

Computação Gráfica Unidade I

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Conteúdo [unidade 01]

- Introdução a sistemas gráficos:
 - histórico e aplicações; conceitos gerais
 - principais áreas da CG; introdução a biblioteca OpenGL
- Objetivos específicos: identificar os conceitos gerais da CG e as principais áreas de atuação
- Procedimentos metodológicos: aula expositiva dialogada; material programado; atividades em grupo (laboratório)
- Instrumentos e critérios de avaliação: exercícios trabalhos práticos (avaliação 1)

Referências



Algumas imagens clássicas



Empresas de Games em SC [motivação]

- Casthalia (www.casthalia.com.br)
- Céu Games (www.ceugames.com)
- Cre8 (internacional)
- Experience Solutions
- Fisiogames (fisiogames.com.br)
- Hoplon Infotainment (www.hoplon.com)
- Megajogos (www.megajogos.com.br)
- Nexia Mobile (www.nexiamobile.com.br)
- Palmsoft (www.palmsoft.com.br)
- Pangas Entertainment (www.pangasentertainment.com)
- Tecnomagia (www.tecnomagia.com)
- ThunderWorks (www.thunder-works.com)

...

Conferências [motivação]

- 3DIM2 International Conference on 3--D Digital Imaging and Modeling 2
- 3DUI IEEE Symposium on 3D User Interfaces
- AC IADIS International Conference on Applied Computing
- ACE International Conference on Advances in Computer Entertainment Technology
- ACIVS Advanced Concepts for Intelligent Vision Systems Conference
- ACM--MM ACM Multimedia Conference
- AIIDE Artificial Intelligence and Interactive Digital Entertainment
- ANNPR IAPR International Workshop on Artificial Neural Networks in Pattern
- APGV Symposium on Applied Perception in Graphics and Visualization
- AVBPA International Conference on Audio-- and Video--Based Biometric Person
- AVI International Working Conference on Advanced Visual Interfaces
- CAGD International Symposium of Computer Aided Geometric Design
- CAIP International Conference on Computer Analysis of Images and Patterns
- CGI Computer Graphics International Conference
- CGIM International Conference on Computer Graphics and Imaging
- CIARP Iberoamerican Congress on Pattern Recognition
- CIG IEEE Symposium on Computational Intelligence and Games
- CISST International Conference Image Science_ Systems and Technology
- CIVR ACM International Conference on Image and Video Retrieval
- CLIHC Latin American Conference on Human--Computer Interaction
- CMV International Conference on Coordinated and Multiple Views in Exploratory Visualization

Conferências [motivação]

- CVPR IEEE Conference on Computer Vision and Pattern Recognition
- CyberGames International Conference on Games Research and Development
- DGCI Digital Geometry for Computer Imagery
- DIGRA Digital Games Research Conference
- ECCV European Conference on Computer Vision
- EGSR Eurographics Symposium on Rendering
- EGVE Eurographics Workshop on Virtual Environments
- EHCI--DSVIS IFIP Working Conference on Engineering for Human--Computer Interaction
- EUROGRAPHICS Eurographics Annual Conference of the European Association for Computer Graphics
- EuroITV European Interactive TV Conference
- EuroVis Eurographics/IEEE--VGTC Symposium on Visualization
- GD International Symposium on Graph Drawing
- GMP Geometry Modeling and Processing Conference
- GRAPP International Conference on Computer Graphics Theory and Applications
- GREC IAPR International Workshop on Graphics Recognition
- I3D ACM Symposium on Interactive 3D Graphics and Games
- IAIF International Workshop on Image Analysis and Information Fusion
- IAPR--TC--15 Workshop on Graph--based Representations in Pattern Recognition
- ICCV IEEE International Conference on Computer Vision
- ICIAP International Conference on Image Analysis and Processing
- ICIG International Conference on Image and Graphics
- ICIP IEEE International Conference on Image Processing
- ICPR International Conference on Pattern Recognition
- ICVS International Conference on Computer Vision Systems
- InfoVis IEEE Symposium on Information Visualization
- IPCV International Conference on Image Processing Computer Vision and Pattern Recognition

Conferências [motivação]

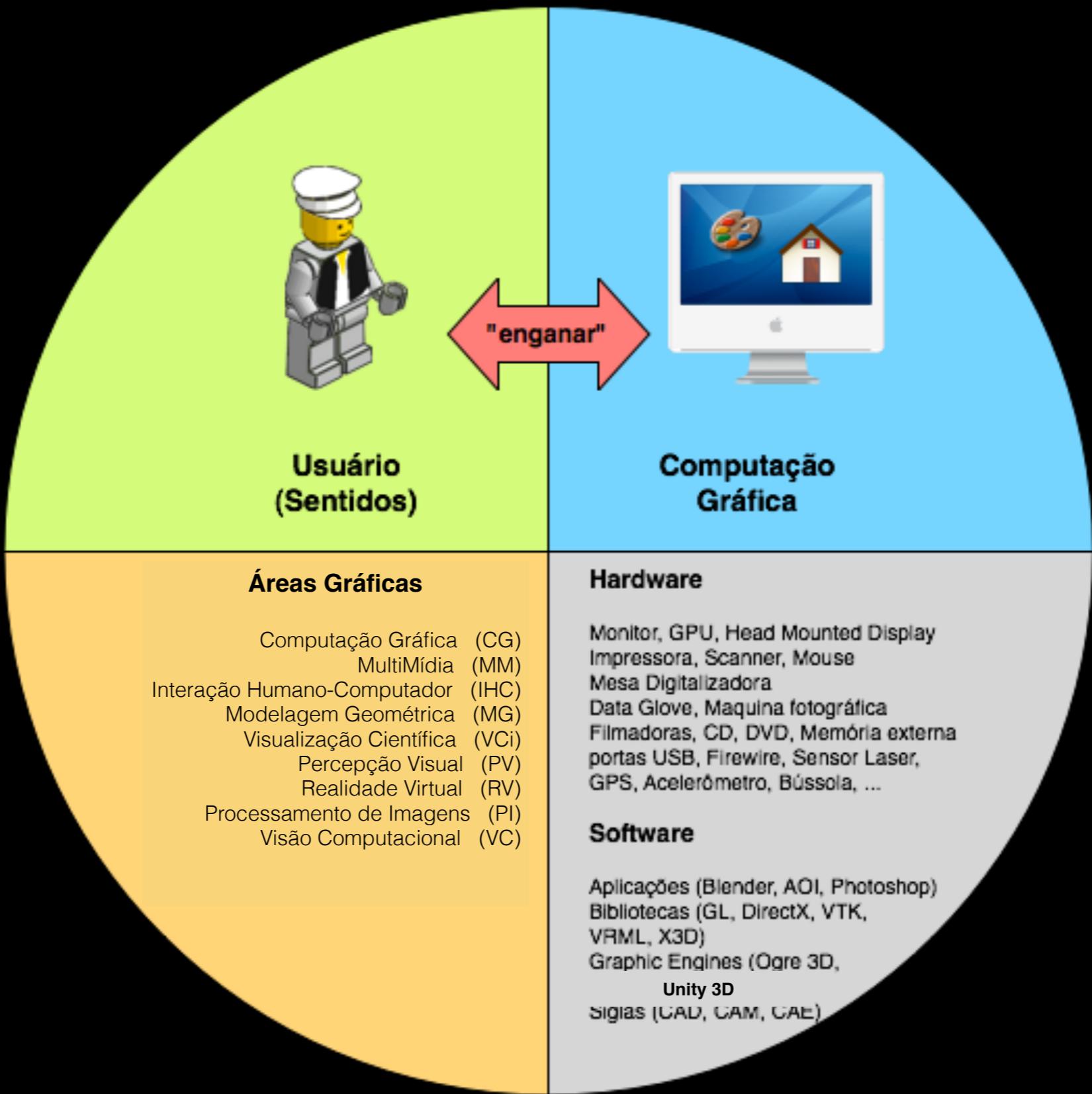
- ISAVIIA International Symposium on Audio Video Image Processing and Intelligent Applications
- ISBI IEEE International Symposium on Biomedical Imaging: From Nano to Macro
- ISIMP International Symposium on Intelligent Multimedia Video and Speech Processing
- IV International Conference on Information Visualization
- IVCNZ Image and Vision Computing Conference
- IWCA International Workshop on Combinatorial Image Analysis
- IWSSIP International Workshop on Systems Signals and Image Processing
- MICCAI International Conference on Medical Image Computing and Computer Assisted Intervention
- MMBIA IEEE Computer Society Workshops on Mathematical Methods in Biomedical Image Analysis
- MMVR Annual Medicine Meets Virtual Reality Conference
- MSV International Conference on Modeling_ Simulation and Visualization Methods
- MVA IAPR International Workshop on Machine Vision Applications
- PACIFICVIS IEEE Pacific Visualization Symposium
- PACIFIC_GRAPHICS Pacific Conference on Computer Graphics and Applications
- PBG IEEE/Eurographics Symposium on Point--Based Graphics
- Sandbox ACM SIGGRAPH Sandbox Symposium on Videogames
- SBGames Simpósio Brasileiro de Jogos e Entretenimento Digital
- SBM Eurographics Workshop on Sketch--Based Interfaces and Modeling
- SCA ACM SIGGRAPH / Eurographics Symposium on Computer Animation
- SGP Eurographics Symposium on Geometry Processing

Empresas “grandes” [motivação]

