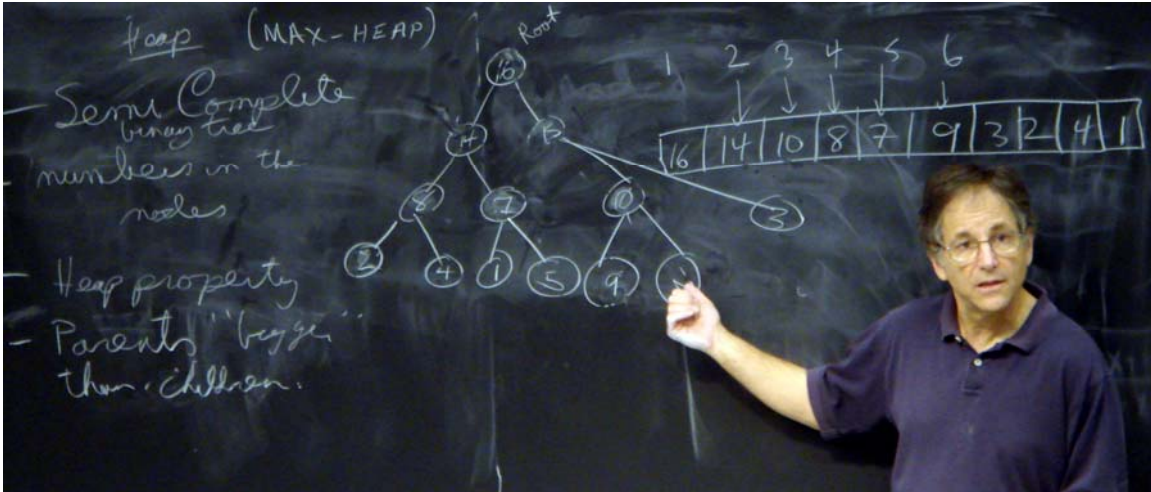
A heap is a semicomplete binary tree that satisfies the heap property.



A semicomplete binary tree is a complete binary tree that is only missing nodes on the bottom row.

Heap property (for MAX-heap) no child can be greater than its parent.

There are many different heaps for most sets of numbers. A heap can be stored in an array (for every node, if it is in position i in the array, its left child is position $2i$ and its right child is in position $2i+1$).



Operations	Heap
Op ₁	Height of the heap
Op ₂	
Op ₃	$\Theta(1)$

Adding a new node: create a new node in the semicomplete binary tree, compare that node with its parent (grandparent, great-grandparent, etc.) to fix the heap property.