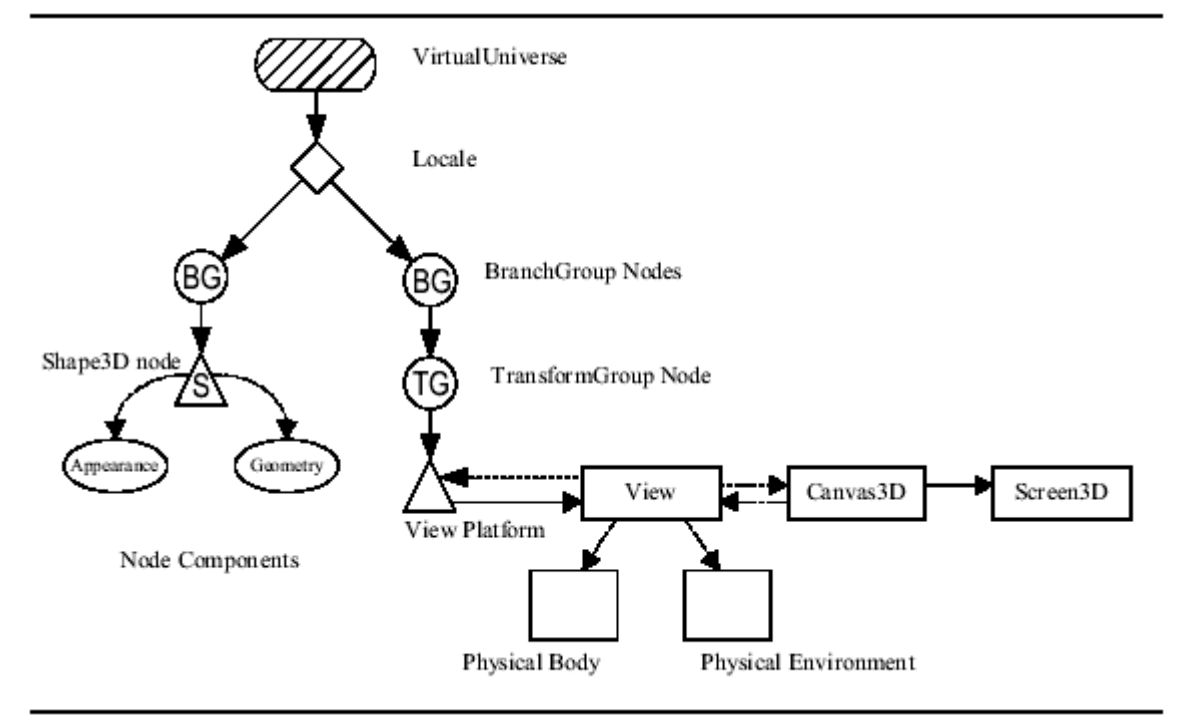
Computer Game Technologies

Java 3D Scene Graph

Java 3D Scene Graph

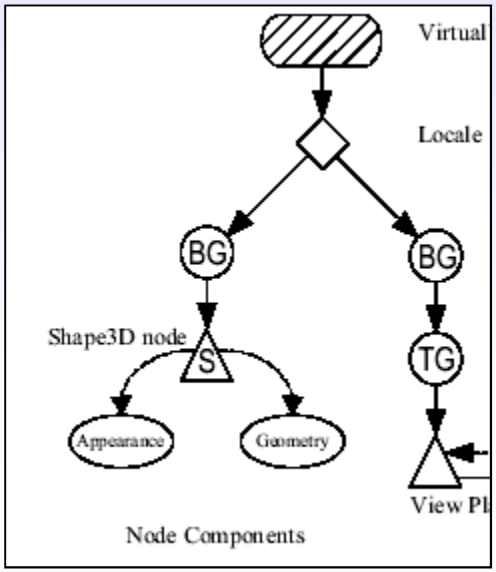
- The scene graph describes the components of a Java 3D application
  - Forms a tree structure



(Java 3D Tutorial Fig. 1-2)