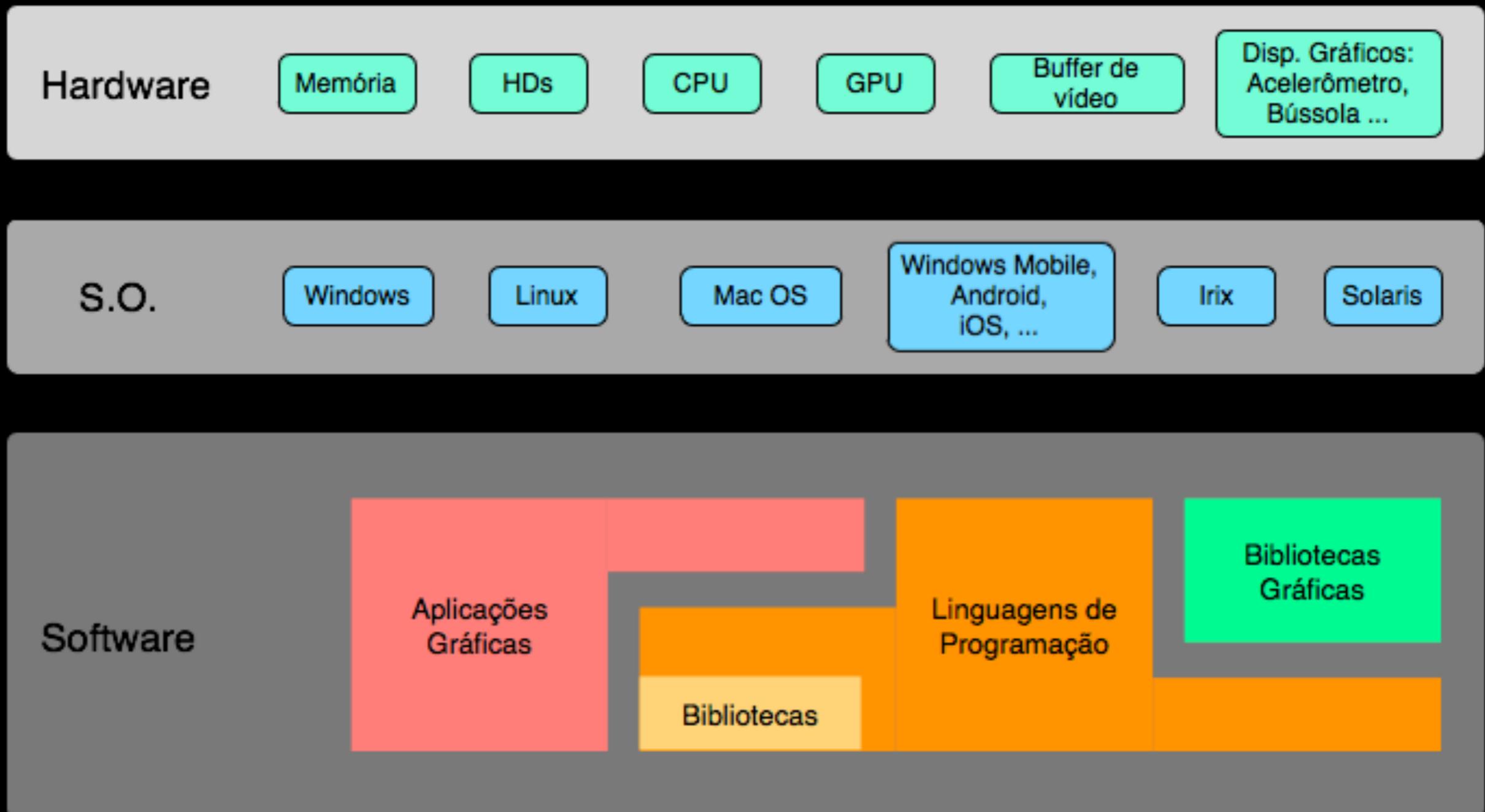
MASSIVE

<https://www.massivesoftware.com>

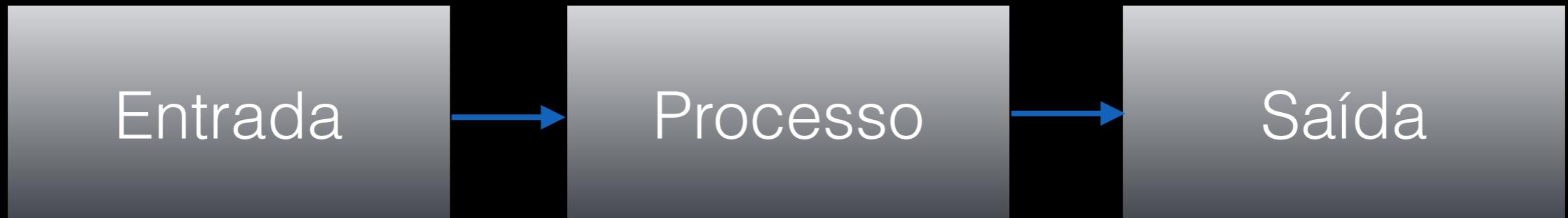
Pacotão Gráfico: visão geral



Pacotão Gráfico: camadas



Visão geral: macro



- Camadas:
 - hardware
 - software
 - rotinas
 - dados

Visão geral: dados

- Dimensão:

- 1D ... valor escalar
- 2D
- 2D 1/2
- 3D
- 4D
- ..
- nD

Sistema de
Referência

Câmera
Sintética

Unity: <https://docs.unity3d.com/Manual/2Dor3D.html>

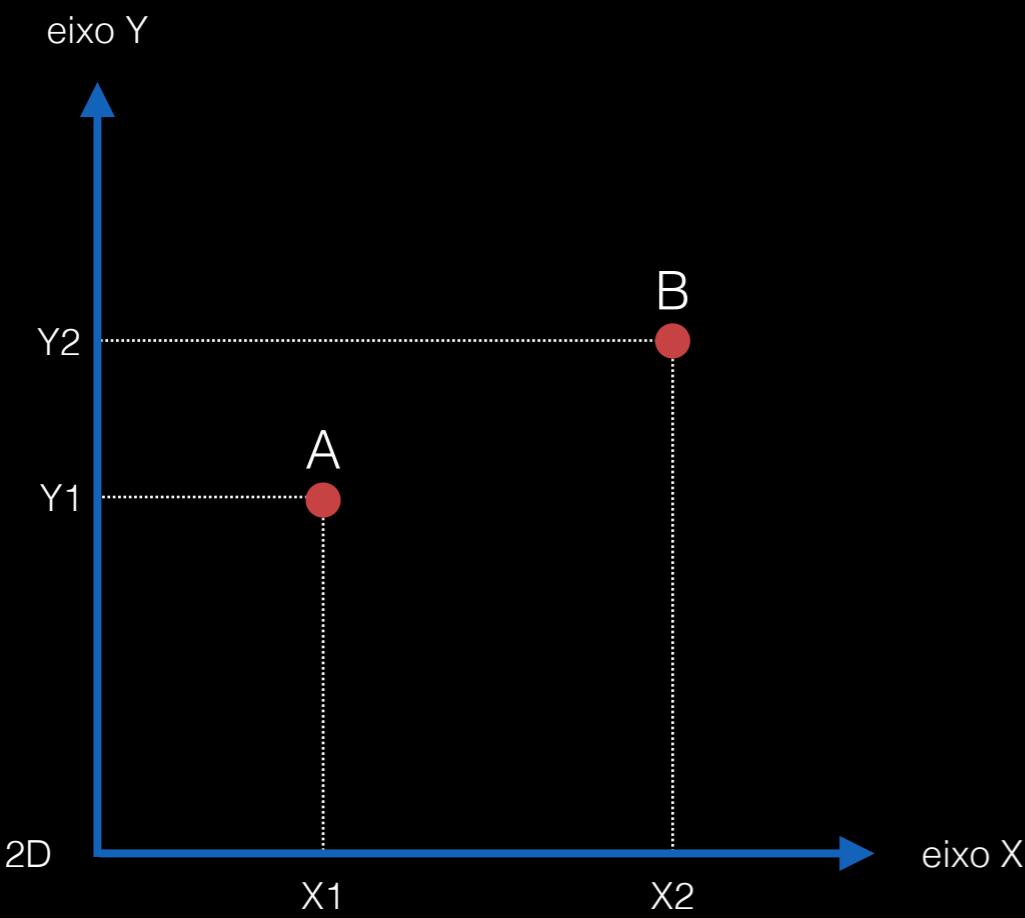
Cinemachine: <https://unity.com/pt/unity/features/editor/art-and-design/cinemachine>

Visão geral: dados

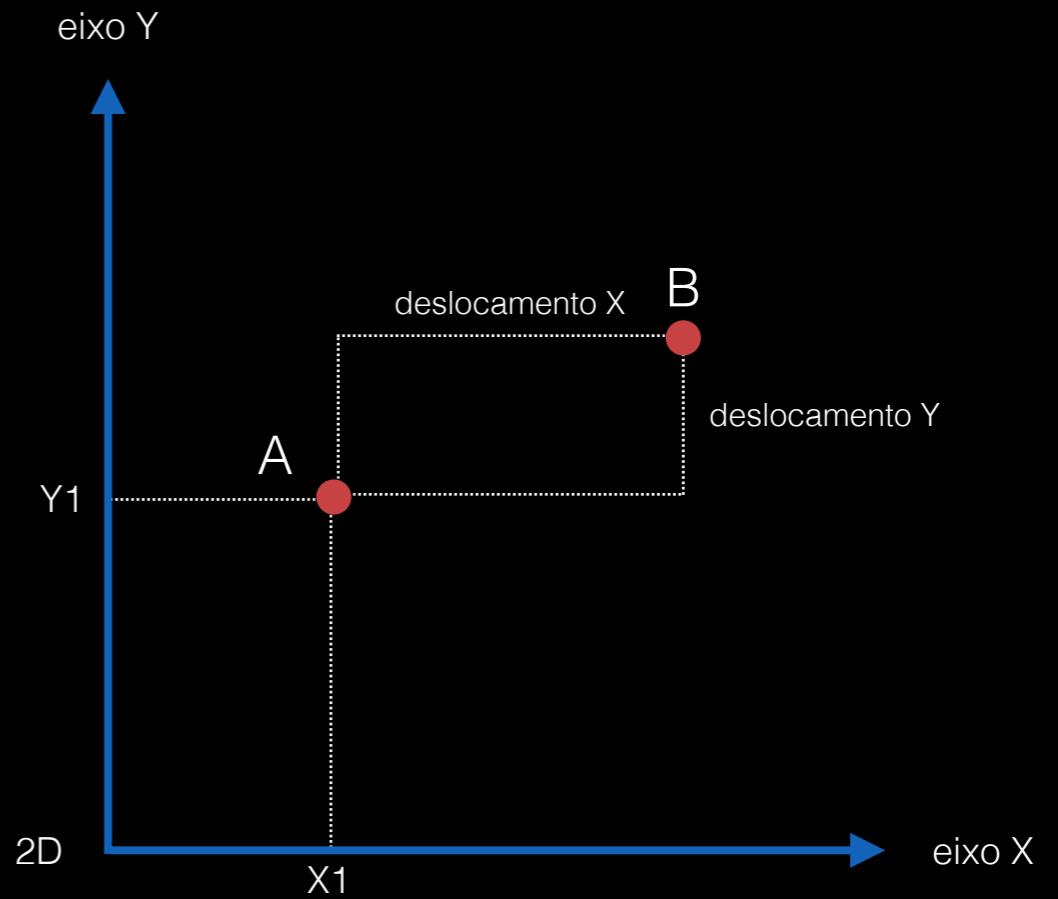
- Referência (2D ou 3D):

