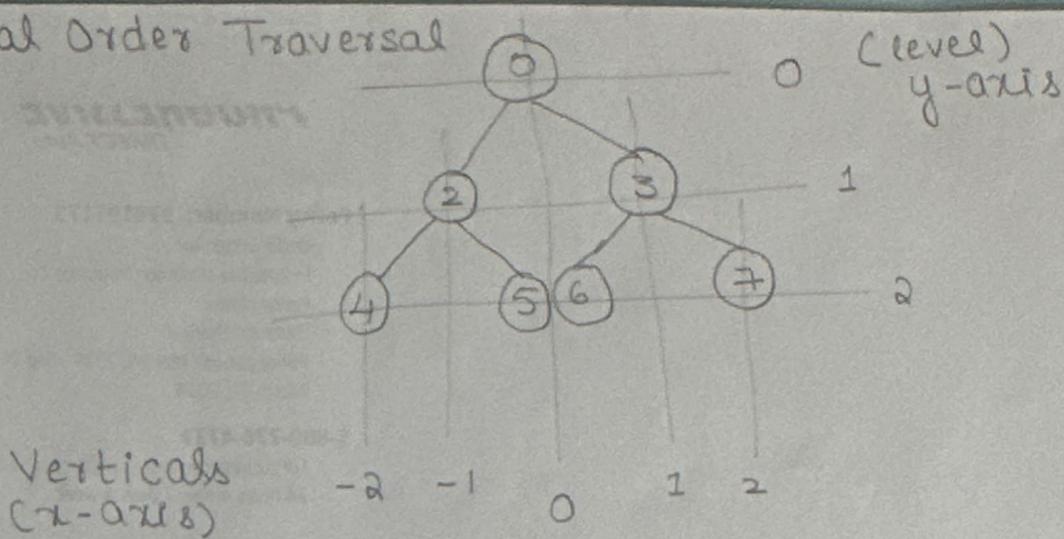


Vertical Order Traversal



Vertical Order Traversal

= top to bottom ordering starting from left to right.

i.e:

- ① First, we need to traverse based on column (x-axis)
- ② Second, we need to traverse based on row (y-axis)

To Store Value Column Wise — We can use a dictionary

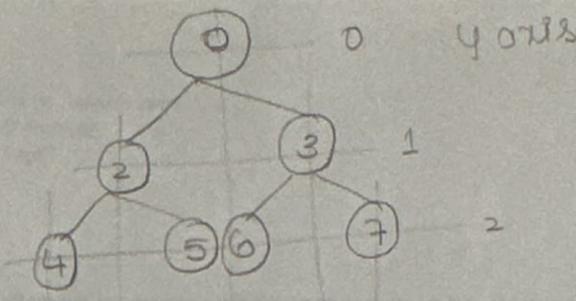
whose Key = Column

Value = (row, node)

{ key : [(row, node)]
 ↓
 Column }

while storing value in dictionary, we store row, node value.
This is because we need to arrange data row wise
↓
(left to right)

By storing it this way, it will be easy to sort the data.
First we sort data row wise, if same row has
multiple node, then we automatically sort data by value



rows -2 -1 0 1 2

1# To store data column wise we can traverse the tree & append value in dictionary.

- POP : 000
- add left & right child to stack

000
node, row, col • append value to dic

- POP : 2,1,-1
- add left & right child to stack
- append value to dic

- POP (3,1 1)
- add its left & right child
- append value to dic

- POP 4 2 -2
- No children
- append value to dic

Column wise data
 Key : value
 col rows, data
 0 : [(00)]

{ 0 : [[0,0]]
 -1 : [[1,2]]

{ 0 : [[00]]
 -1 : [[12]]
 1 : [[13]]

{ 0 : [[00]]
 -1 : [[12]]
 1 : [[13]]
 -2 : [[24]]

722
620
520
420

722
620
520

- POP 5 2 0
- No children
- append to dic

{ 0: [[00] [25]]
-1: [[12]]
1: [[13]]
-2: [[24]]

722
620

- POP 6 2 0
- No children
- append to dic

{ 0: [[00] [25] [26]]
-1: [[12]]
1: [[13]]
-2: [[24]]

722

- POP 7 2 2
- No children
- append to dic

{ 0: [[00] [25] [26]]
-1: [[12]]
1: [[13]]
-2: [[24]]
2: [[27]]

Our Dictionary looks like this before moving to step 2

0: [[00], [25], [26]]

-1: [[12]]
1: [[13]]
-2: [[24]]
2: [[27]]

from the above dic we can easily get to know the range of x-axis, using that we can traverse left to right.

$$\text{min_col} = -2, \quad \text{max_col} = 2$$

so we traverse from top to bottom (ie from leftmost column to rightmost column) & store value

$$\text{Col} : -2, \quad [[4]]$$

$$\text{Val} = 4$$

$$\text{Col} : -1 \quad [[4] [2]]$$

$$\text{Val} = 2$$

$$\text{Col} 0$$

$$\text{Value} = [[0\ 0], [2\ 5], [2\ 6]]$$

so here we move level wise. i.e from top level

0 to bottom level.

since we stored data (row, value), we can easily traverse the dictionary & get the value.

Also, when we have multiple node on same level eg [2 5] [2 6], we must sort the value & append

$$\text{so } [0 \ 5 \ 6]$$

\downarrow
from level 0

\downarrow
from level 2,

sorted based on value

COL: 1

VAL : 3 [[4] [2] [0 5 6] (3)]

COL: 2

[[4] [2] [0 5 6] [3] [7]]

VAL : 7

Final OP

-2 -1 0 1
[[4] [2] [0 5 6] [3] [7]]
0 2 2
 $\leftarrow \begin{matrix} \text{row wise traversal} \\ \rightarrow \end{matrix}$
 $\leftarrow \text{Column wise traversal} \rightarrow$