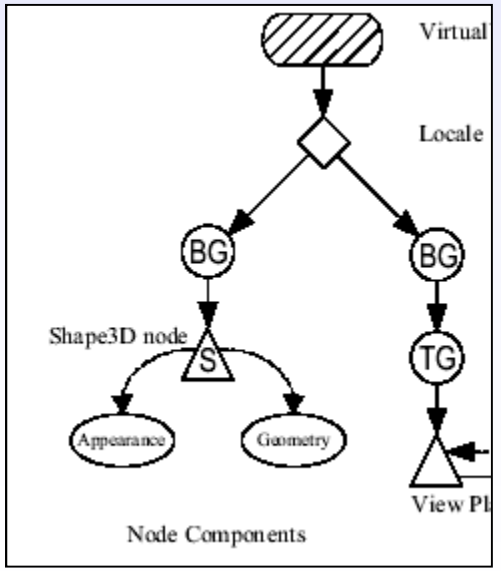
Scene Graph Structure

- Created using instances of Java 3D classes
  - Defines geometry, sound, lights, location, orientation and appearance of visual and audio objects
- Tree structure consisting of *nodes* and *arcs*
- Arcs commonly describe a *parent-child relationship*
  - All nodes have a single parent
  - Group nodes can have many children
  - Leaf nodes have no children



Scene Graph Structure (2)

- An arc may also describe a *reference relationship* between a *node component* and a node
  - Node components describe appearance attributes
  - Node components and reference arcs are NOT part of the scene graph tree
- A single path exists between a root node and a leaf
  - *Scene graph path* of the leaf node
  - Defines the state of the leaf node



Scene Graph Nodes

- *A scene graph defines the Virtual Universe*
- *A scene graph tree is rooted at a Locale node*