absoluta

relativa



Sistema de referência - SRU

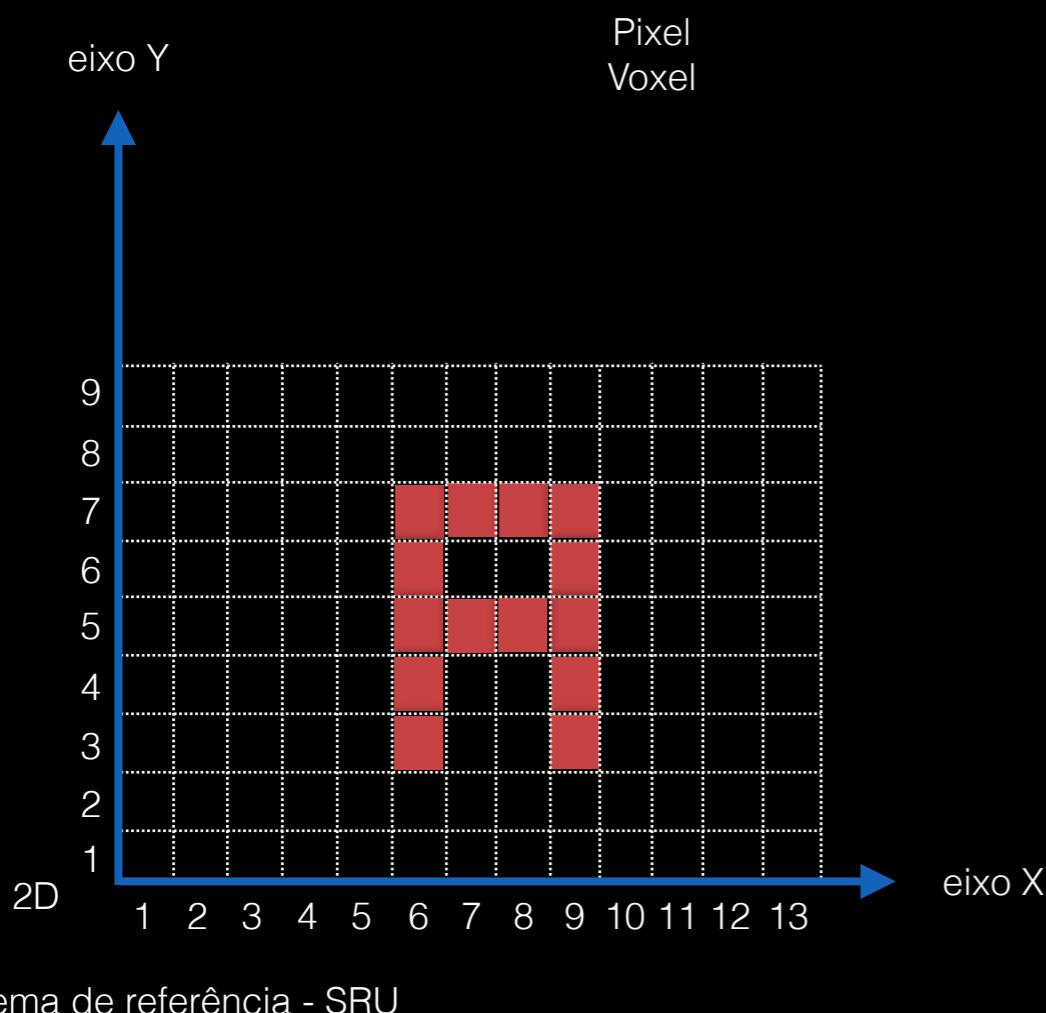


Sistema de referência - SRU

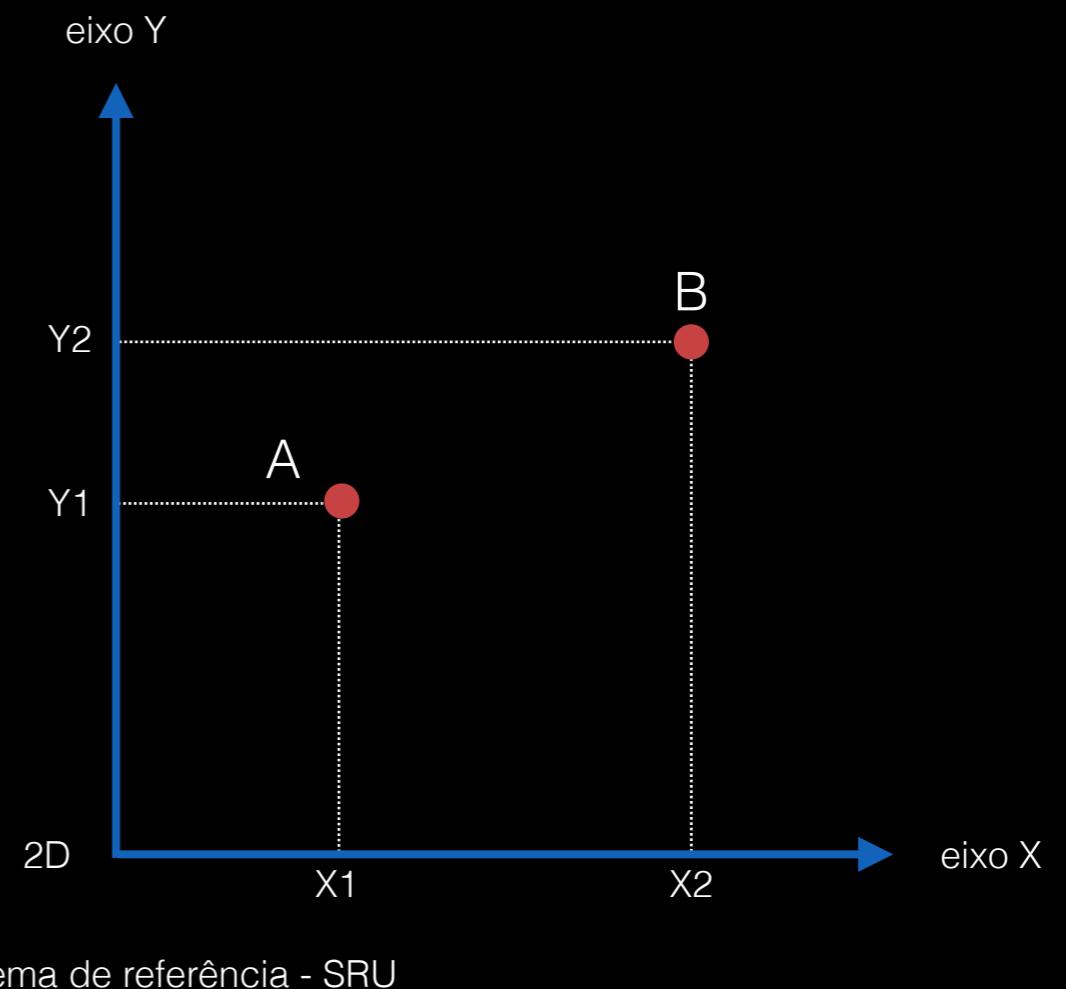
Visão geral: dados

- Tipo (2D ou 3D):

Raster



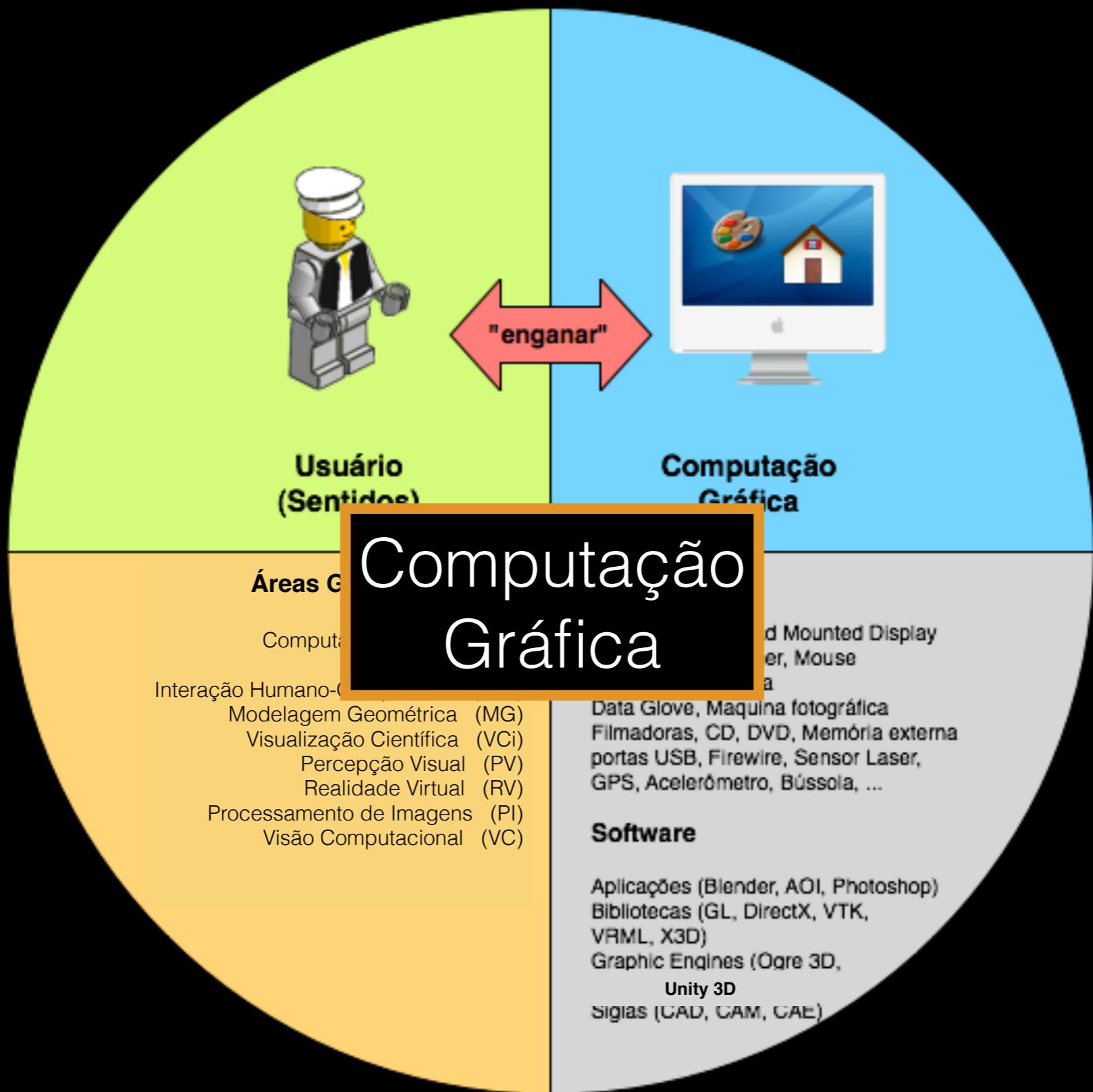
Vetorial



Visão geral: dados

- Dúvidas:
 - qual é a “melhor”?
 - posso mudar de um tipo para outro?
 - o que impacta na escolha errada?
 - como fica no hardware, tem diferenças?
 - e nas rotinas (softwares) é tudo igual?
 - e para persistir, é só fazer um Modelo-Entidade-Relacionamento (MER), banco relacional, etc.
 - ...

Pacotão Gráfico: visão geral



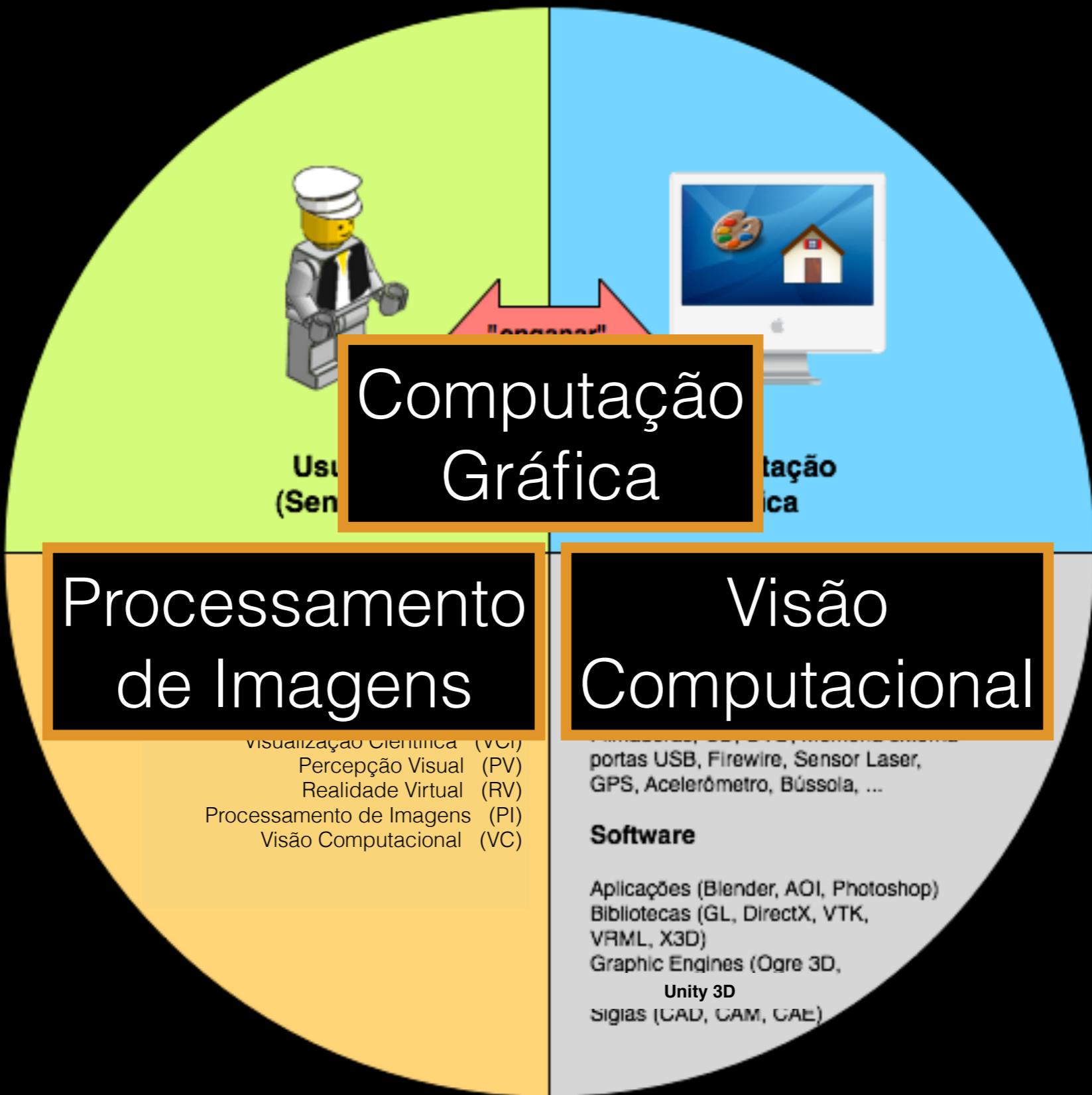
O que é CG?

