CMSC 491G/691G

Computer Graphics for Games

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Common Libraries

- Low-level
  - OpenGL, Direct3D
- Interaction
  - GLX
  - GLUT, FLTK, GLUI, DirectInput
- Scene Graph
  - Performer, OpenSceneGraph
- Middleware / *Game Engines*
  - Renderware, Gamebryo, Unreal Engine
  - Ogre, Irrlicht, Crystal Space, Wild Magic
  - (Alchemy)

Scene Graph Rendering

- Traverse Graph
- Display actions
  - 1–handful GL calls
- Options
  - action does traversal
  - pre & post actions
  - SG state management

Scene Graph Traversal

- Not just for rendering
- Save
  - Rather than render, print to file
- Optimize
  - Sort by state changes
  - Sort by distance for transparency
- Produce intermediate *display list*

OSG Node

- Generic Node class
  - Inherits Name & Reference counting
  - Parents / Children
  - *StateSet*
  - Bounds
  - Callbacks
    - Event, Update, Cull

OSG Node Types

- Geometry Node
  - Contains Drawable
- Group Node
  - Simple Grouping
  - Transform
  - Switch / Level of Detail
  - Light Source

OSG StateSet

- Attach to any Node
- Applies to subtree
  - Merge sets
- Set of Attributes
  - Texturing, Shading, Drawing modes, Blending, …

OSG NodeVisitor

- C++ Mechanics
  - Node::accept(NodeVisitor&)
    - Also ascend and traverse
  - MyNodeVisitor::apply(MyNode&)
- Uses
  - Compute bound, Cull
  - Optimize, Simplify
  - Intersect
  - Smooth

OSG RenderBins

- Rather than render, create a bin
- Opaque vs. Transparent
- Multi-threading

OSG Add-ons

- Node kits
  - Specialized nodes
  - Particles, shadows, …
- ReaderWriter
  - Plug-ins to read & save
    - Geometry
    - Images

Using Multiple Cores

- Pipeline of processes
  - Application
  - Cull
  - Draw
- Rohlf & Helman, SIGGRAPH 1994