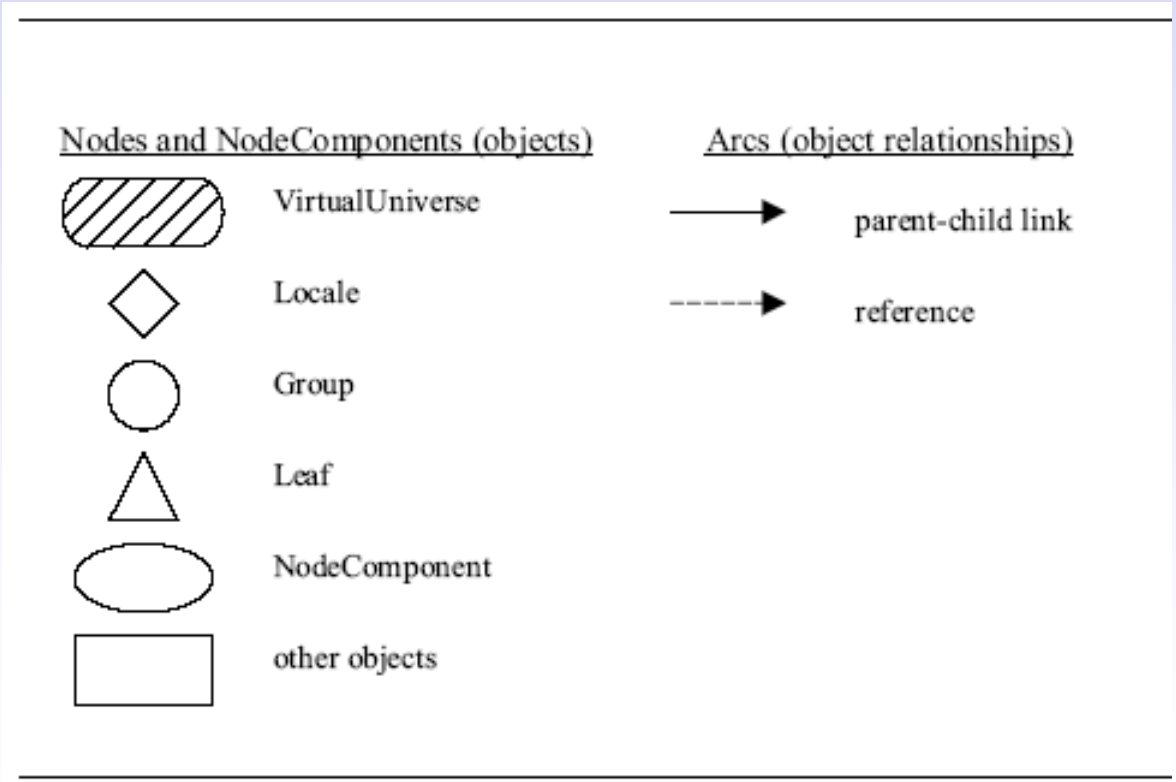


Figure 1-1 Symbols Representing Objects in Scene Graphs

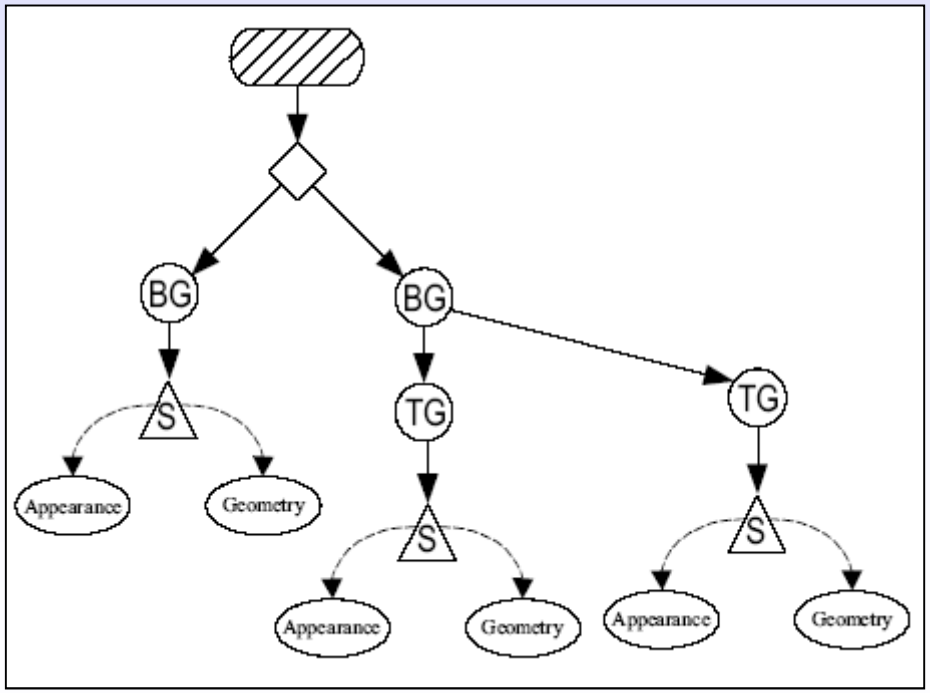
Scene Graph Nodes (2)

- Locale node provides a reference point for location of all objects in the virtual universe
  - Landmark
  - A virtual universe may have more than one locale
- Group nodes group components together
  - Branch groups
  - Transform groups
- Branch groups are roots of subgraphs
  - Content branch graph
  - View branch graph
- Leaf nodes are visual or audible components
  - Shape3D
  - Behaviours

Content Branch Graph

VirtualUniverse -> Locale -> Content branch graph

- Most programming work is devoted to the content branch graph
- Branch nodes, transform nodes, leaf nodes