- Grande Área Gráfica: "Pacotão Gráfico"

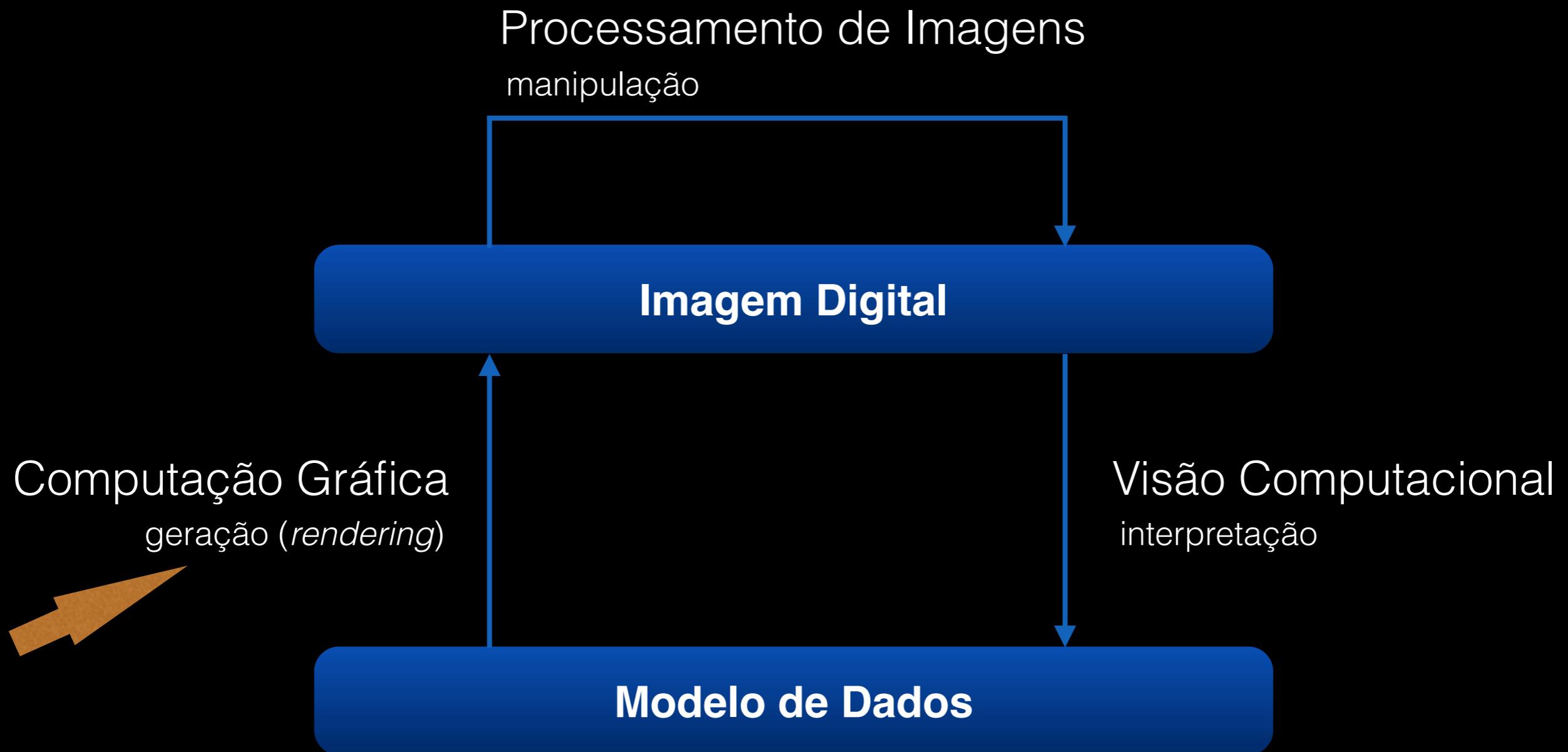
Área da computação que trata da **geração, manipulação e interpretação** de imagens geradas pelo computador

- Preocupações:
 - geração: habilidades artísticas x ferramentas gráficas; distinguir real do virtual, ...
 - manipulação: relação custo x benefício, recursos x qualidade gráfica, ...
 - interpretação: manual x automático, uso de Inteligência Artificial, ...

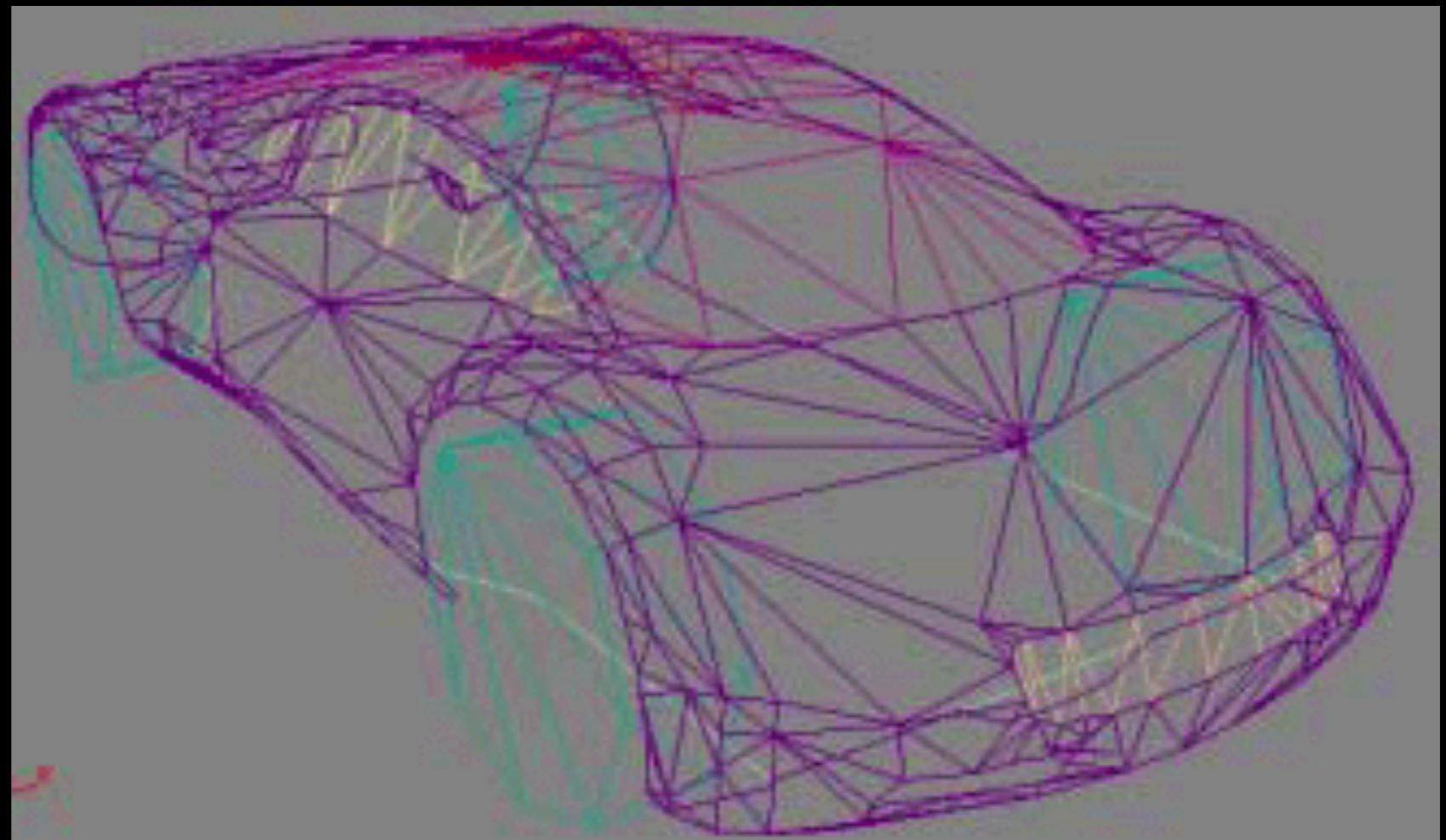
Pacotão Gráfico: visão geral



Áreas Gráficas



Computação Gráfica: geração



- 1^a geração - *wireframe* (até 1987):
 - vértices: transformações e projeções;
 - rasterização: interpolação de pontos e linhas.

Computação Gráfica: geração



- 2^a geração - sólidos com sombras (1982 a 1992):
 - vértices: cálculo da luz;
 - rasterização: interpolação de profundidade (triângulos);
 - fragmentos: *depth buffer, color blending*.

Computação Gráfica: geração



- 3^a geração - texturização (1992 a 2000):
 - vértices: transformação das coordenadas da textura;
 - rasterização: interpolação das coordenadas da textura;
 - fragmentos: avaliação da textura, *anti-aliasing*.

