CSE 101 – Dec 6, 2019 (Week 10) (Half Lecture)

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Binary Search Trees

- Binary trees
- Complete binary trees (CBT)
- Almost complete binary trees (ACBT)

Let T be an ACBT with n nodes, height h. Then

$$2^h - 1 < n \leq 2^{h+1} - 1$$

$$2^h \leq n < 2^{h+1}$$

$\therefore h \leq \lg n < h + 1$

$\therefore h = \lfloor \lg n \rfloor$

6.1 Heaps

Two things:

- ACBT
- An array
- Helper functions

Attributes:

- $heapSize[A]$
- $length[A]$

Helper functions

$\text{Parent}(i) = \lfloor \frac{1}{2} \rfloor \qquad (i > 1)$

$\text{Left}(i) = 2i$

$\text{Right}(i) = 2i + 1$

Heap properties

Max: $A[\text{Parent}(i)] \geq A[i]$

Min: $A[\text{Parent}(i)] \leq A[i]$

How?

- Heapify
- BuildHeap

Why?

- HeapSort
- Priority Queue operations
  - Insert
  - ExtractMax
  - Max
  - IncreaseKey