Matrix to Tree Converter

Data Structures Assignment

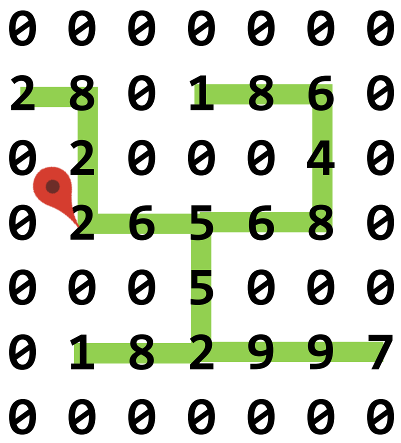
NTHU EE and CS

Overview

- Given
    - A matrix of digits
    - A starting position
    - Traversal method
- Task
    - Convert the nonzero digits of the matrix into a tree
        - The input matrix guarantees no cycle
    - Print out the digits based on the specified tree traversal methods

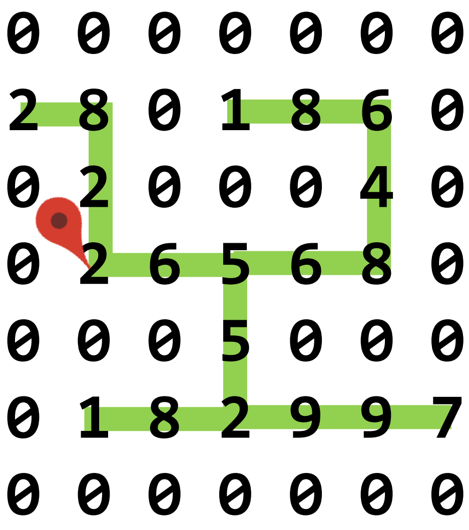
Matrix and Tree Specification

- Each matrix cell contains a digit value ranged from 0 to 9
- The starting position of the matrix represents the root of the tree
  - The starting position cannot be 0
- Each tree node can have up to four children
  - Left, Down, Right, Up
- Take the right figure as an example
  - The root is 2, and it has two children
    - Up for 2 and right for 6