Computação Gráfica: geração



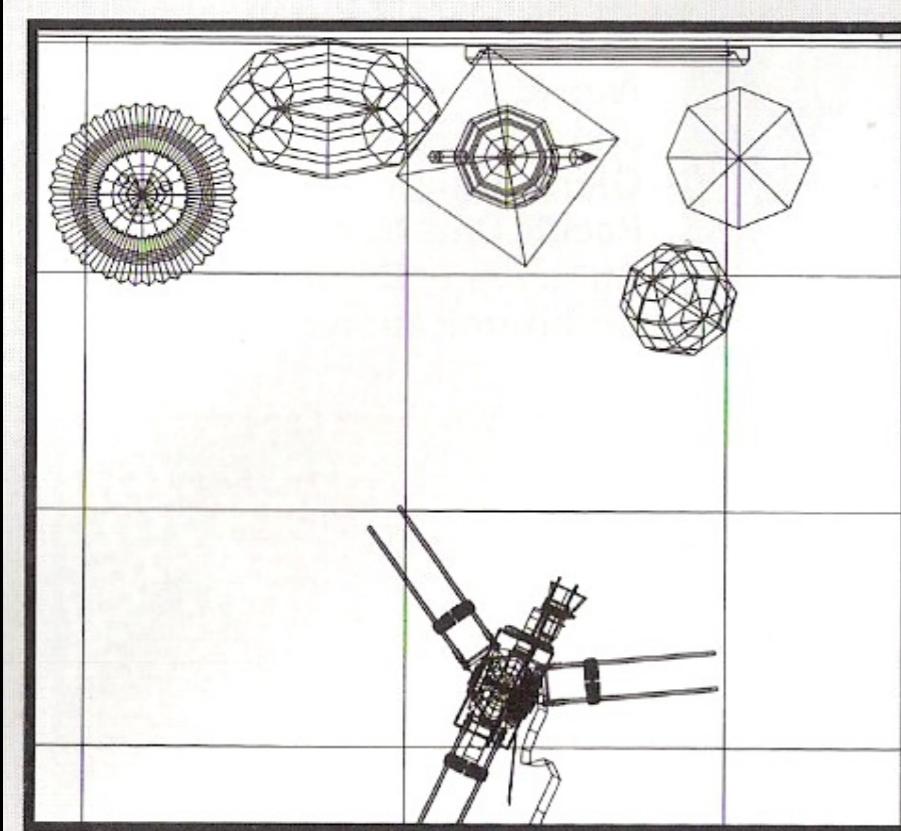
- 4^a geração - programação:
 - sombras procedurais;
 - image based rendering;
 - convergência de mídias.

Computação Gráfica: geração

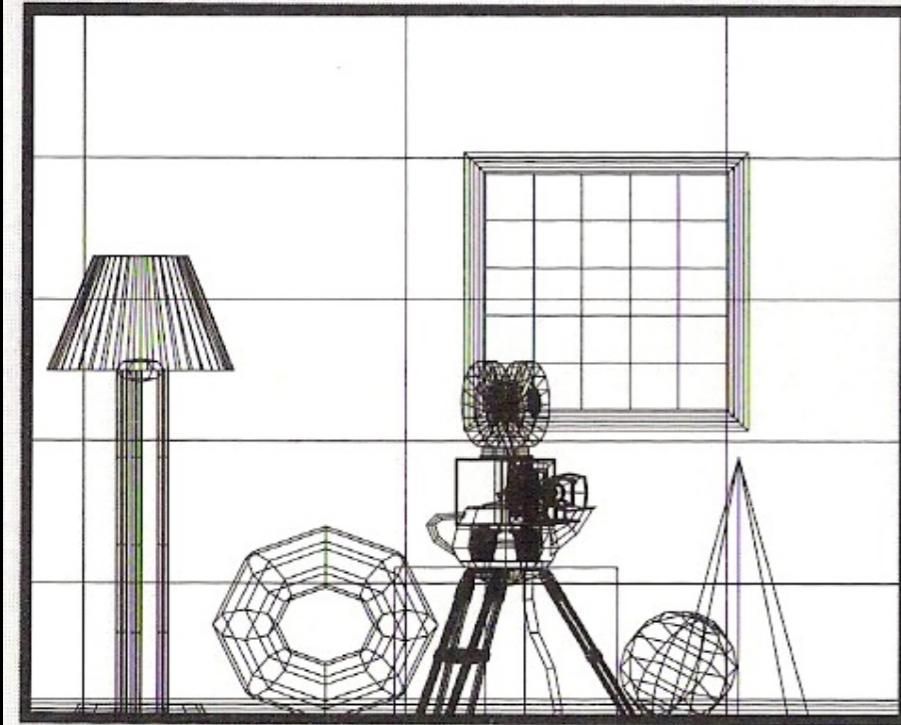


- 5^a geração - iluminação global:
 - radiosidade, *true shadows*.

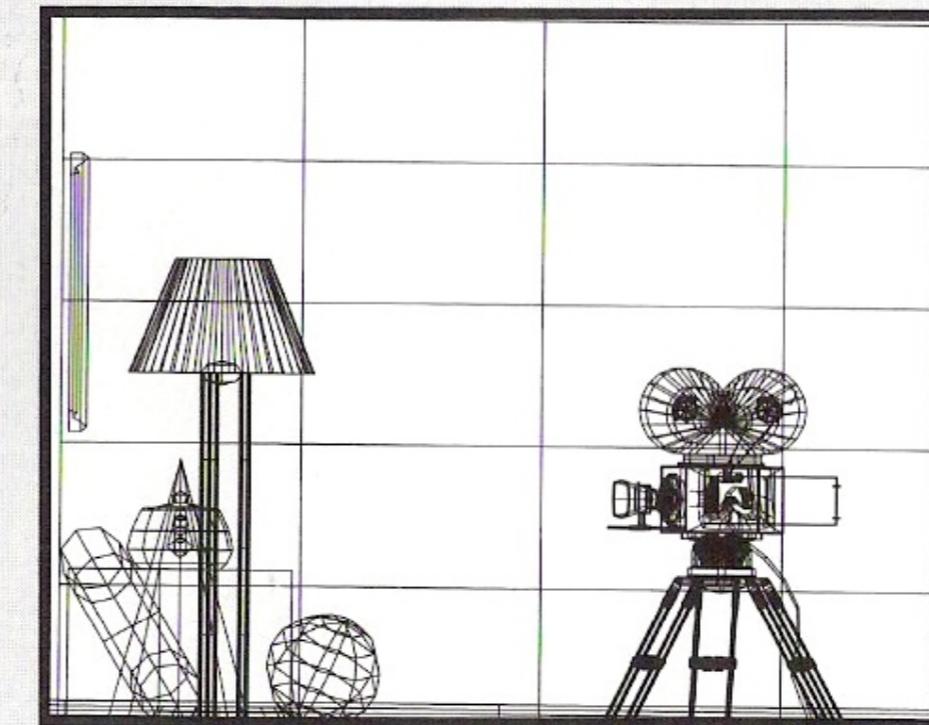
Computação Gráfica: etapas



(a)



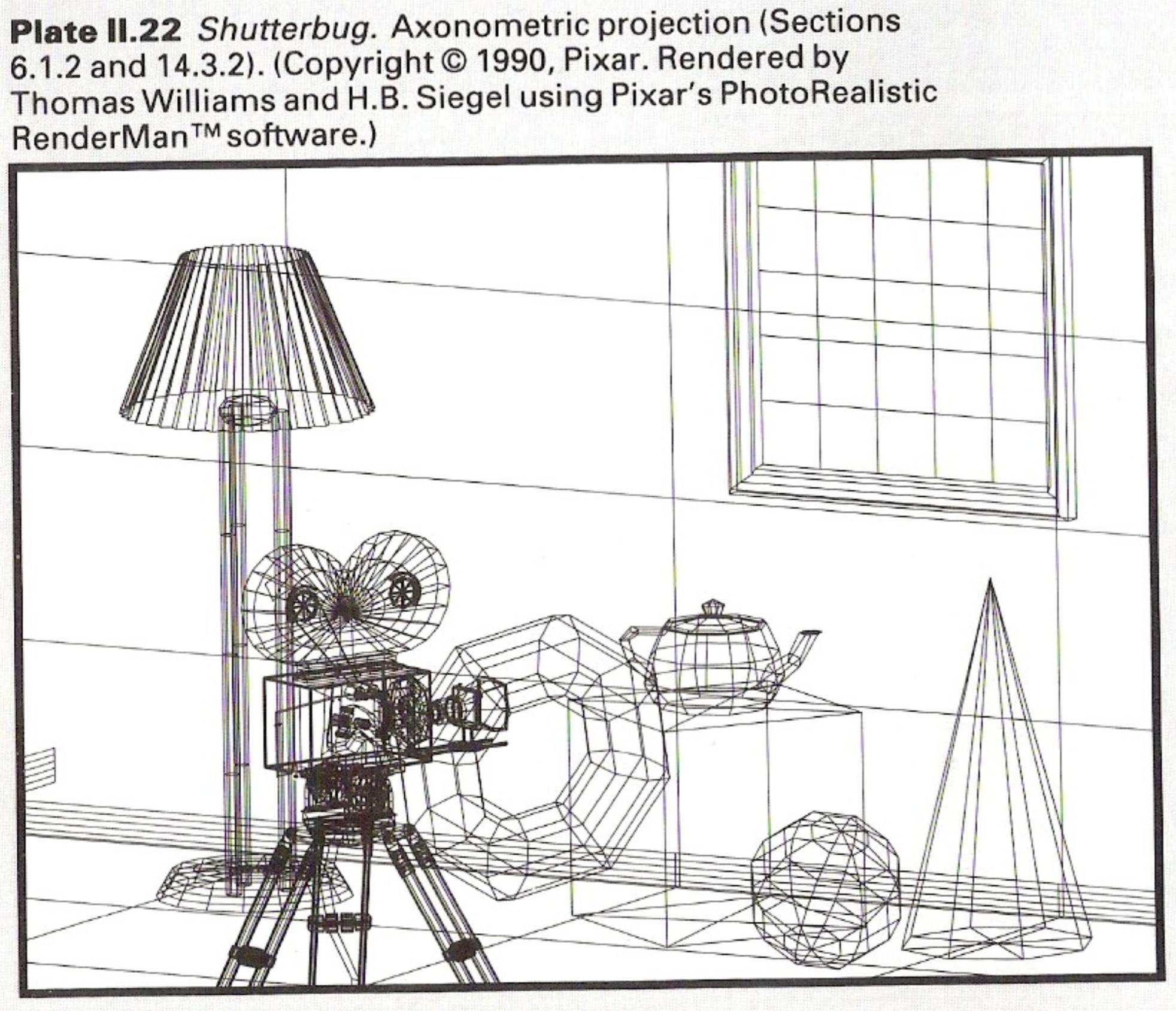
(b)



(c)

Plate II.21 *Shutterbug*. Living room scene with movie camera. Orthographic projections (Sections 6.1.2 and 14.3.1). (a) Plan view. (b) Front view. (c) Side view. Polygonal models generated from spline patches. Note the “patch cracks” (Section 11.3.5) visible along the entire right front side of the teapot, and how they cause shading discontinuities in the polygon-mesh interpolated-shading models used in Color Plates II.30–II.32. (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar’s PhotoRealistic RenderMan™ software.)

