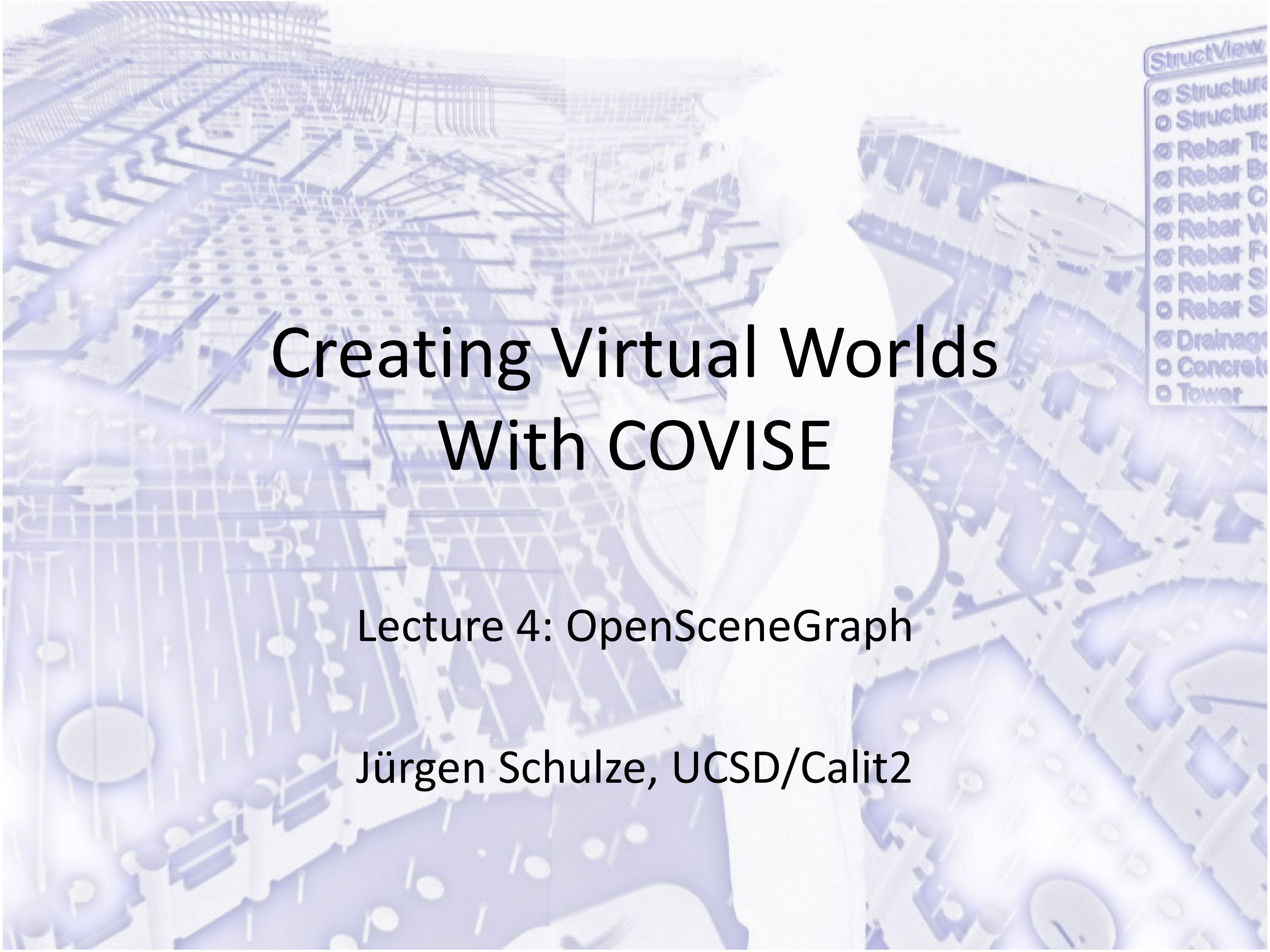


Creating Virtual Worlds With COVISE

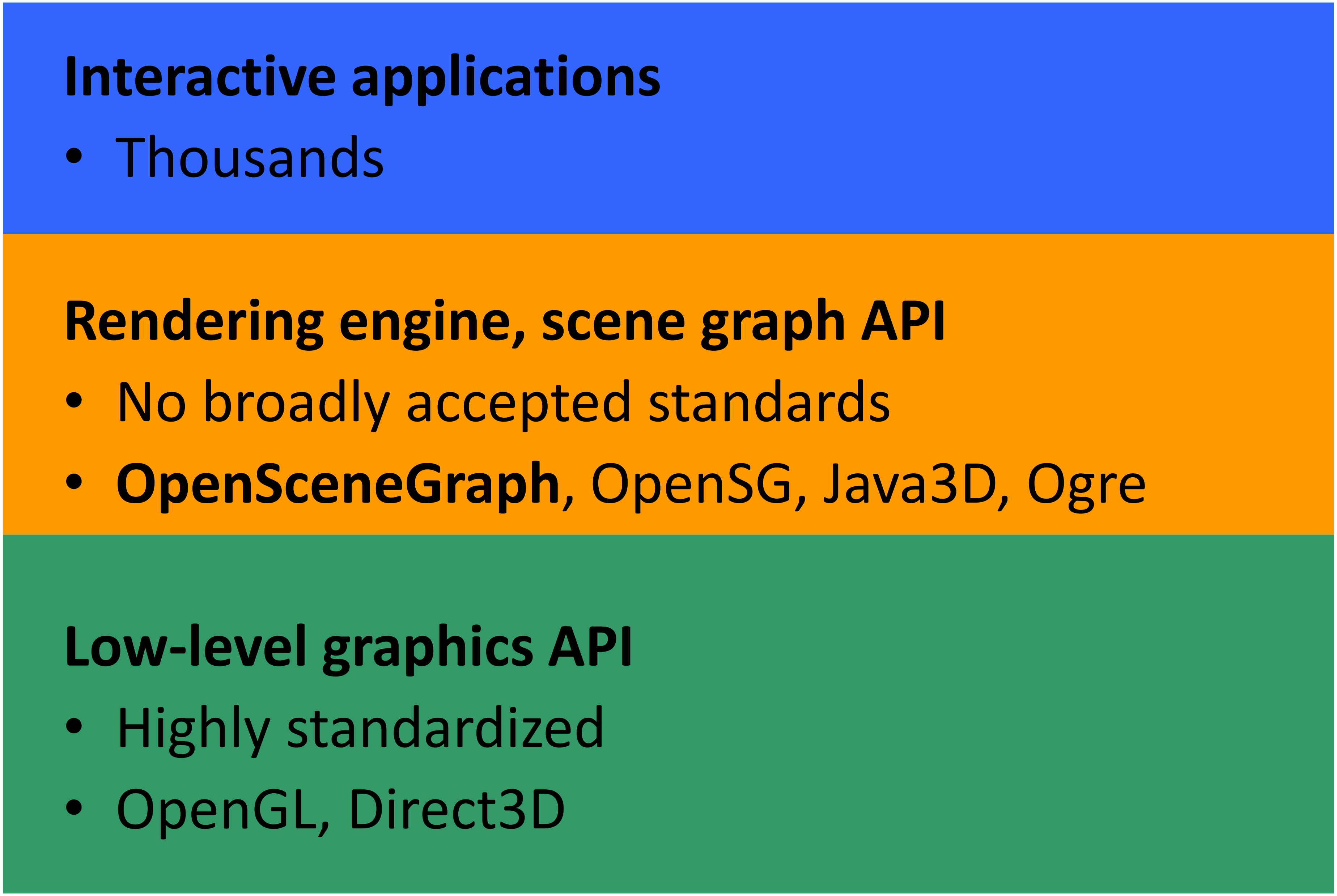
Lecture 4: OpenSceneGraph

Jürgen Schulze, UCSD/Calit2

Course Overview

- Lecture 1: COVISE Overview
- Lecture 2: Map Editor and Modules
- Lecture 3: OpenCOVER and Plugins
- Lecture 4: OpenSceneGraph
- Lecture 5: User Interaction
- Lecture 6: Collaborative Applications

