CS 563 Advanced Topics in Computer Graphics
Primitives and Acceleration

by Travis Grant

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- **PBRT Primitives**
  - geometric vs. volumetric primitives
    - geometric
      - shapes + materials
      - i.e. Spheres, Cylinders, Disks bound with texture properties
    - volumetric (participating media)
      - covered in Ch. 12 (not tonight)
      - particles distributed throughout a region of 3D space
      - i.e. atmospheric haze, beams of light through clouds...

PBRT Primitives (cont.)

Object Instancing

- geometry of a shape is referenced in order to reduce the memory requirements for representing many instances.
- a unique transformation is stored for each instance

Primitives and Acceleration

- over 4000 individual plants (19.5 Million triangles total)

- only 61 unique plant models (1.1 M triangles stored in memory)

- consumes 300MB of memory during rendering

Primitives and Acceleration
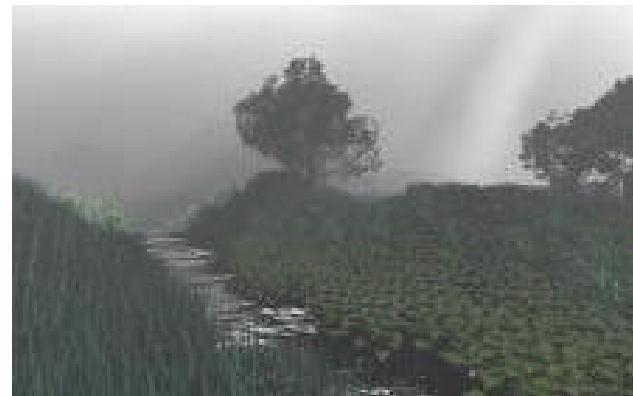
- Aggregates
  - logical concatenation of multiple primitives
  - A container that can hold many Primitives
  - Basis for implementing acceleration structures