Computação Gráfica: etapas



Computação Gráfica: etapas

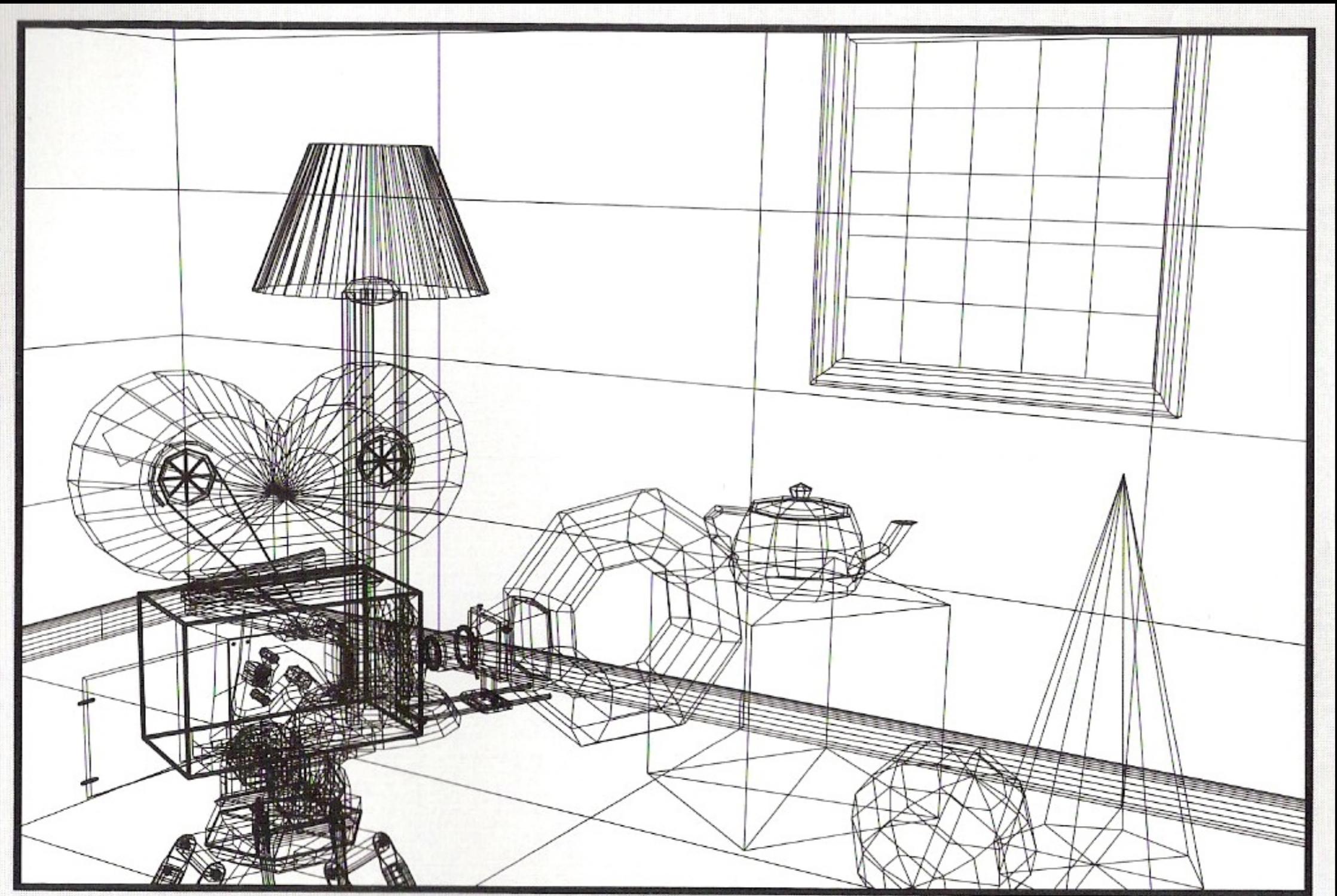
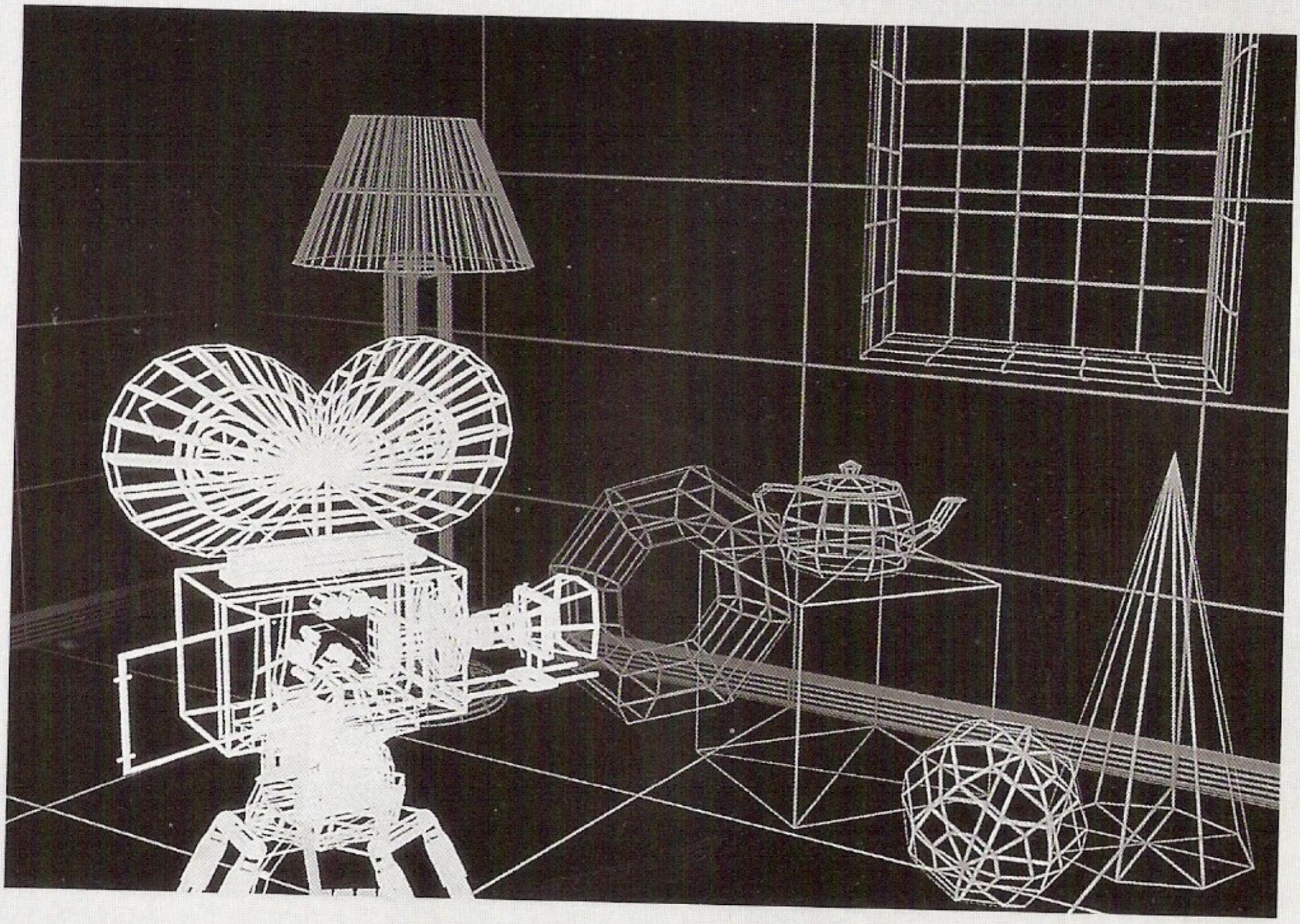


Plate II.23 *Shutterbug*. Perspective projection (Sections 6.1.1 and 14.3.3). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)

Computação Gráfica: etapas

Plate II.24 *Shutterbug*. Depth cueing (Sections 14.3.4 and 16.1.3). (Copyright © 1990, Pixar.
Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™
software.)



Computação Gráfica: etapas

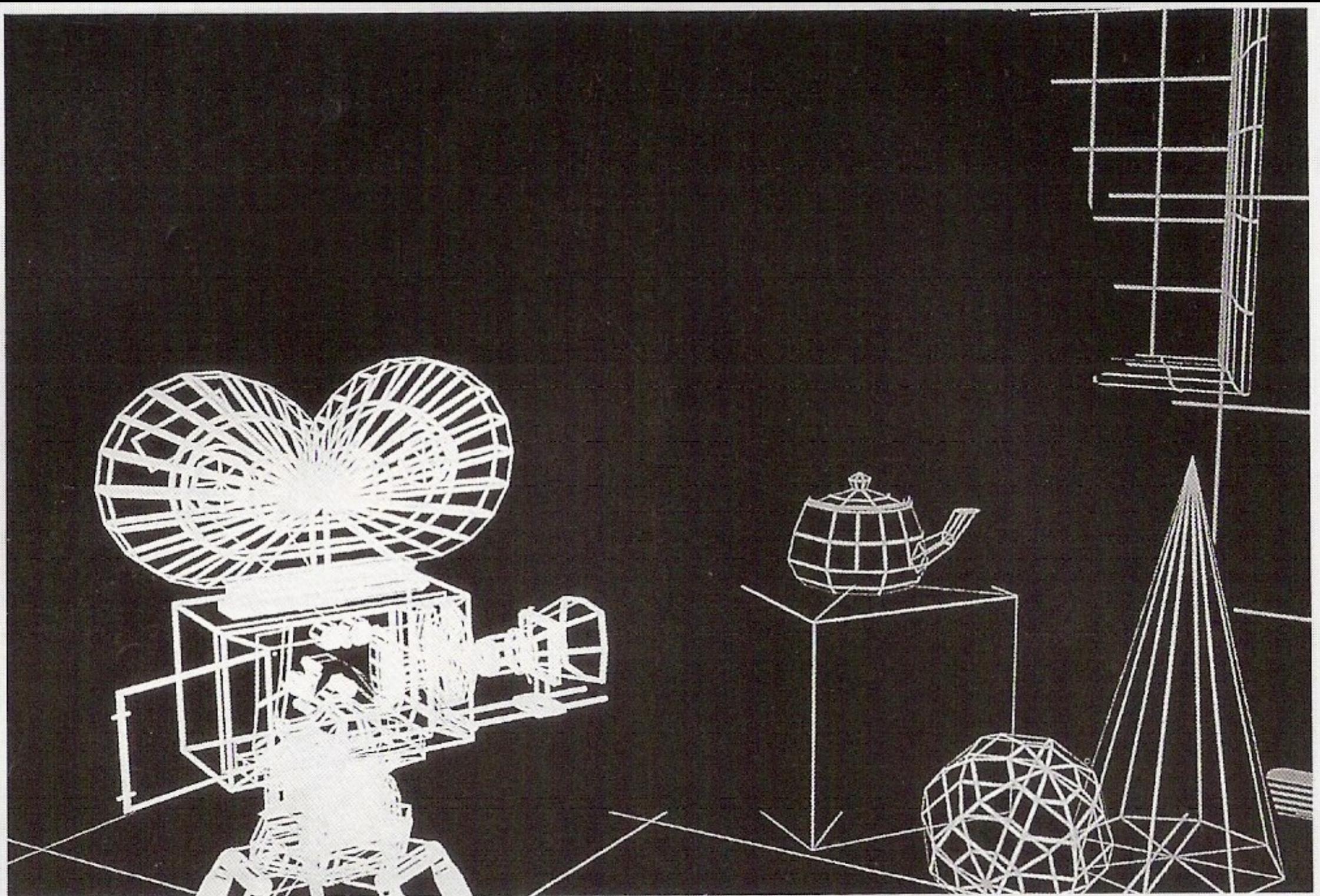
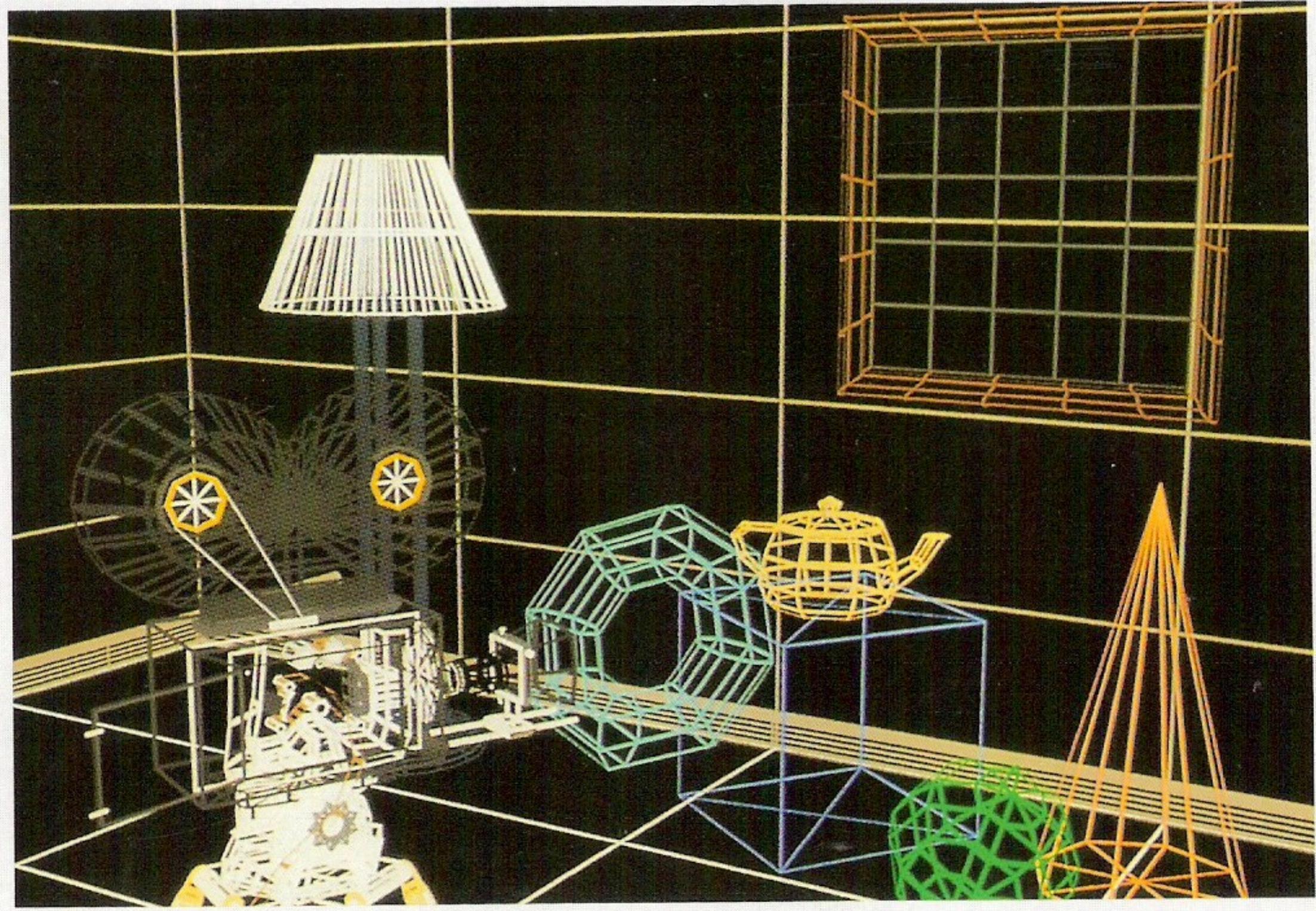