System architecture



Interactive applications

- Thousands

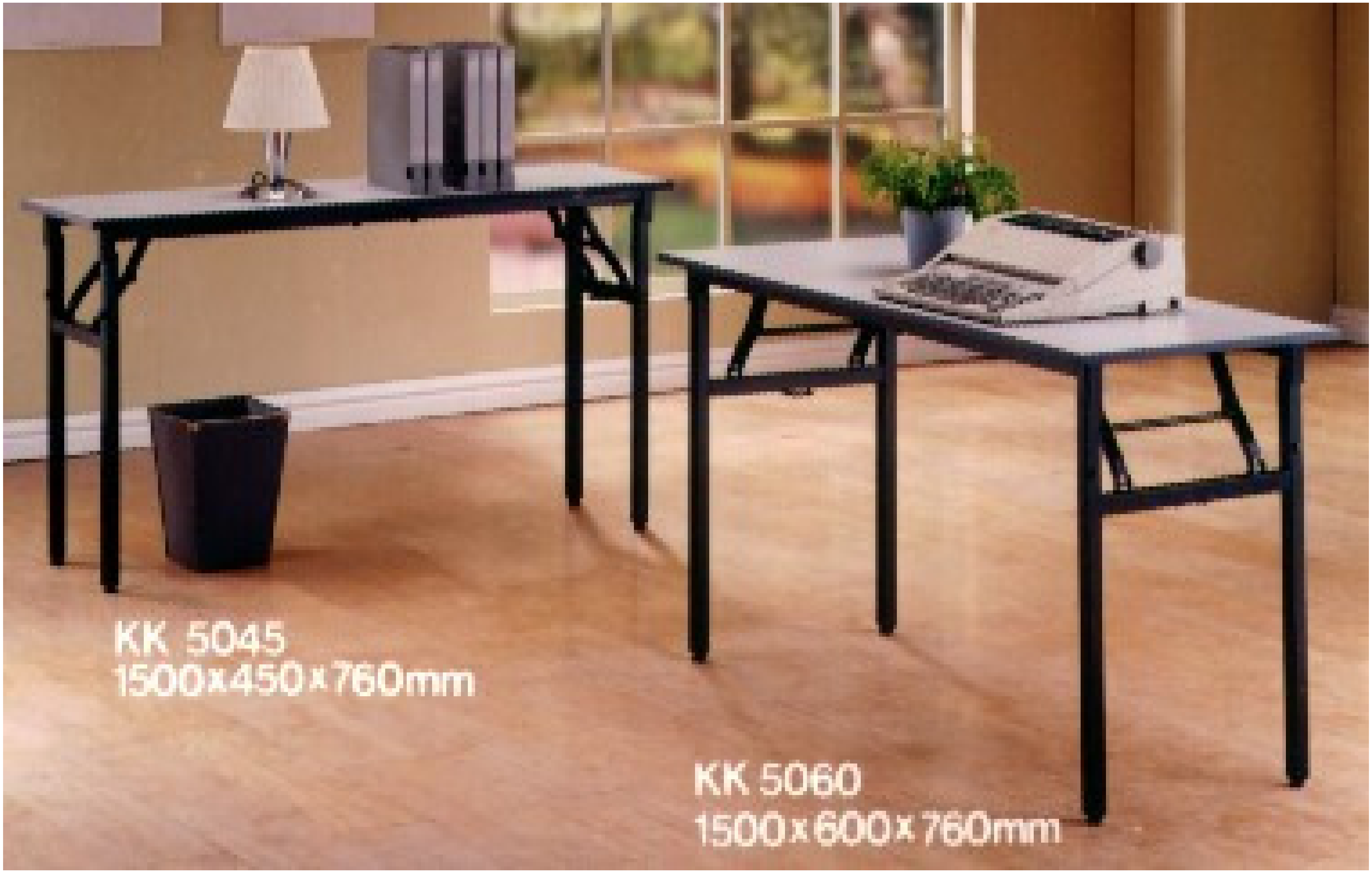
Rendering engine, scene graph API

- No broadly accepted standards
- **OpenSceneGraph**, OpenSG, Java3D, Ogre

