Divide-And-Conquer : Structural Induction

Structural Induction - Examples

- Inductive Structure of Problem: Example 1-a
  - List / Array: Induction on size (say, N)

Consider sub-problem of size N-1

Where is this used? Provide an example

Structural Induction

- Inductive Structure of Problem: Example 1-b
  - List / Array: Induction on size (say, N)
    - Consider sub-problems of size N/2

Where is this used? Provide an example

Structural Induction

- Inductive Structure of Problem: Example 1-c
  - List / Array: Induction on size (say, N)
    - Consider sub-problems of size K, and N-K where K is variable.

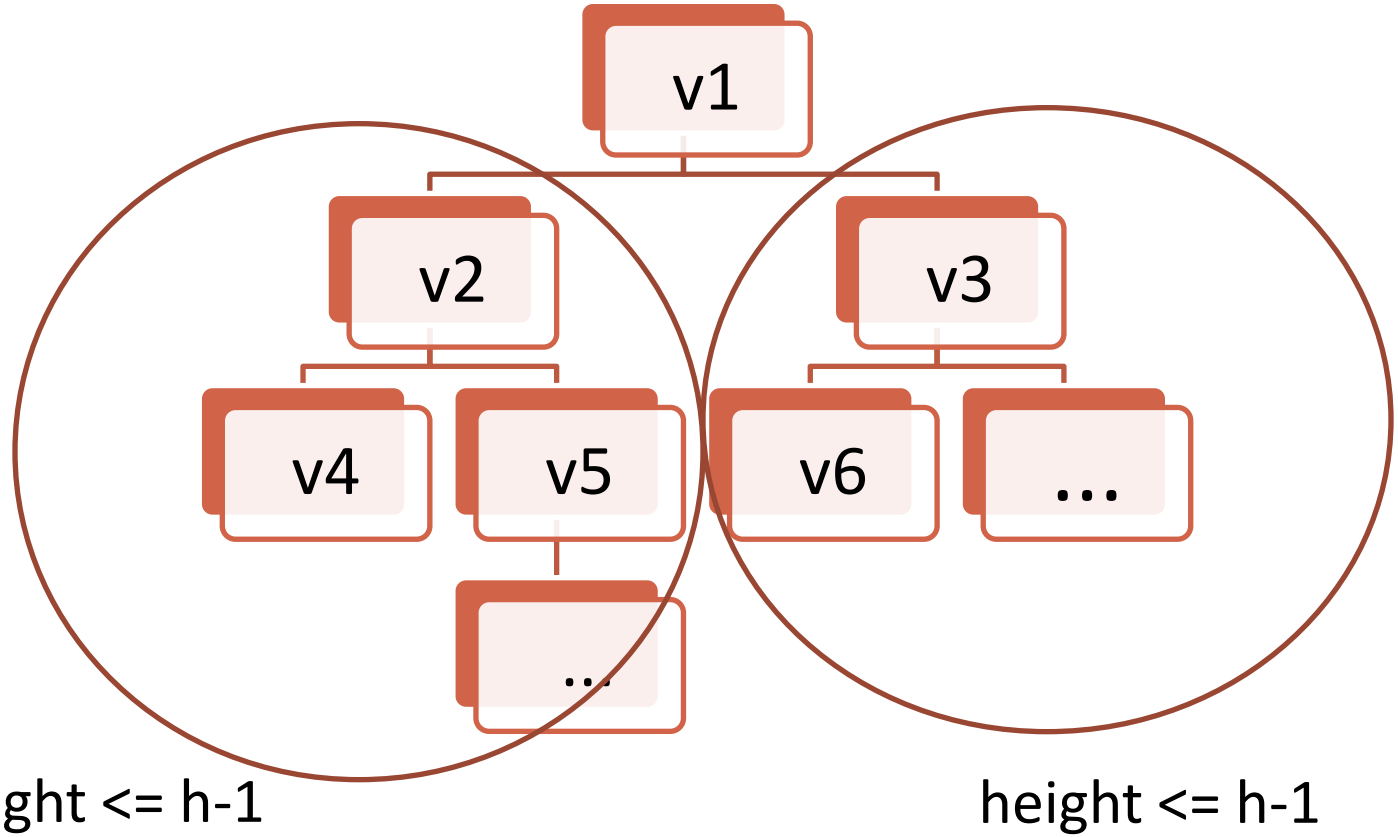
Where is this used?

