



3D Scenegraph-based systems

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DESY

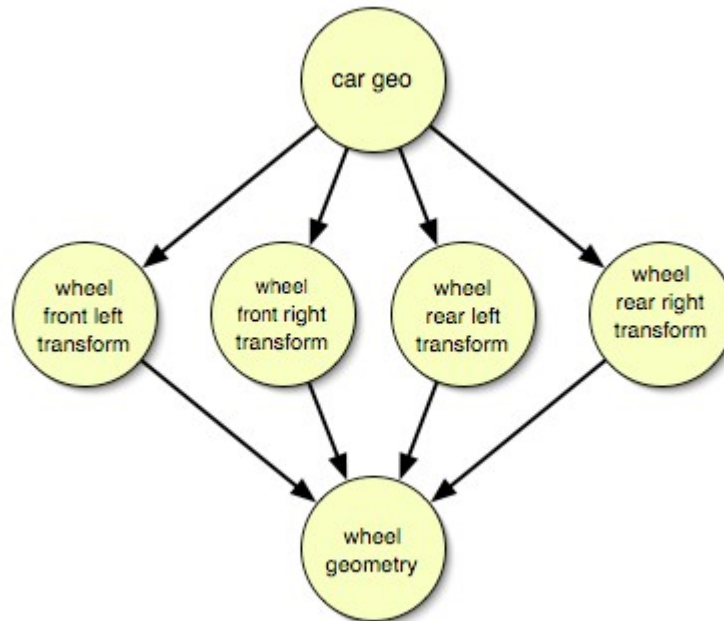
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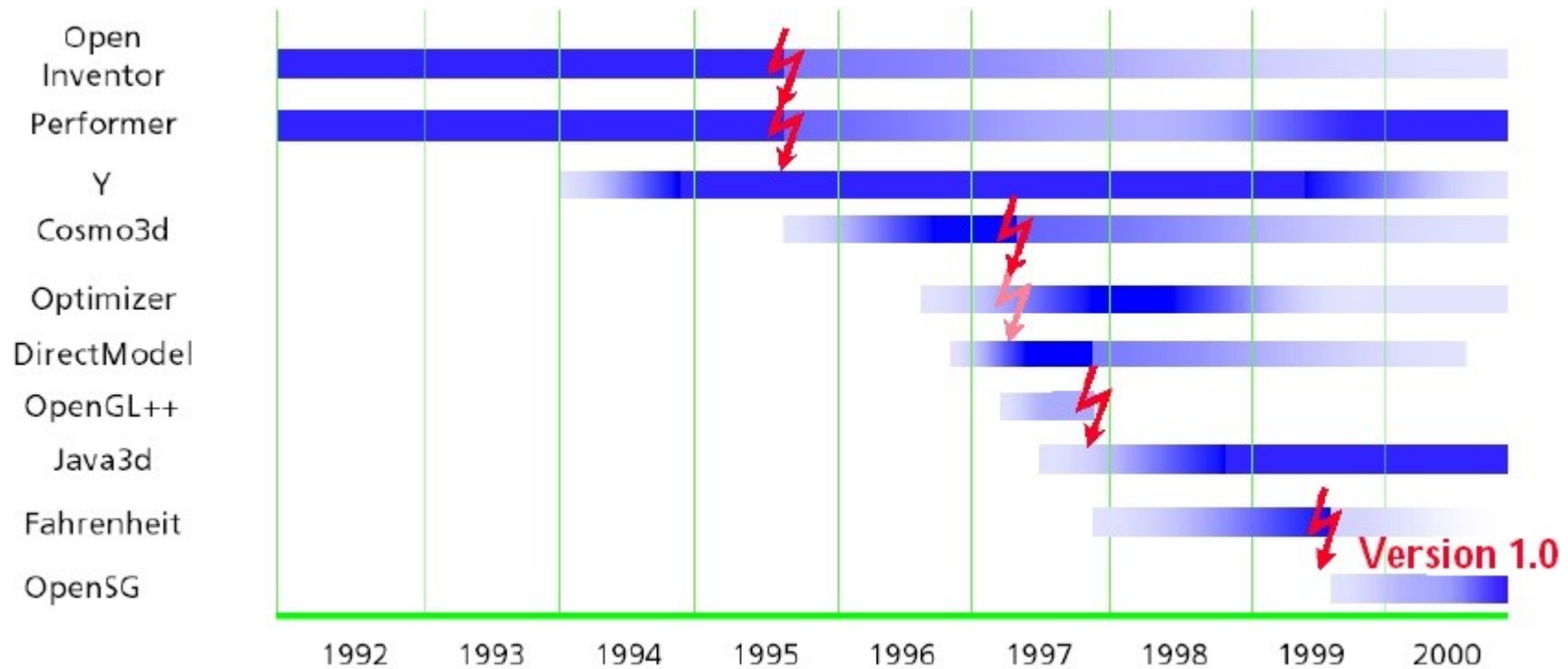
Scenegraphs



- **Scene-graph** = graph that describes a scene
 - **Scene** = environment perceived by the viewer
 - **Graph** = group of nodes connected to each other
- **Scenegraph API's** (OpenGL, Coin3D, Open Inventor, OpenSceneGraph...)