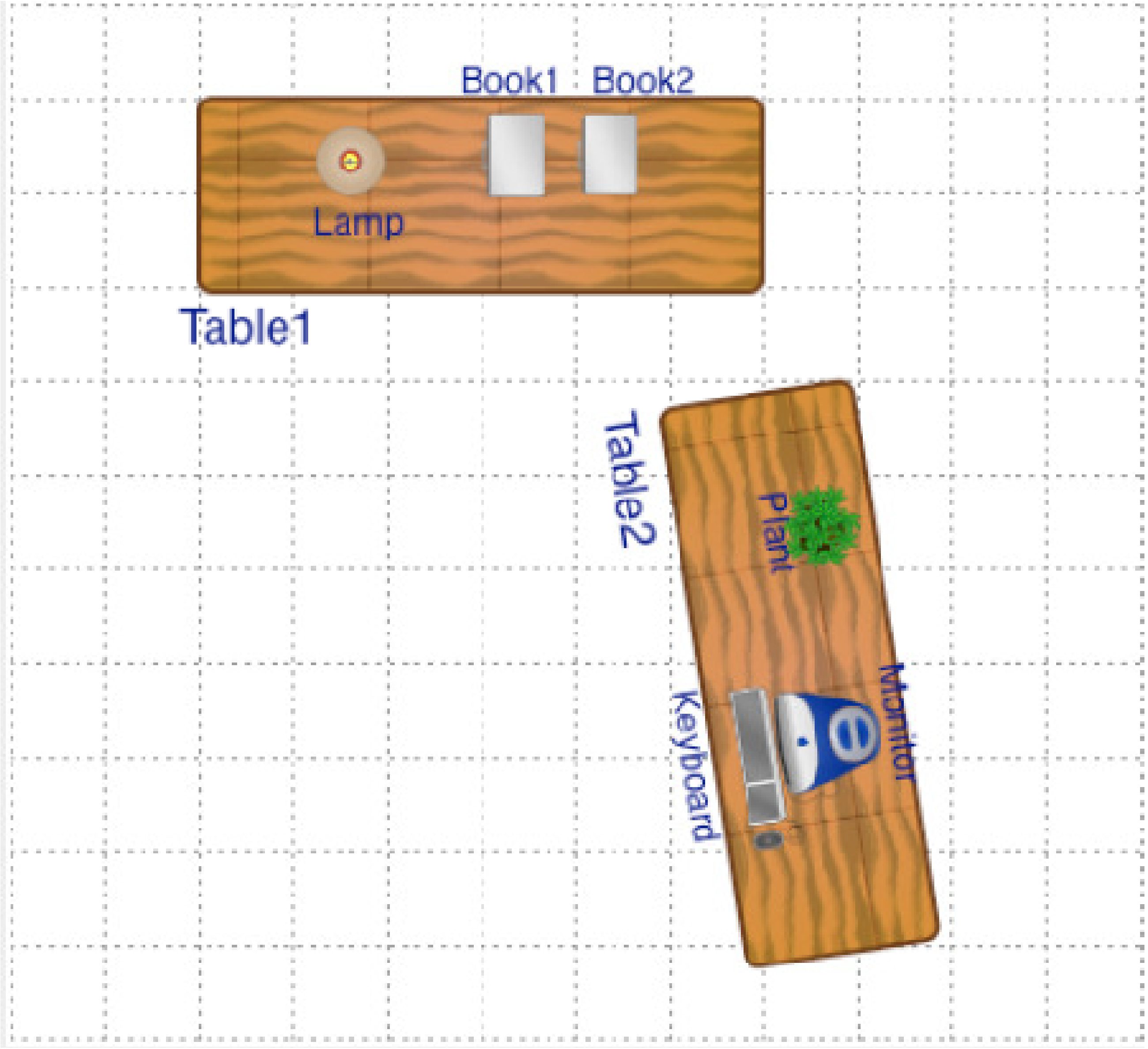
Low-level graphics API

- Highly standardized
- OpenGL, Direct3D

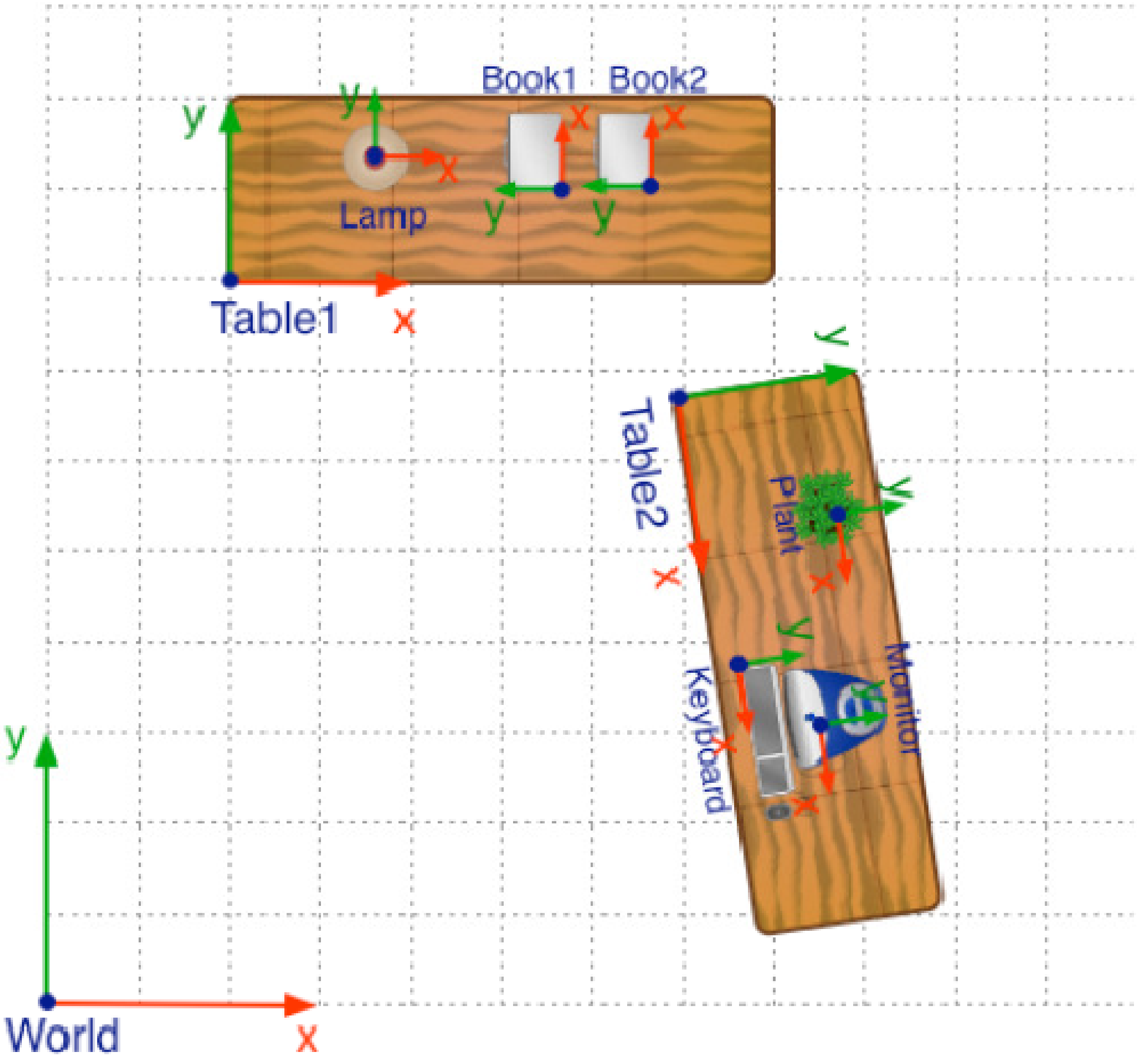
Sample scene



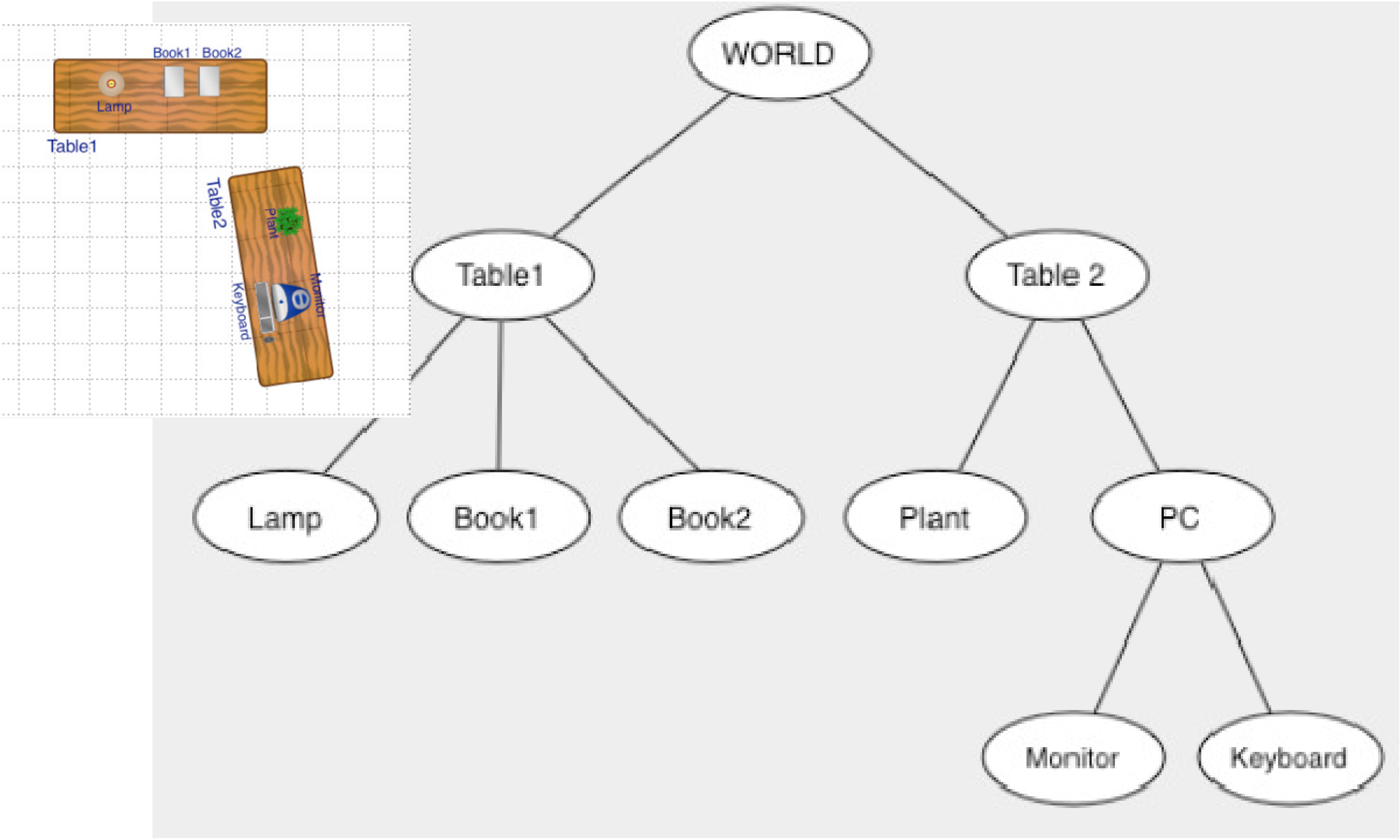