View Branch Graph

VirtualUniverse -> Locale -> View branch graph

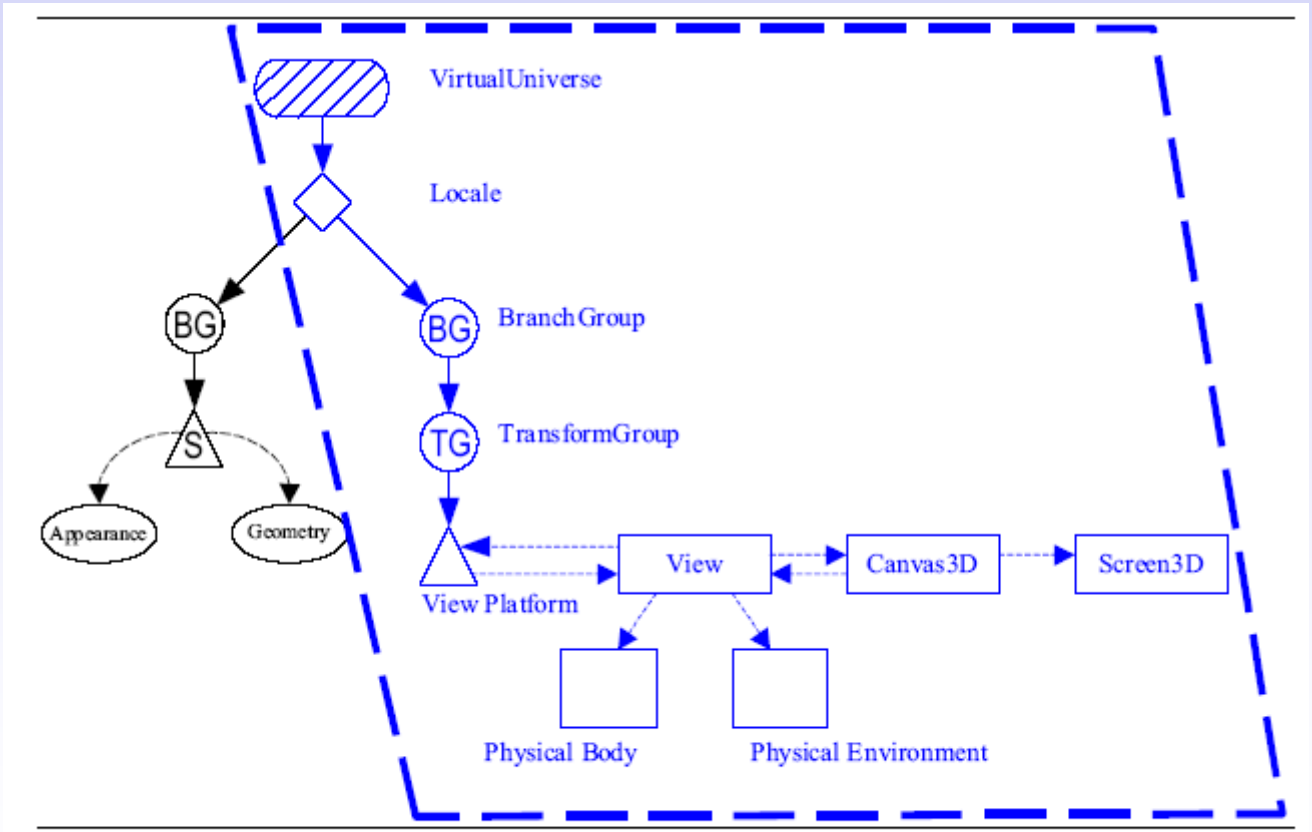


Figure 1-7 A SimpleUniverse Object Provides a Minimal Virtual Universe, Indicated by the Dashed Line.

