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Scribed Notes

Types of number systems:

1. Integers
2. Rational
3. Algebraic
4. Irrational
5. Complex
6. Transcendental

Vectors: A list of numbers in an ordered manner (**i.e. order is important**) in known as a vector.

Ex: (5,3,12,6)

Finite State Systems:

It processes the finite string data which is always a string over its alphabet and check whether the string belongs or not.

The computation should only be performed by reading the string on character at a time, end to end.

How a Finite State System Works?

It reads a string from the finite set character by character from left to right, and it takes an action at each step according to the rules defined.

Computational Problems: Problems for which a generalized code can be written to process the given finite set and generate an output.

For ex:

(1) Is the given set sorted?

INPUT: A1= {5,7,22,6,2}

OUTPUT: NO

INPUT: A1= {3,6,7,12,11}

OUTPUT: YES

(2) Does the given set have distinct numbers?

INPUT: A1= {2,4,3,1}
OUTPUT: YES

INPUT: A1= {2,4,1,4,7}
OUTPUT: NO

Decision Problems: Computational problems which are having output space as {Yes, No} are called as Decision Problems.

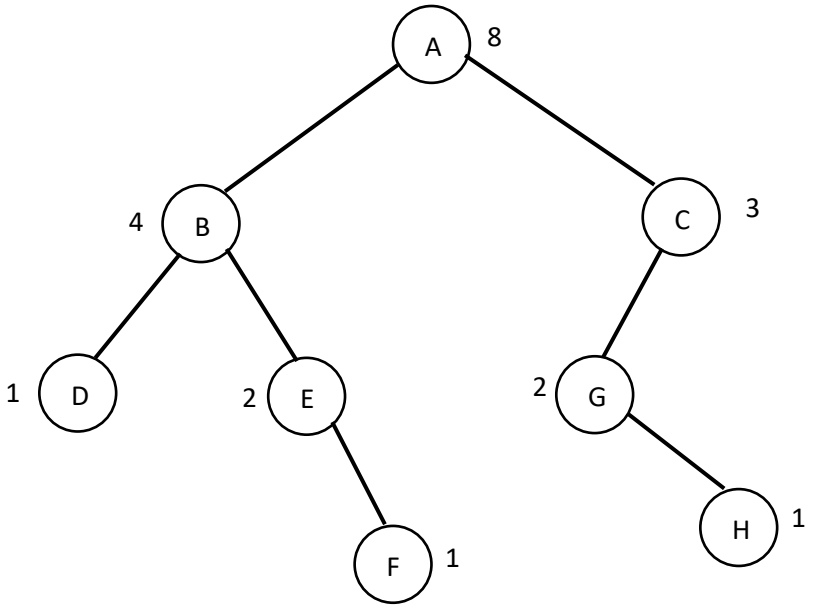
Example:

Check Balance Binary tree,

The highest size subtree side must less than or equal to the twice of other size of subtree.

1) Subtree size algorithm:

```
Subtree_size (tree, node)
1: if (x == NULL)
        Then return 0
2: Else y ← Subtree_size(left(x))
3: z ← Subtree_size(right(x))
4: return y + z + 1;
```



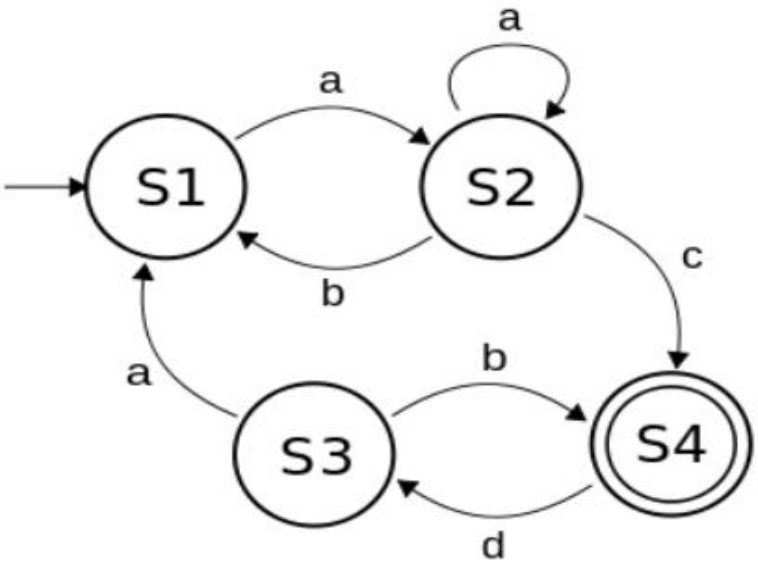
we can see that |L| = 4 and |R| = 3

So, answer for Balance tree is **True**, because size of left subtree is less than the twice of size of right subtree.

Example to Understand the concept of Finite State System:

In this diagram S1 is the initial stage where the mapping begins, and the one having **double circles** are called the **accepting states**.

If the final state is at the accepting state, then the string is accepted else rejected.



Q: set of all states
∑: finite set of input symbol where δ: Q x ∑ →Q
q0: initial state
F: final state

Example 1:

Q = {S1, S2, S3, S4}

∑ = {a, b, a, c}

q0 = {S1}

F = {S4}

Here as the Final State is at the Accepting state that is S4, hence this string is accepted.

Example 2:

Q = {S1, S2, S3, S4}

∑ = {a, a, a, c, d}

q0 = {S1}

F = {S3}

Here as the Final State is not at the Accepting state rather it is at S3, hence this string is not accepted.