Top view



Top view with coordinates



Hierarchical organization



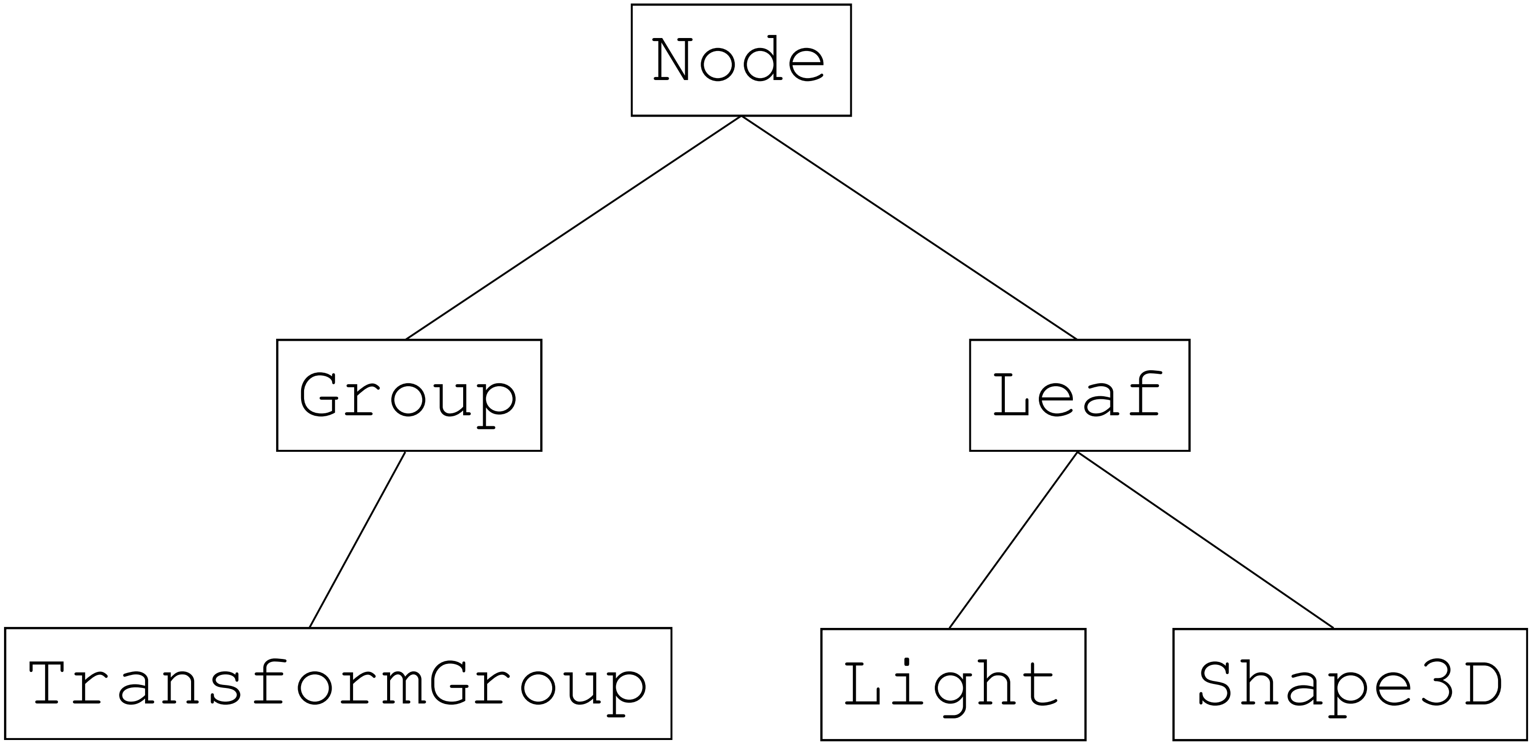
Data structure

- Requirements
  - Collection of individual models/objects
  - Organized in groups
  - Related via hierarchical transformations
- Use a tree structure
- Nodes have associated local coordinates
- Different types of nodes
  - Geometry
  - Transformations
  - Lights
  - …