Plate II.25 *Shutterbug*. Depth clipping (Section 14.3.5). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)

Computação Gráfica: etapas

Plate II.26 *Shutterbug*. Colored vectors (Section 14.3.7). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)



Computação Gráfica: etapas

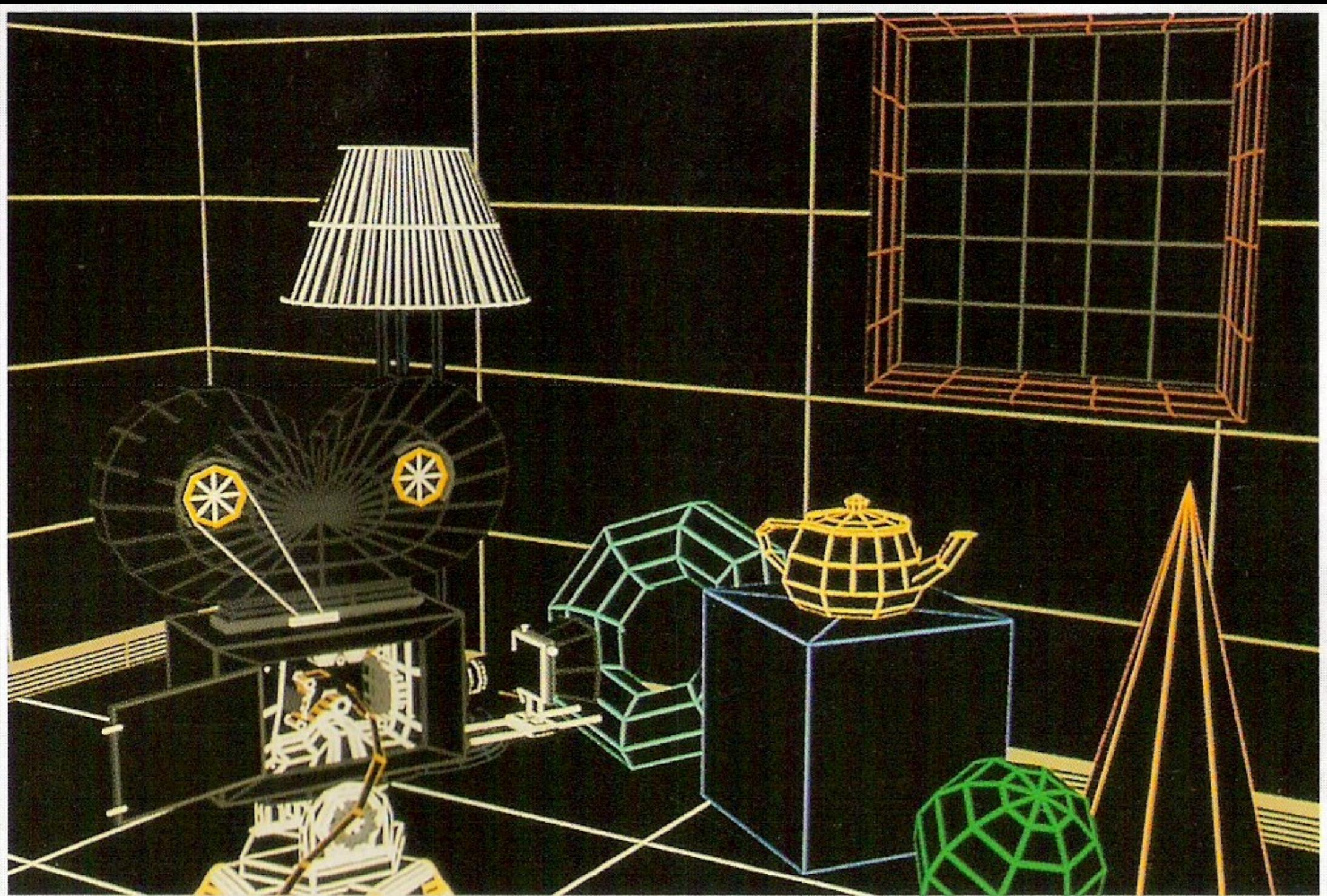


Plate II.27 *Shutterbug*. Visible-line determination (Section 14.3.8). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)

Computação Gráfica: etapas

Plate II.28 *Shutterbug*. Visible-surface determination with ambient illumination only (Sections 14.4.1 and 16.1.1). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)



Computação Gráfica: etapas

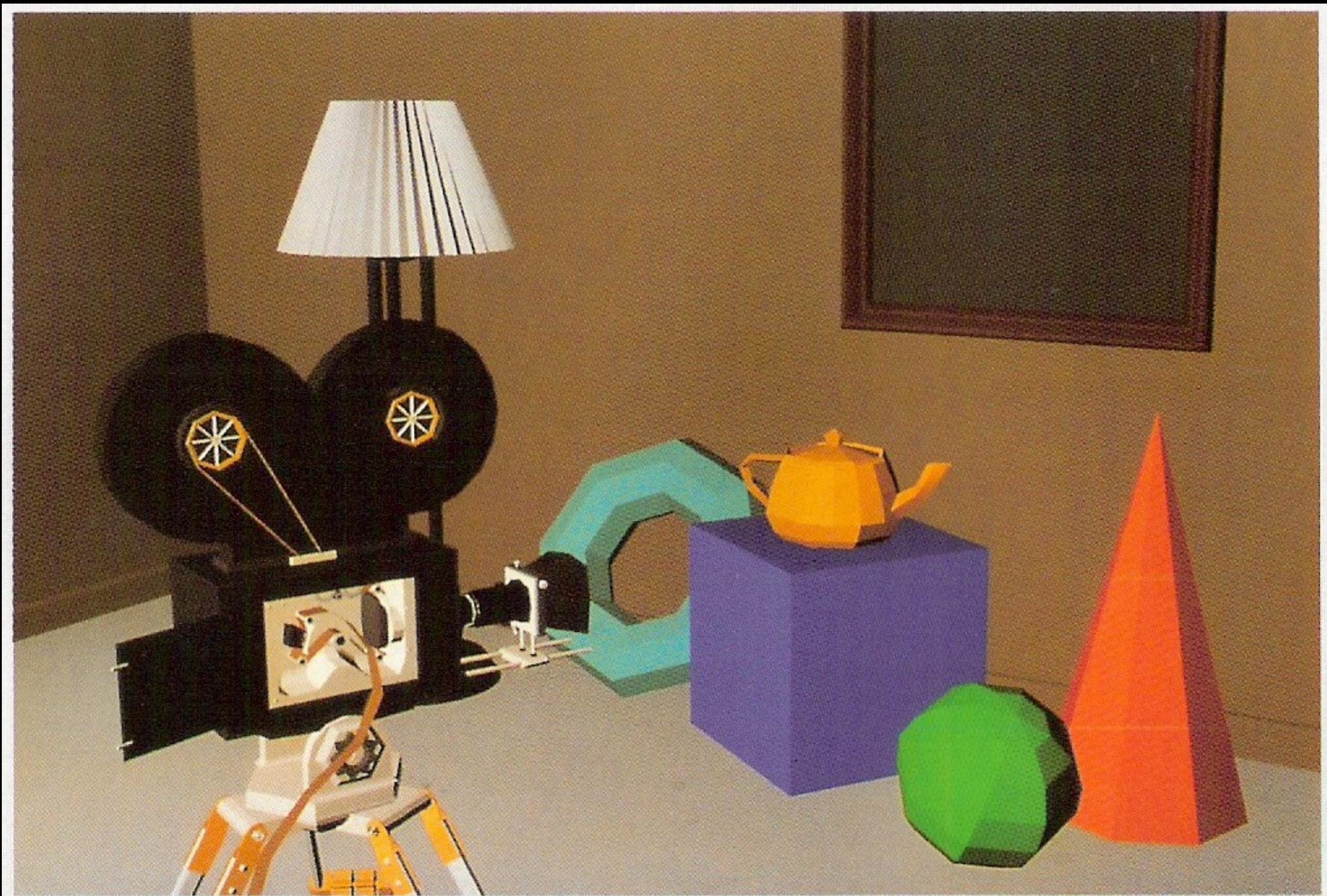
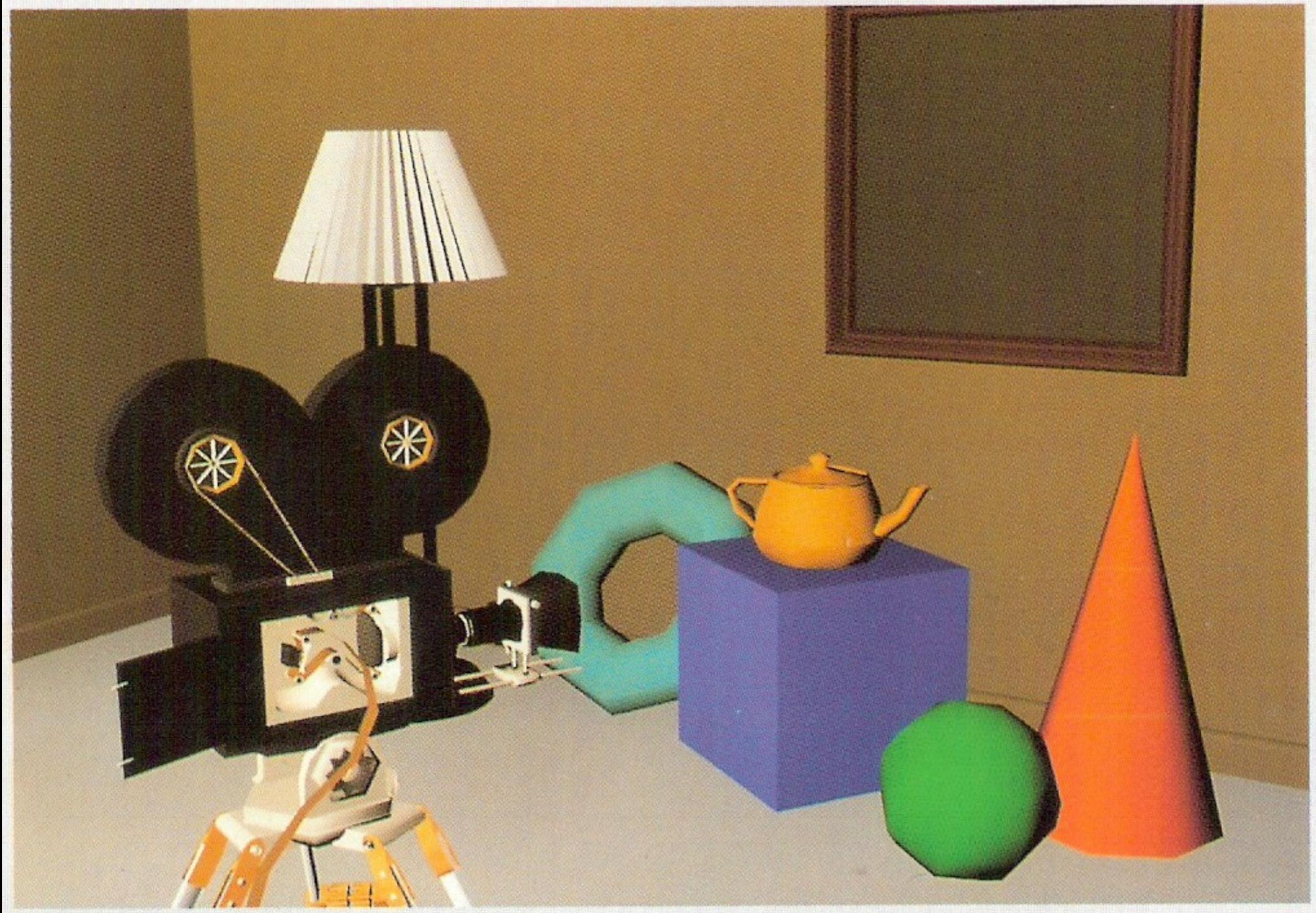