Illegal Scene Graphs

- Scene graphs may not contain cycles
- *Multiple parent* runtime error

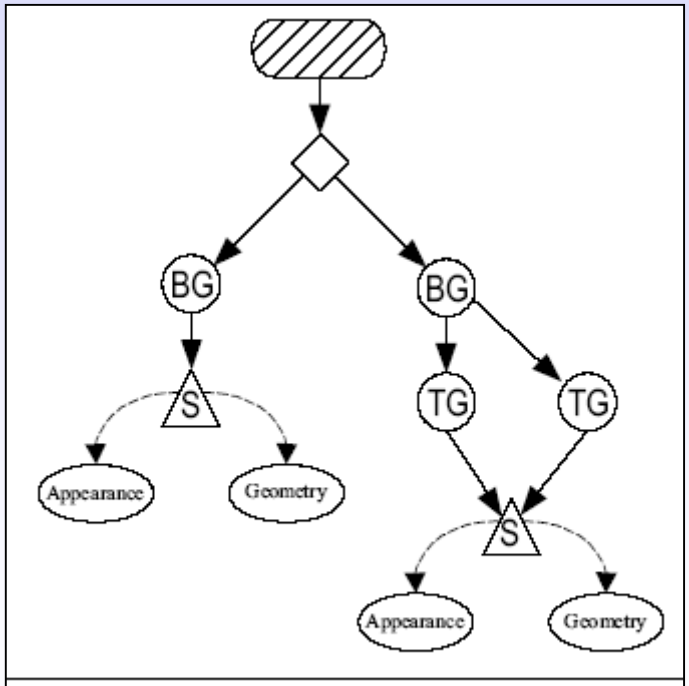


Figure 1-3 Example of an Illegal Scene Graph

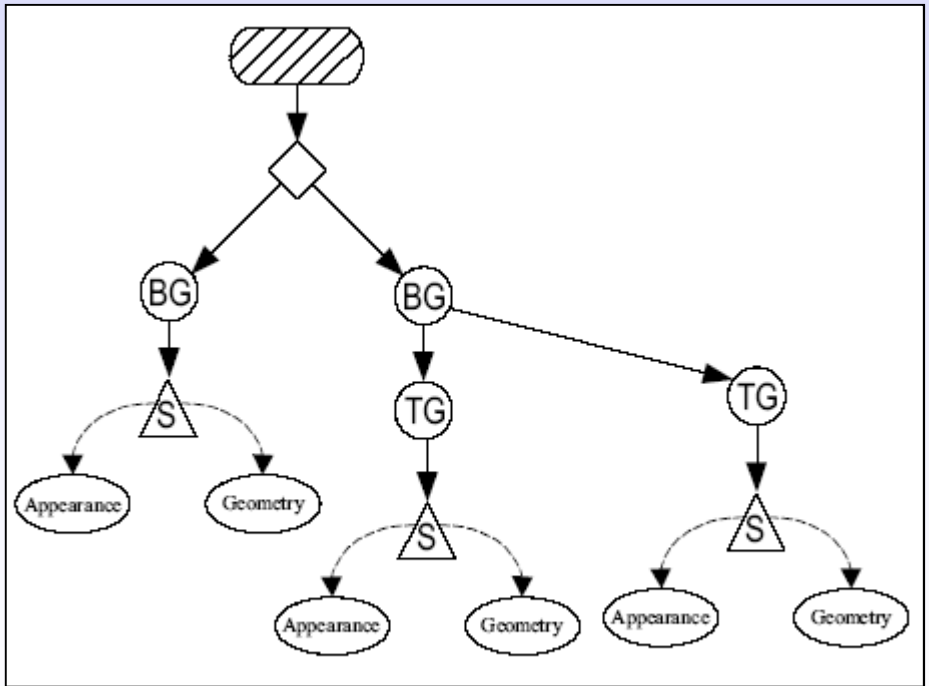


Figure 1-4 One Possible Fix for Illegal Scene Graph of Figure 1-3

Compiling the Scene Graph

- Creates internal representation of scene graph
- Can perform optimisations
- *Capabilities* specify components that may change following compilation

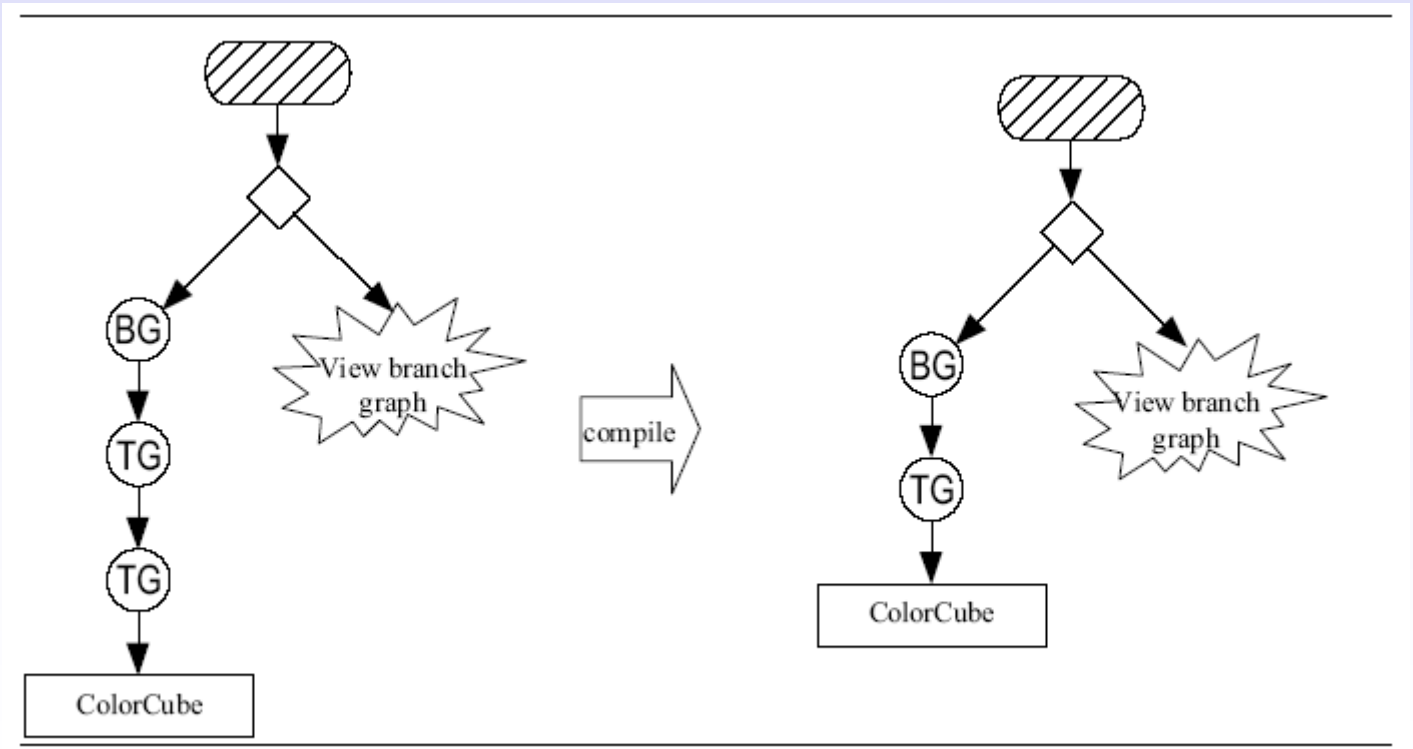


Figure 1-16 Conceptual Example of the Result of Compiling a Scene Graph

The End