Lecture 6: CS6250 Graphics & Visualization

Data Representation for Visualization

- Dataset
- Cell types
- Attributes
- Types of Datasets
- Data Abstractions in General
- VTK specifics
- Examples

Dataset

What is a dataset?

Cell Types

A dataset consists of one or more cells.

A cell is defined by two objects:

- A type
- An ordered list of points called a ***connectivity list***

What specifies the geometry of the cell?

Cell Representation

A cell may be represented mathematically by using set theory. C_i is an ordered set of points:

$C_i = \{p_1, p_2, \cdots, p_n\}$ with $p_i \in P$

P is a set of n-dimensional points.

A cell uses a point when $p_i \in C_i$

The "use set" of a point p_i is the collection of all cells that contain p_i.

$U(p_i) = \{C_i : p_i \in C_i\}$

Memory Representation of a Cell

The topology is implicit based on the type of a cell.

Let's look at an example: a triangle strip:

Cell Types:

Vertex

Polyvertex

Line

Polyline

Triangle

Triangle Strip

Quadrilateral

Pixel

Polygon

Tetrahedron

Hexahedron

Voxel

Additional Types

Let's look at some additional types that might be useful:

• Pyramid

Square base

• Wedge

Two non-parallel triangles connected by lines

• Quadratic quadrilateral

Nonlinear Cells

Used primarily in numerical analysis. Provides better curved geometry representations. Only quadratic interpolation functions currently supported in VTK.

How can we render nonlinear primitives?

Nonlinear Types (see pp. 129-130)

Quadratic Edge

Quadratic Triangle

Quadratic Tetrahedron

Quadratic Hexahedron

Attribute Data

What types of information need to be represented?

At what levels in structures would you want to attach attribute information?