

## Multiway Trees

10-23-2003

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## Opening Discussion

- What did we talk about last class?
- Do you have any questions about the assignment (design and test code are due today)?
- We have focused on binary trees. Can anyone think of an example of a tree with more than two children? What possible uses might you have for such a tree?

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## A Word on Keys

- We talked about the use of keys with our hash, but more generally, any data structure that has sorting or allows fast lookups can be done with keys. In that case the key is the part of the data we sort/search on and the rest of the data is ancillary.
- This is a case where we might template on two things.

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## General Trees

- In the general form a tree can have any number of children.
- This can be implemented either by putting a vector in each node with pointers to the children, or having children link together (have a nextSibling pointer).
- Directory structures and "outlines" fit into this. My semester example from last year used a general tree.

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## Special Purposes

- Part of the reason we focus so much on binary trees is that higher order trees are often very specialized. Binary trees are much more general.
- However, it is good for you to see some of the uses of these things so that if you come across a need from something similar you will know where to start.

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## Geometric Trees (Quad/Oct)

- We know that trees are good because they break large sets into pieces that help us find/organize things. If our set is distributed in a spatial way (points in Cartesian space) then trees that break things up by geometry can be helpful.
- In 2-D we could use a Quadtree. In 3-D we use an Octree. These types of structures appear in graphics and simulations.

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## Building a Quadtree

- Because it is easier to draw we will start with a quadtree. Let's go into code and write what would be required for this type of structure. Exactly how this is done would depend a lot on the application, we will just make something up for now and see what requirements that leads us to.

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## Minute Essay

- Given the quadtree that we did in class today, what can you see as causing it problems?
- Remember to turn in your design and test code today and that the bulk of assignment #3 is due Tuesday.

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