

Binary Trees

Jonathan Windle

University of East Anglia

J.Windle@uea.ac.uk

May 22, 2017

Overview I

1 Intro

- Tree structures are **Non-Linear**.
- A **Binary Tree** T , on a set of elements E is either:
 - empty, or
 - consists of a finite collection of nodes, each containing an element of E , and which contains a particular node called the **root** of T , with the remaining nodes of T partitioned into to binary tress, called **left sub-tree** and **right sub-tree** respectively.

Terminology

- **nodes/vertices** - contain elements of T .
- **parent** - Every node except for the root has a unique parent node.
- **child** - if p is the parent of c then c is a child of p .
- **siblings** - two nodes are siblings if they have the same parent node.
- **ancestor** - Node a is an ancestor of node d if either a is the parent of d or a is the parent of an ancestor of d .
- **descendant** - Node d is a descendant of a if a is an ancestor of d .
- **leaf** - a node with no child.
- **external** - another name for a leaf node. **internal** - a non-leaf node, i.e. a node with at least one child.
- **level** - if n is the root node, then $level(n) = 0$, otherwise $level(n) = level(parent(n)) + 1$.
- **height** - $height(T) = \max_{n \in T} level(n)$ (Height T is also called the level of the tree).

The End