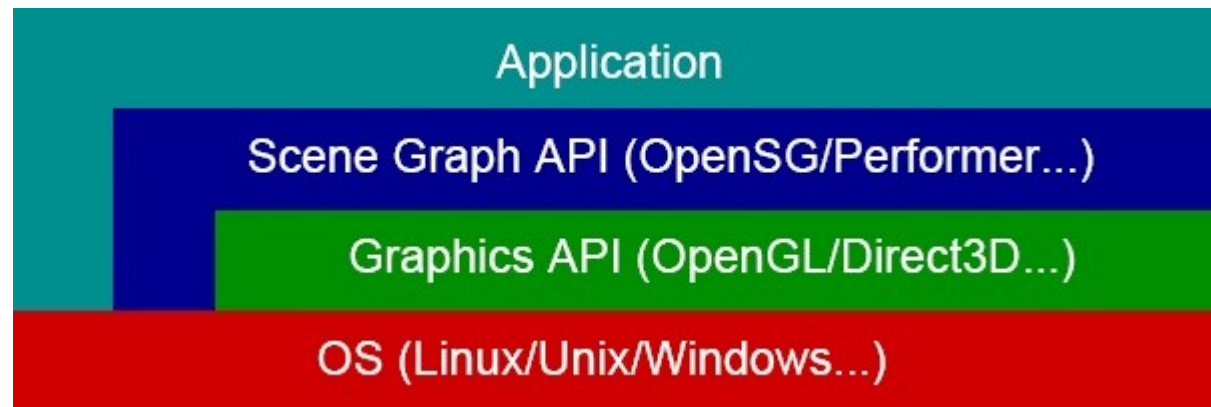
Scenegraph API's



Scenegraph API's



- Situated between the 3D application and the graphics API
- Optimizes the way data is passed to the graphics API
 - view frustum culling (cut out invisible objects in the scene)
 - minimize state changing
 - ...



Scenegraphs



- Basically a **tree of nodes** which store information about transformations, material, geometry and a lot of other stuff
 - **multi** or a **single parent** tree
- Common **actions** performed on a scenegraph
 - View frustum culling
 - State sorting for rendering
 - Collision detection
 - Rendering :)
 - a lot more...
- almost every action requires a **scenegraph traversal**
 - crucial impact on the overall performance of the system thus it is a highly optimized operation



Why use a scenegraph?



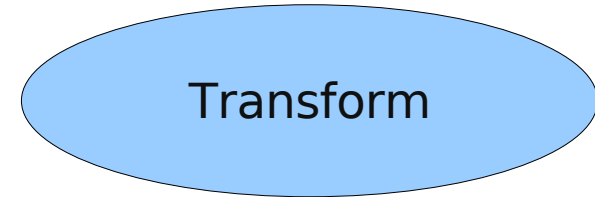
- Computer graphics is OO!!
- Objects vs. Vertices
- Objects of interconnected sub-objects
 - House: Roof, walls, door, window
 - Man: Head, torso, arm, hand, ...
- Higher level of hardware abstraction
 - High increase of performance on complex scenes
- Already a lot of functionality implemented
- Just a few lines of code for lots of functionality
- Bindings to GUIs (QT, ...)
- Export models to VRML/X3D
- Cross platform
- Why try to reinvent the wheel?



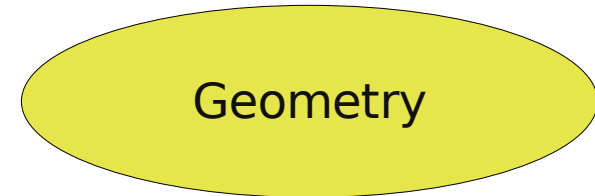
OpenGL VS Scenegraphs



- glLoadMatrix,
- glPush-/PopMatrix,
- glRotate, glTranslate, glScale
- etc...