Class hierarchy

- Many designs possible
- Concepts are the same, details differ
- Design driven by intended application
  - Games
    - optimized for speed
  - Large-scale visualization
    - Optimized for memory requirements
  - Modeling system
    - Optimized for editing flexibility

Class hierarchy


Node

Group

Leaf

TransformGroup

Light

Shape3D

Class hierarchy

`Node`

- Access to local-to-world coordinate transform

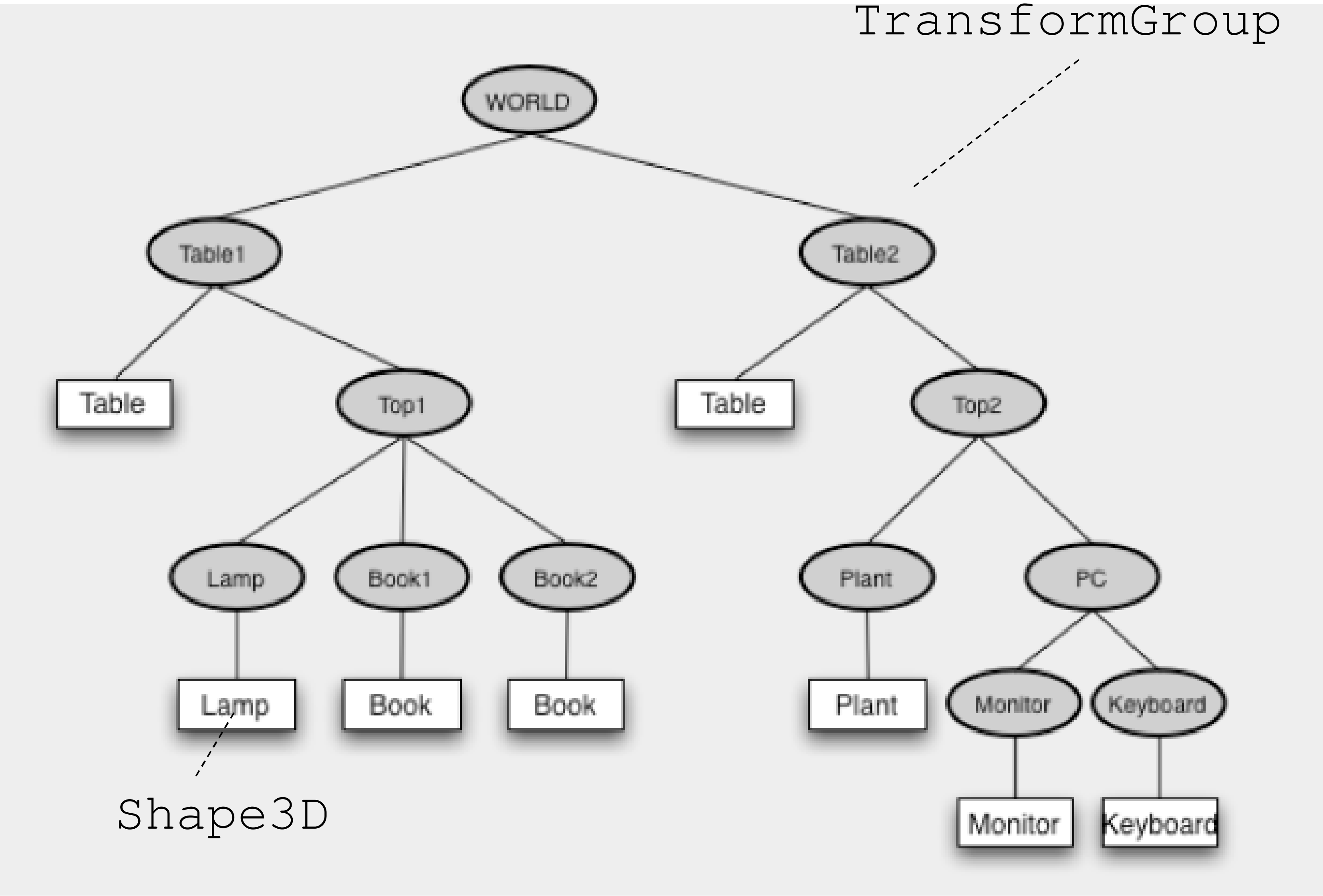
`Group`

- List of children
- Get, add, remove child

`Leaf`

- Node with no children