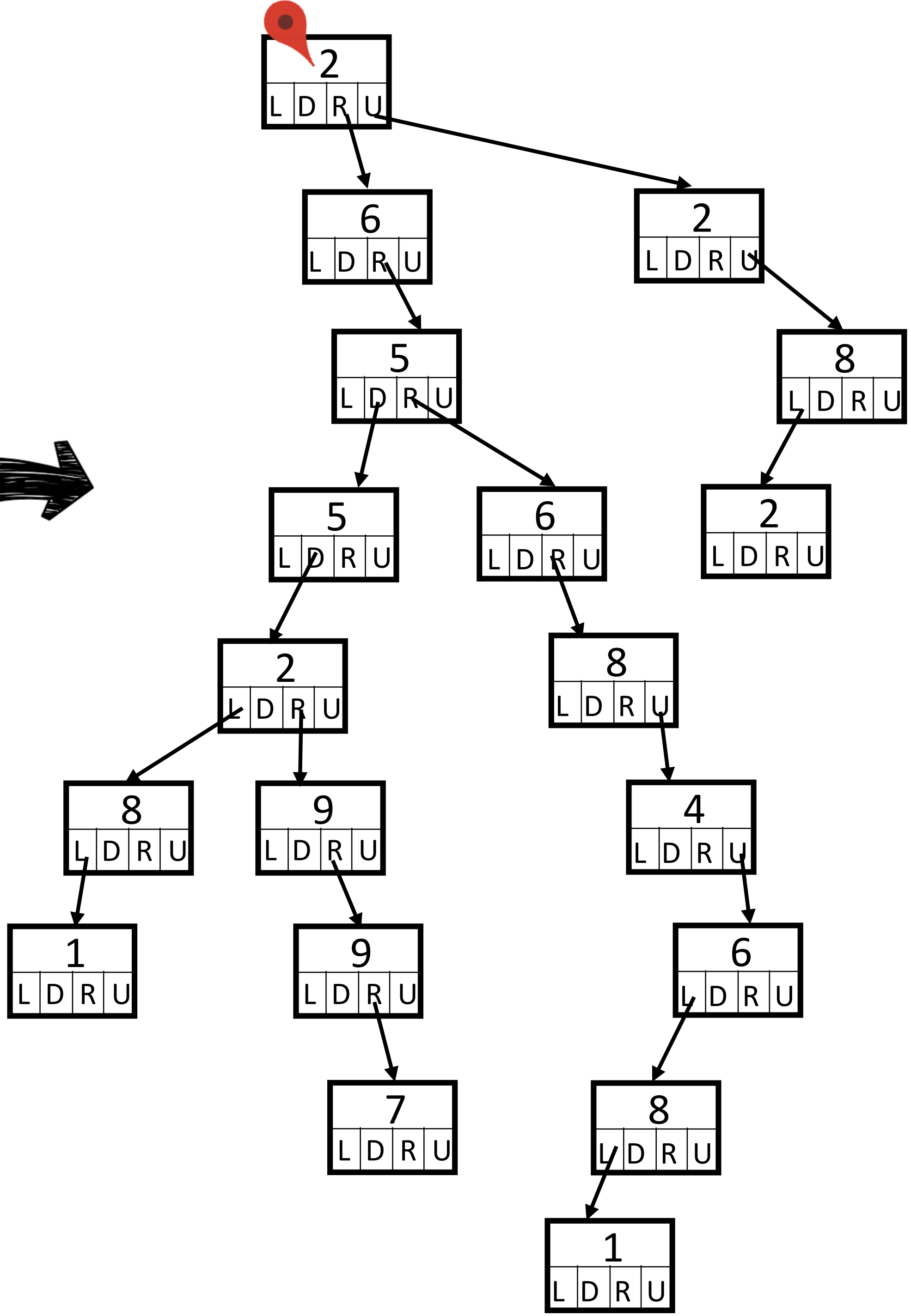


```
0 0 0 0 0 0 0
2 8 0 1 8 6 0
0 2 0 0 0 4 0
0 2 6 5 6 8 0
0 0 0 5 0 0 0
0 1 8 2 9 9 7
0 0 0 0 0 0 0
```

Example



```
0 0 0 0 0 0 0
2 8 0 1 8 6 0
0 2 0 0 0 4 0
0 2 6 5 6 8 0
0 0 0 5 0 0 0
0 1 8 2 9 9 7
0 0 0 0 0 0 0
```



Tree Node Format

Digit			
Left	**Down**	**Right**	**Up**

Sample Input

Number of matrices (≥ 1)

Width and Height

Position of the starting digit (X and Y)

The matrix

Traversal method

```
1↲
7 7↲
1 3↲
0 0 0 0 0 0 0↲
2 8 0 1 8 6 0↲
0 2 0 0 0 4 0↲
0 2 6 5 6 8 0↲
0 0 0 5 0 0 0↲
0 1 8 2 9 9 7↲
0 0 0 0 0 0 0↲
Level-order-traversal↲
```

Traversal method can be one of the following:

- “Level-order-traversal”
- “Pre-order-traversal”
- “Post-order-traversal”

Sample Output

- Repeat the inputs and additionally print out the tree traversal

```
1↲
7 7↲
1 3↲
0 0 0 0 0 0 0↲
2 8 0 1 8 6 0↲
0 2 0 0 0 4 0↲
0 2 6 5 6 8 0↲
0 0 0 5 0 0 0↲
0 1 8 2 9 9 7↲
0 0 0 0 0 0 0↲
Level-order-traversal↲
2 6 2 5 8 5 6 2 2 8 8 9
4 1 9 6 7 8 1 ↲
```