Binomial Trees

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Computer Science at fingertips

Binomial Trees are one of the type of trees that are defined **recursively**. A Binomial tree of order 0 is a single node and a binomial tree of order n has a root node whose children are roots of binomial trees of order n-1, n-2, n-3, n-4, ...3,2,1,0.

Properties of Binomial Tree

- There are 2^n nodes in a binomial tree of order **n** where n is the order and degree of tree(Fig 1).
- Deleting roots yield binomial trees $B_{n-1}, B_{n-2}, \ldots 0$.
- B_n has $\binom{n}{d}$ **nodes** at depth d.

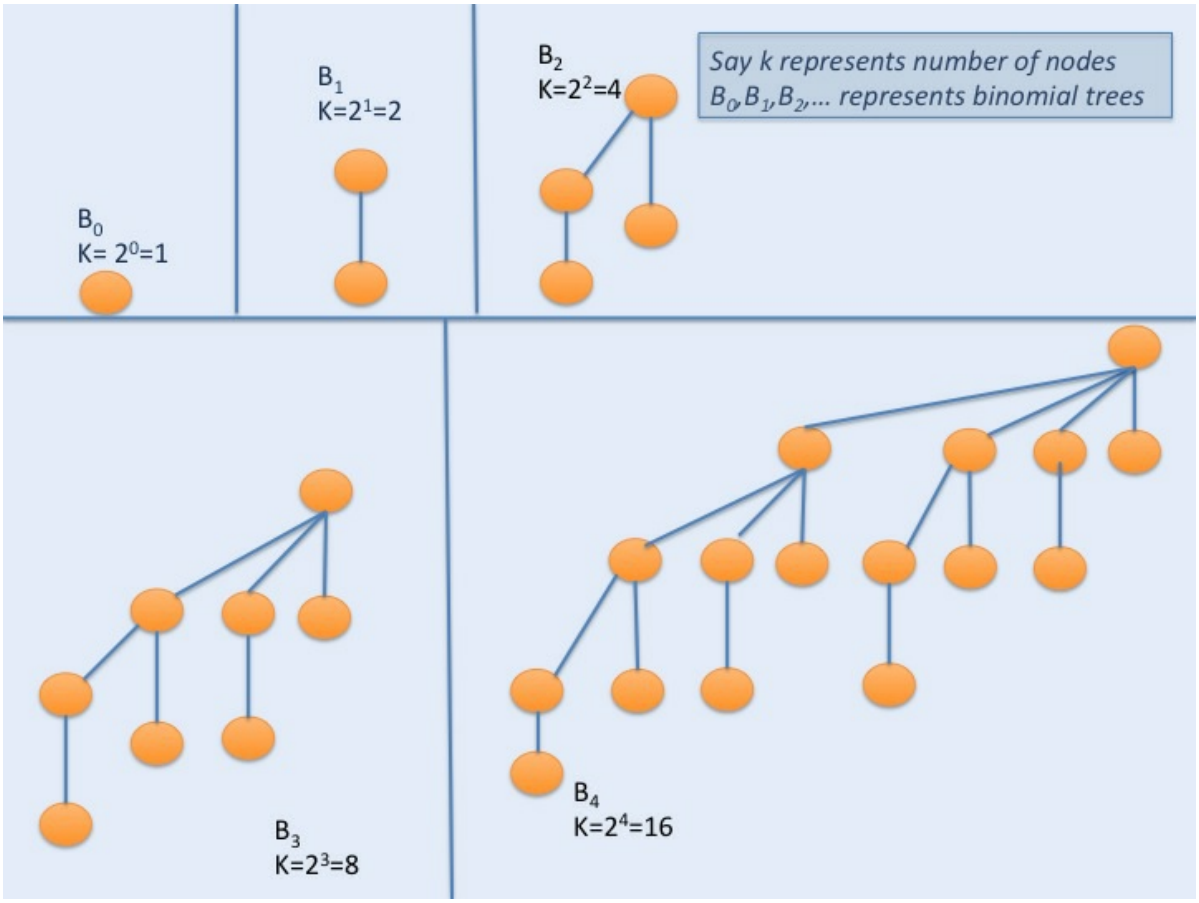

Fig 1 : Binomial Tree

Binomial Tree of height/order(n)=0

When height =0 then **single** node will be present in Binomial tree(Fig 2).

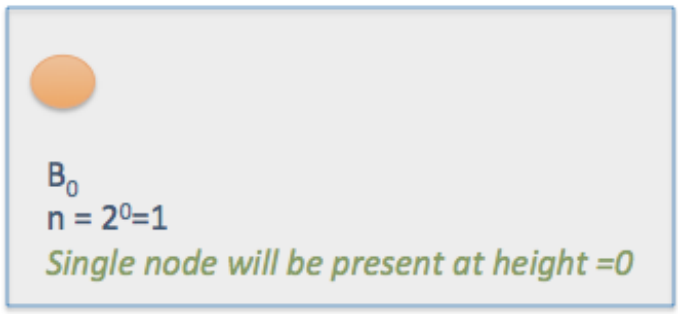

Fig 2 : Binomial Tree of Order 0

Binomial Tree at height (n)=1

When n=1 then 2^1 =**2** nodes will be present in the tree(Fig 3).

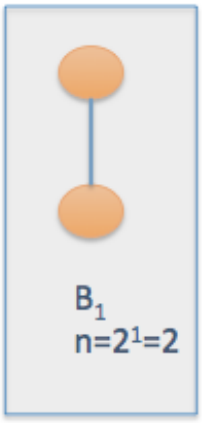

Fig 3 : Binomial Tree of order 1

Binomial Tree of order=2

When n=2 then 2^2 = **4 nodes** will be present in the tree.The subtree is **binomially** attached to the root node(Fig 4).