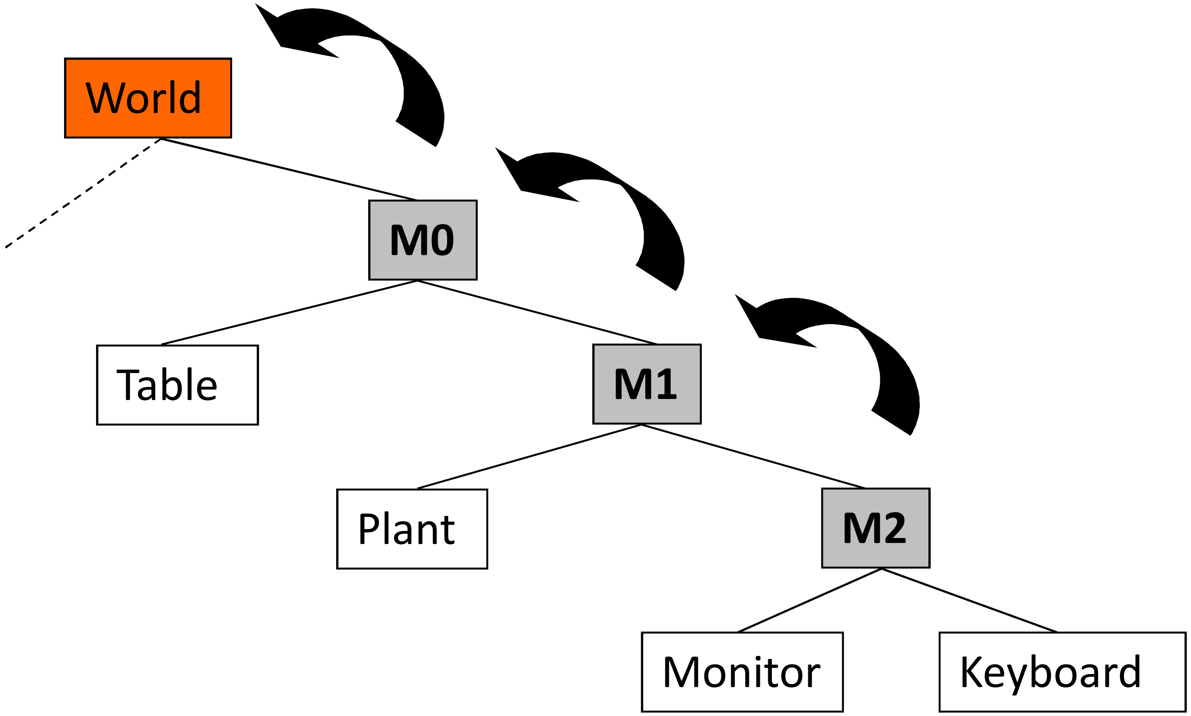
Scene graph for sample scene



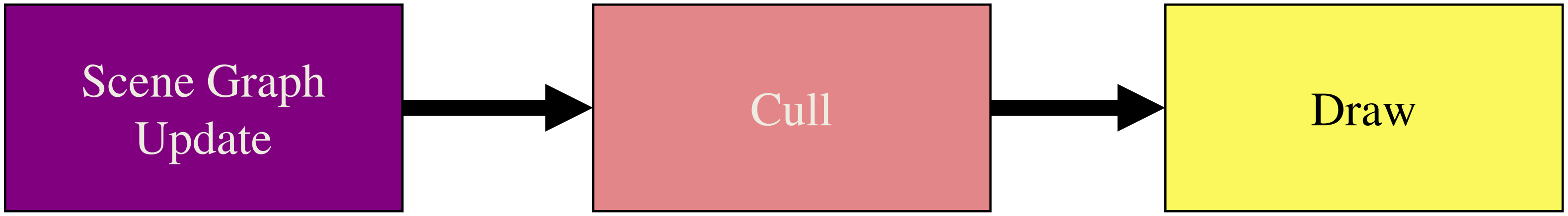
Class hierarchy

`TransformGroup`

- Stores additional transformation $\mathbf{M}$
- Transformation applies to subtree below node
- Monitor-to-world transform $\mathbf{M}_0\mathbf{M}_1\mathbf{M}_2$



Processing Phases



More Information

- OpenSceneGraph home page: `http://www.openscenegraph.org/`

- Tips for how to use OpenSceneGraph within OpenCOVER: `http://ivl.calit2.net/wiki/index.php/COVISE_and_OpenCOVER_support`