- glBegin(...)
- glVertex(...)
- glVertex(...)
- ...
- glEnd()



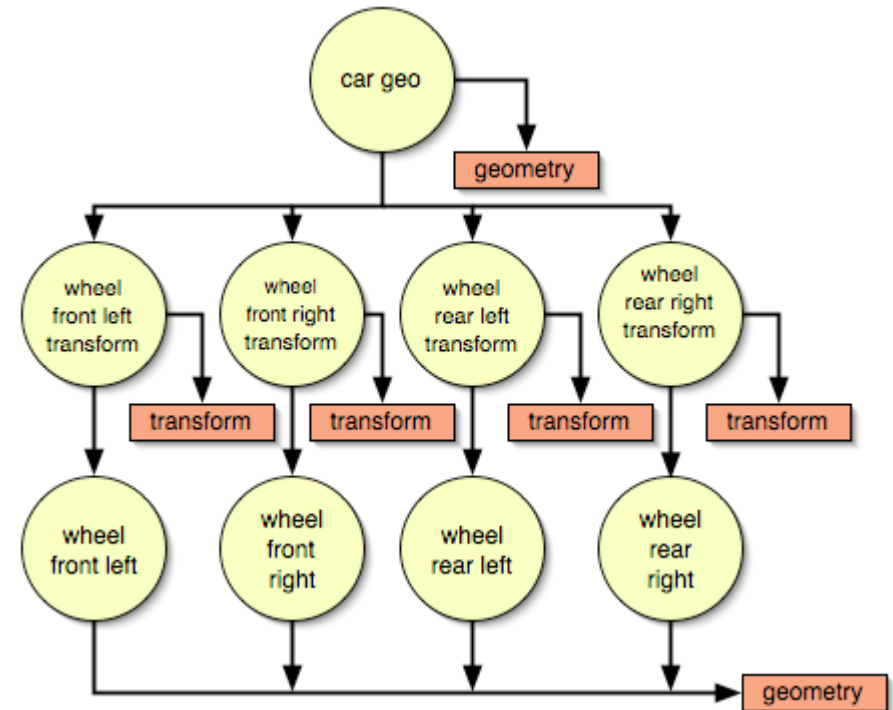
- glEnable, glDisable,
- glSet, glGet,
- glTexGen, glBindTexture
- etc...



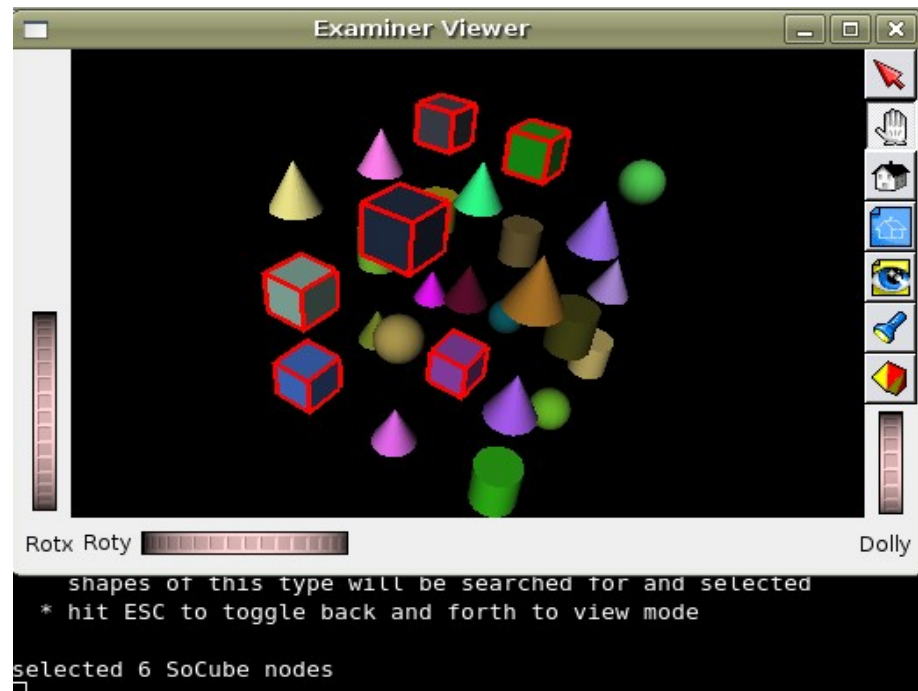
OpenSG



- Cross platform
- Open source
- Multi-Threading Support
- Distributed – Cluster Support
- QT
- Single-parent graph
 - Separates Cores/Nodes



- Cross platform
- Open source
- Mature product
 - Successor of Open Inventor
- Very good generic viewer already available
 - can be extended
- Native GUI Bindings
 - SoWin
 - SoXt
 - Sc21
 - SoQT



Summary



- A lot of scenegraph-based systems out there!
- Each of them has advantages/disadvantages!
- Programming directly in OpenGL / GLUT is OK for very small applications. For applications that need a little more functionality one should definitely take a look at these libraries.
- Useful links:
 - <http://www.opensg.org>
 - <http://www.coin3d.org/>
 - <http://www.openscenegraph.org>

Thank You! Your feedback is welcome!