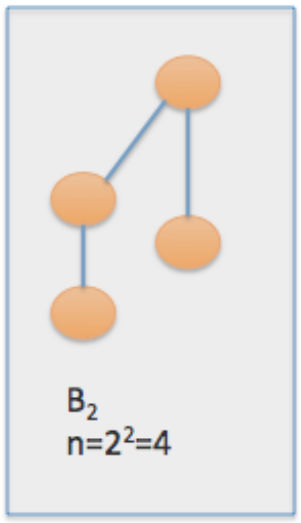

Fig 4 : Binomial Tree of order 2

Binomial Tree of order 3

If order of tree is 3,then 2^3 nodes are present in the Binomial tree.**The root is connected to subtrees of order 0**(green color)**,1**(red) **and 2**(black)(Fig 5)**.**

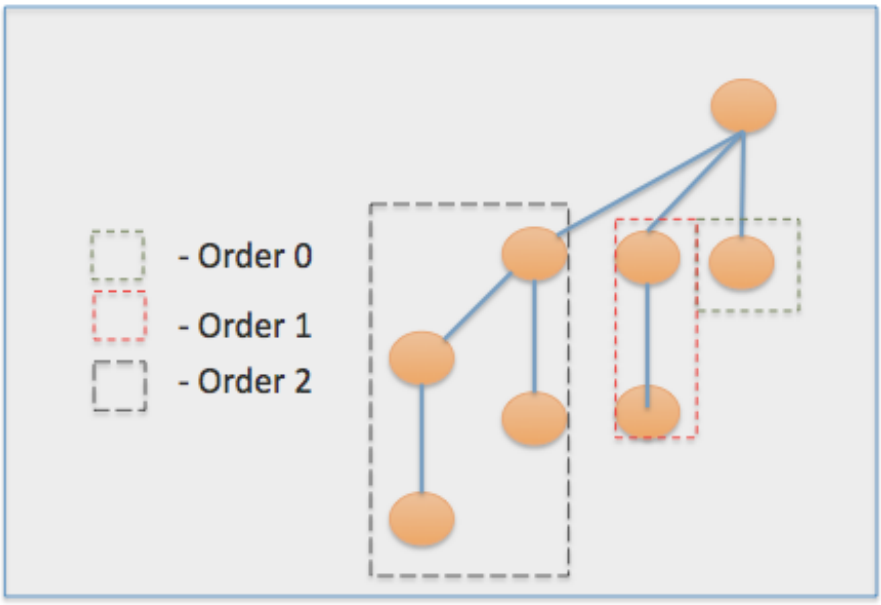

Fig 5 : Binomial Tree of order 3

B_n has $\binom{n}{d}$ nodes at depth d.

If we have a binomial tree of order n,then we can trace the number of nodes at any depth by $\binom{n}{d}$.For e.g the no of nodes of binomial tree of order 4 at depth 2 will be**6**.(Fig 6).In fig 7,number of nodes at level 2 is 6 and is shown by red highlighted area.

$$\binom{4}{2} = 6$$

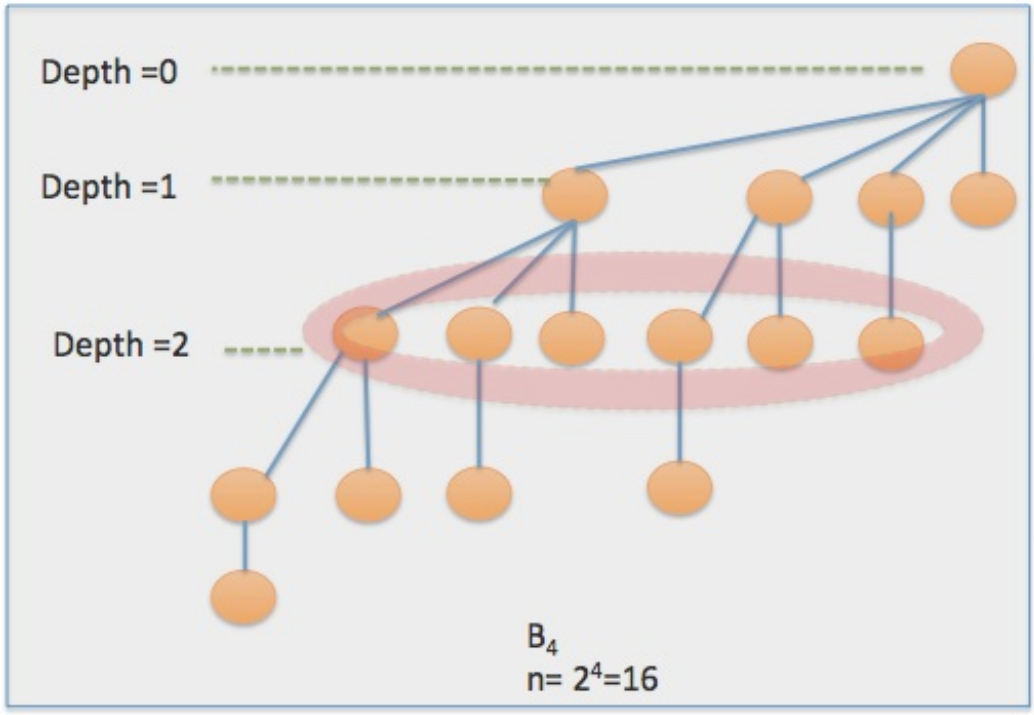

Fig 6 : Binomial Tree of order 4

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