  - Scene::aggregate = single primitive that references to many other primitives (superset of scene) that is implemented with a class that stores the scene's primitives in an acceleration data structure.
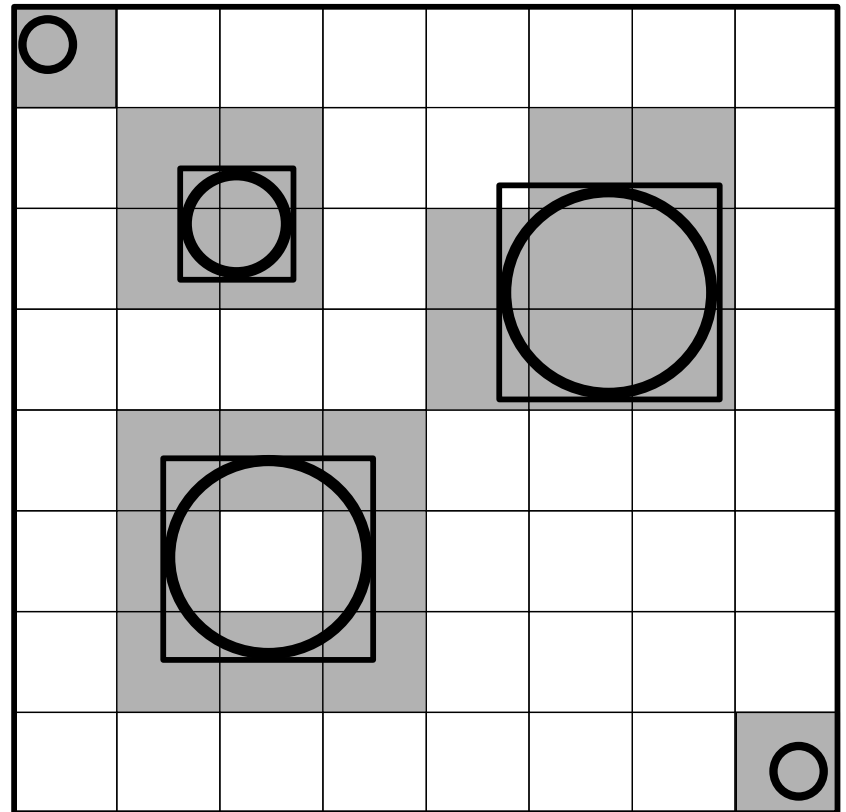
- ## Acceleration
  - ### spatial subdivision
    - regionalized decomposition of 3D space
    - GridAccel & KDTreeAccel (Ch. 4)
  - ### object subdivision
    - progression of granularity through objects in scene
    - i.e. room analogy (four walls, ceiling, and a chair)
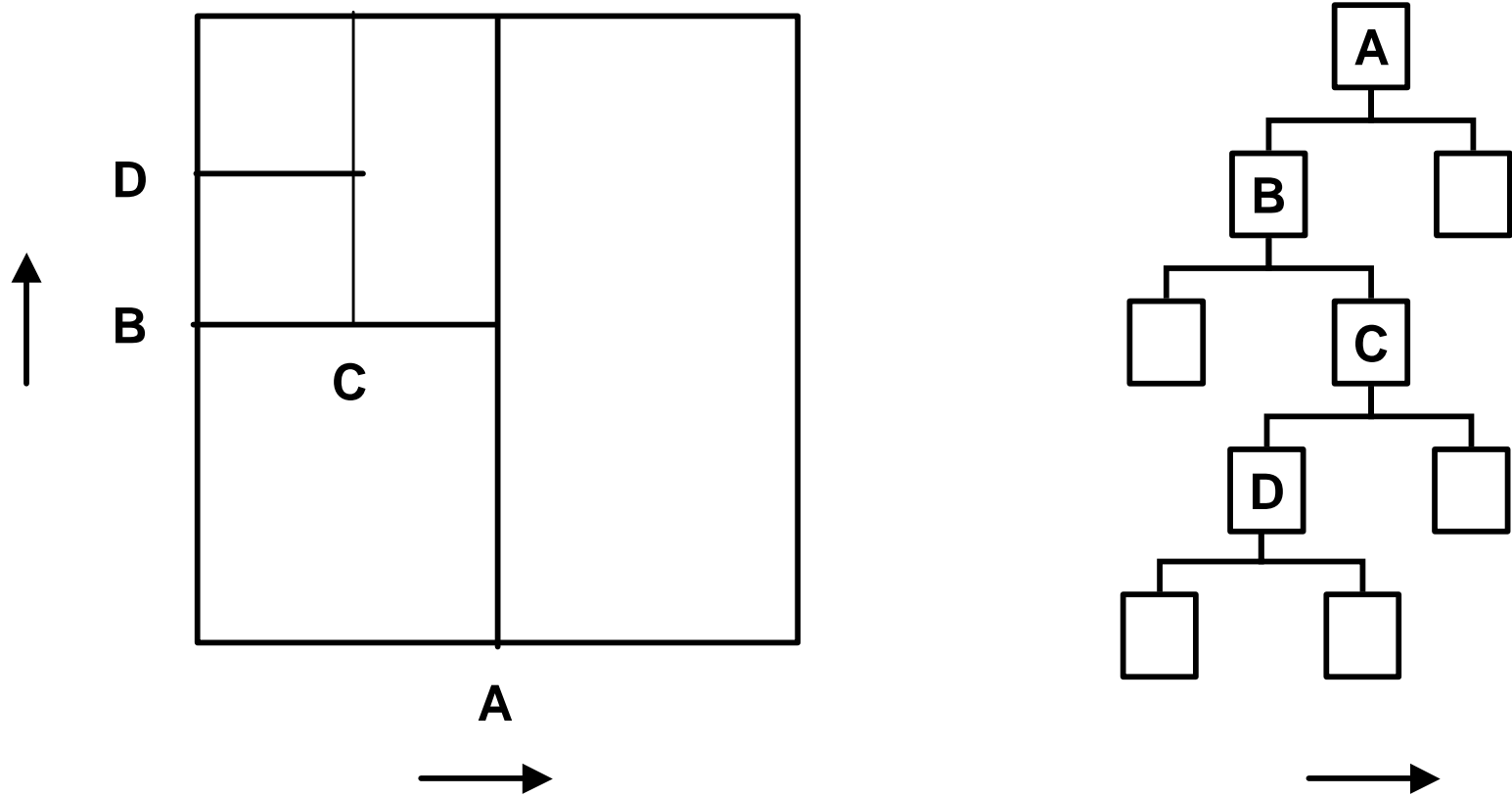   - culled immediately if ray does not intersect room <-> or if a hit, subsequent testing of items in room....

GridAccel

- refinement and grid granularity
- refineimmediately
- teapot in a stadium
- mailboxing
- bbox and overcounting voxels
- traversal

Letters correspond to planes (A, B, C, D)

Point Location by recursive search

- # KD-Tree Accelerator
  - more adept at handling uneven distribution of primitives
  - traversal (depth first, front-to-back)
  - below, above & near, far (splitting plane)

- References and acknowledgements

  - [Apodaca] "Advanced RenderMan"
  - [PHARR] "Physically Based Rendering"
  - Pat Hanrahan's Ray Tracing Presentation