Tree Data Structures

July 16, 2014

Tree Data Structures

Properties of Trees

1. One node is distinguished as the root.

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2. Every node c, except root, is connected by an edge from exactly one other node p. Node p is c's *parent*, and c is one of p's *children*.

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Properties of Trees

1. One node is distinguished as the root.
2. Every node c, except root, is connected by an edge from exactly one other node p. Node p is c's *parent*, and c is one of p's *children*.
3. The path from the root to any node is unique. The number of edges traverse is called the *path length*.

Tree Data Structures

Yeah And...

- In a *Binary Tree* no node can have more than two children.
- There are a special class of trees called *Binary Search Trees*.

Tree Data Structures

But Why Trees?

Because finding things in LinkedLists is slooooow when the lists are large.

Hint: Remember the main difference between arrays and linked lists.

Tree Data Structures

Examples of Binary Trees

- Filesystems
- Expression Trees (Wut?)
- Indexing/Finding stuff

Tree Data Structures

Binary Tree Insertion

For every node X, all nodes on the left subtree have smaller values than X, and all nodes in the right subtree have values larger than X.

Tree Data Structures

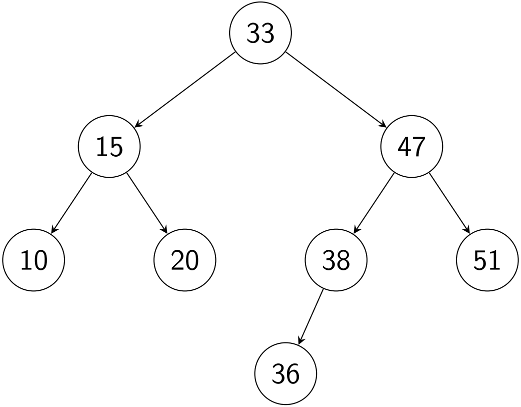
Binary Tree Traversal

- Breadth First
- Depth First
- Binary Search

Tree Data Structures

Binary Tree Traversal

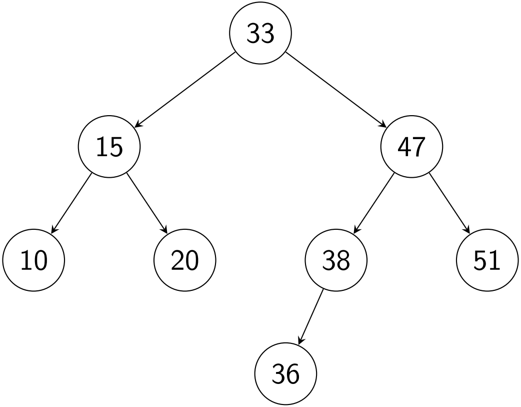
Find 38, using the three tree traversal methods.



Tree Data Structures

Binary Tree Insertion

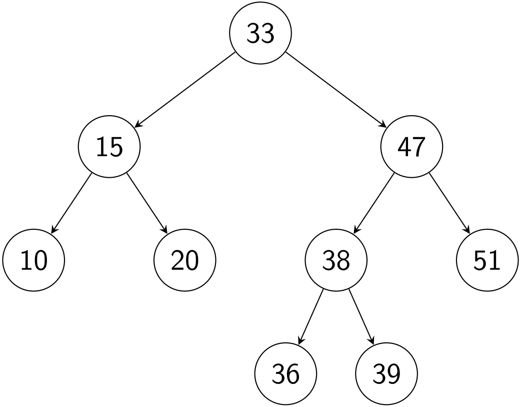
Insert 39



Tree Data Structures

Binary Tree Insertion

Insert 39



Conway’s Game of Life

A Dive into Test Driven Development

Conway's Game of Life

Our Goal

- Learn how to work in a small team.
- Learn how to digest a problem with little guidance.
- Learn how to use testing to solve a problem.

Conway's Game of Life

Get the Files

https://github.com/jcockhren/gameoflife

Conway's Game of Life

The *How* and *What* of Testing

- What does a testing suite look like?
- What should you test?
- What things should one consider before writing your first test?
- How many asserts should you have per test?

Conway's Game of Life

The Rules

1. Any live cell with fewer than two live neighbours dies, as if caused by under-population.
2. Any live cell with two or three live neighbours lives on to the next generation.
3. Any live cell with more than three live neighbours dies, as if by overcrowding.
4. Any dead cell with exactly three live neighbours becomes a live cell, as if by reproduction.

Conway's Game of Life

Rules of Engagement

- Work in pairs
- You have 45 minutes per session
- Erase all your code at the end of each session and switch partners.
- no gems
- Internet solutions are a no-no

Conway’s Game of Life

How to Win

- Implement Conway’s rules
- Verify correctness using 2 Still Lifes and 2 Oscillators (i.e. passing tests).

Conway's Game of Life

Bootstrap

- Focus on how you want to store the data.
- How will you define a live cell?
- How will you define a 'world'?

Slides Available Below

https://github.com/jcockhren/trees-conway