Graphic vs. Image

- An *image* is the graphic converted for 2d display.

- *Rendering* - an operation that takes graphics data and produces image data.
- A *graphic* is a representation of a 3D object.

Graphics

Media type Graphic

    Representation

        Geometric models

        Solid models

        Physically based models

        Empirical models

        Drawing models

        External formats for models

Graphics - Geometric Models

◆ **Geometric primitives**

– **2D (e.g. lines, rectangles, ellipses, polygons, and curves)**

– **3D (e.g. cubes, cylinders, and surfaces)**

– **primitives are defined in local or *object coordinates*, arranged in common *world coordinates* by applying *modeling transformations*.**

Graphics - Solid Models

◆ ***Surfaces of revolution*** - A solid is formed by rotating about an axis in 3D space (lathing).

◆ ***Extrusion*** - A 2D outline is extended in 3D space along an arbitrary path.

◆ ***Constructive Solid Geometry*** - Solids are combined using union, intersections and difference operations

Graphics

- ◆ *Physically based models* - describing forces, stresses, and strains on objects.

- ◆ *Empirical models* - based on observation, rather than physical laws.

- ◆ *Drawing models* - describe an object in terms of drawing or painting actions.

Graphics

Operations
Primitive editing
Structural editing
Shading
Mapping
Lighting
Viewing
Rendering

Graphics - Operations - 1

◆ *Primitive editing* - modifying the parameters associated with the model primitives.

◆ *Shading* - specifies how light interacts with various objects within the model.

- flat shading

- phong shading

- ray tracing

Graphics - Operations - 2

◆ *Mapping*

used to modify an objects surface

– texture mapping

– bump mapping

– displacement mapping

– environment mapping

– shadow mapping

Graphics - Operations - 3

◆ *Lighting*
- ambient light
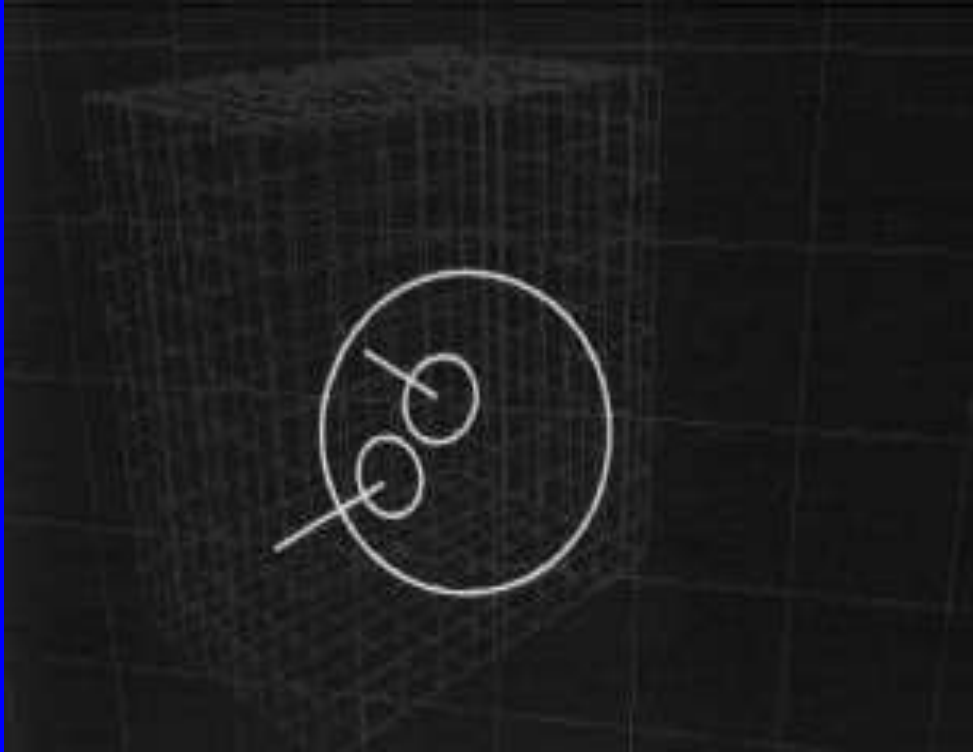- point lights
- directional light
- spot lights

◆ *Viewing*

allows one to calculate a varying viewing position
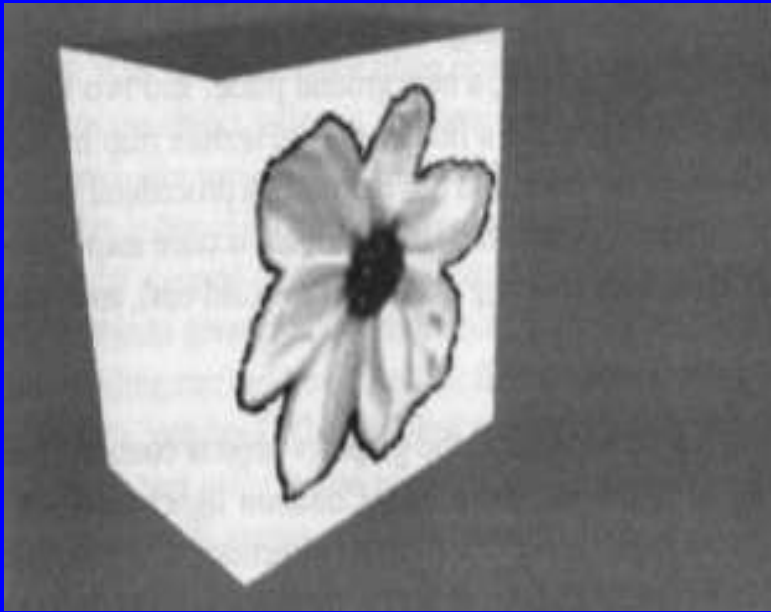
◆ *Rendering*

converts a model into an image

Graphics

A 3D model; Circles indicate light sources

Graphics

Rendered model, with shading and texture mapping

Graphics

Rendered model, with displacement and shadow mapping