Provide examples : provide values / ranges of K.

Structural Induction

- Inductive Structure of Problem: Example 2

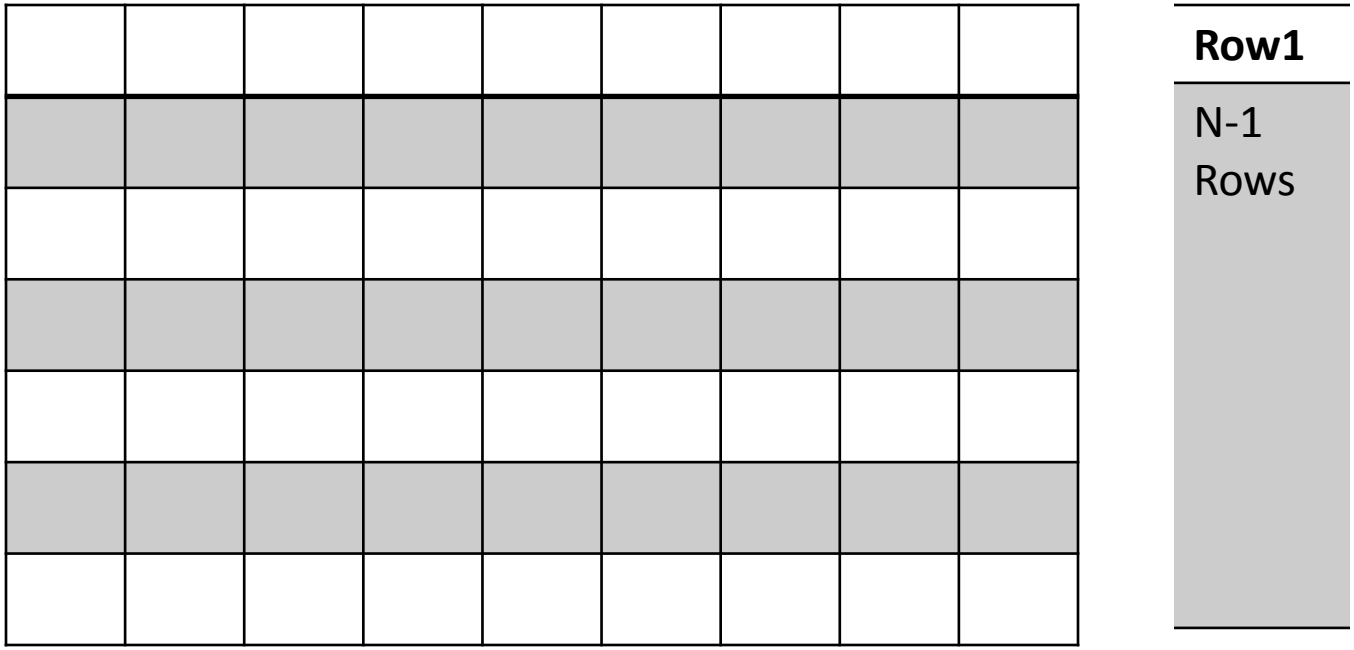
Binary Trees: Induction on height (h)



Structural Induction

Inductive Structure of Problem: Example 3

Matrix : Induction on size (say M*N)
Consider sub-problems of size 1*N and (M-1)*N



What are the other possible decompositions of a matrix?

Structural Induction On Matrices

- How do you choose between row-major vs. column major decompositions?
  - i.e. what does it depend on?
- The choice between row-major access vs. column-major access of a matrix is decided on the basis of the actual representation (storage)
  - i.e. whether the matrix is stored row-after-row or column-after-column in memory
    - Note that the memory is linear or one-dimensional.
- The cost of accessing data and the order of storage must align:
  - Locality of Reference(s)