Plate II.29 *Shutterbug*. Individually shaded polygons with diffuse reflection (Sections 14.4.2 and 16.2.3). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)

Computação Gráfica: etapas

Plate II.30 *Shutterbug*. Gouraud shaded polygons with diffuse reflection (Sections 14.4.3 and 16.2.4). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)



Computação Gráfica: etapas

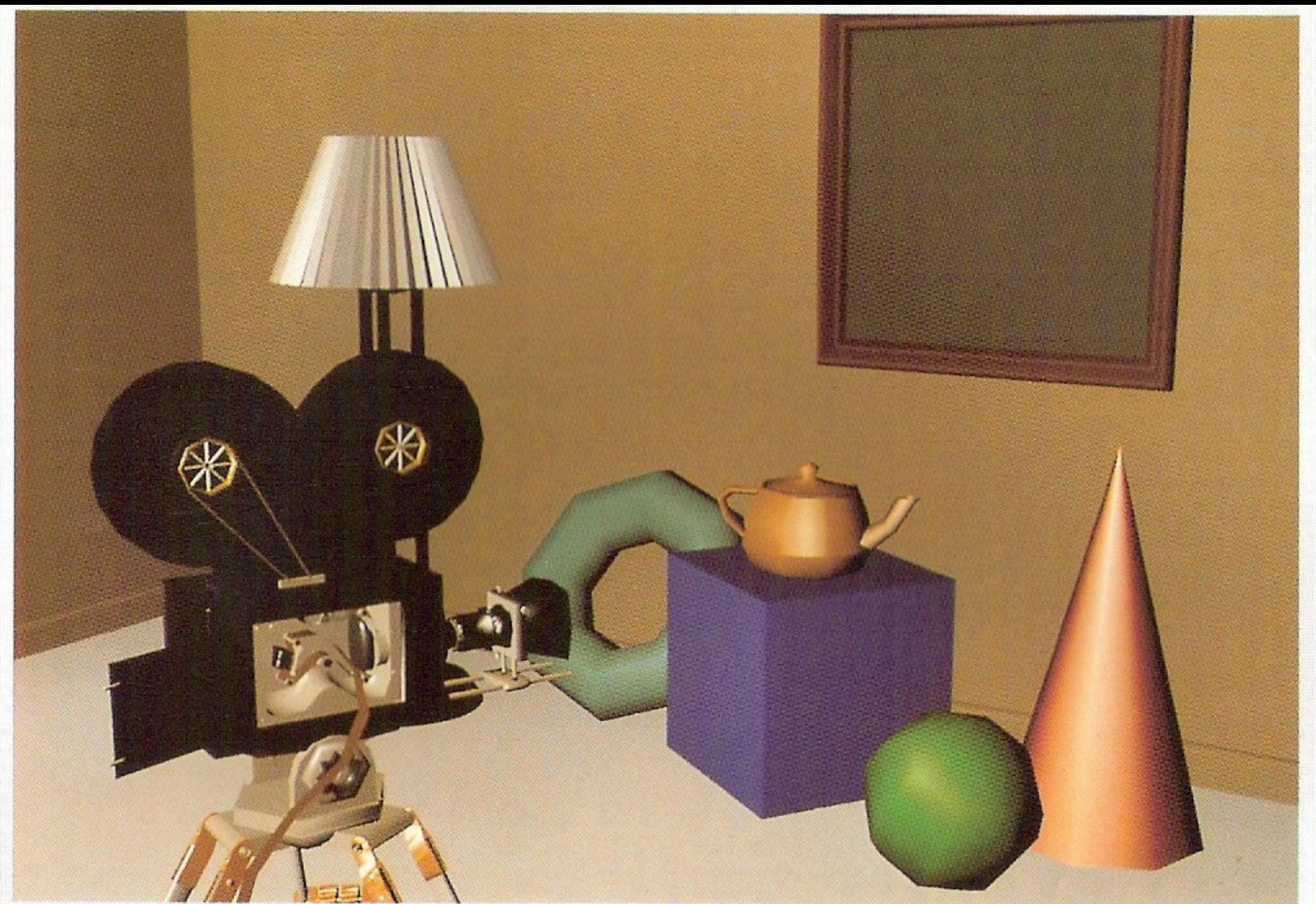


Plate II.31 *Shutterbug*. Gouraud shaded polygons with specular reflection (Sections 14.4.4 and 16.2.5). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)

Computação Gráfica: etapas

Plate II.32 *Shutterbug*. Phong shaded polygons with specular reflection (Sections 14.4.4 and 16.2.5). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)



Computação Gráfica: etapas

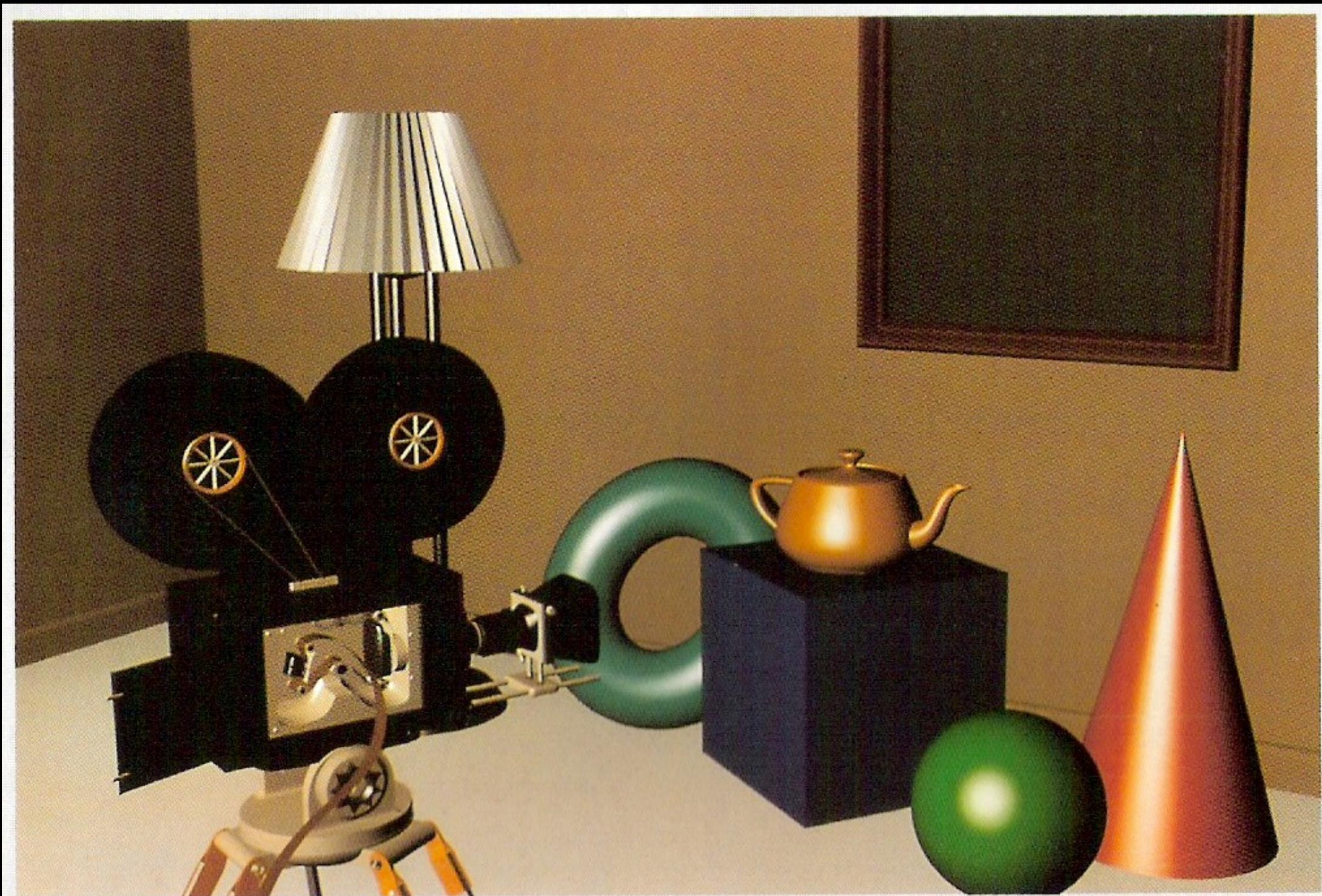
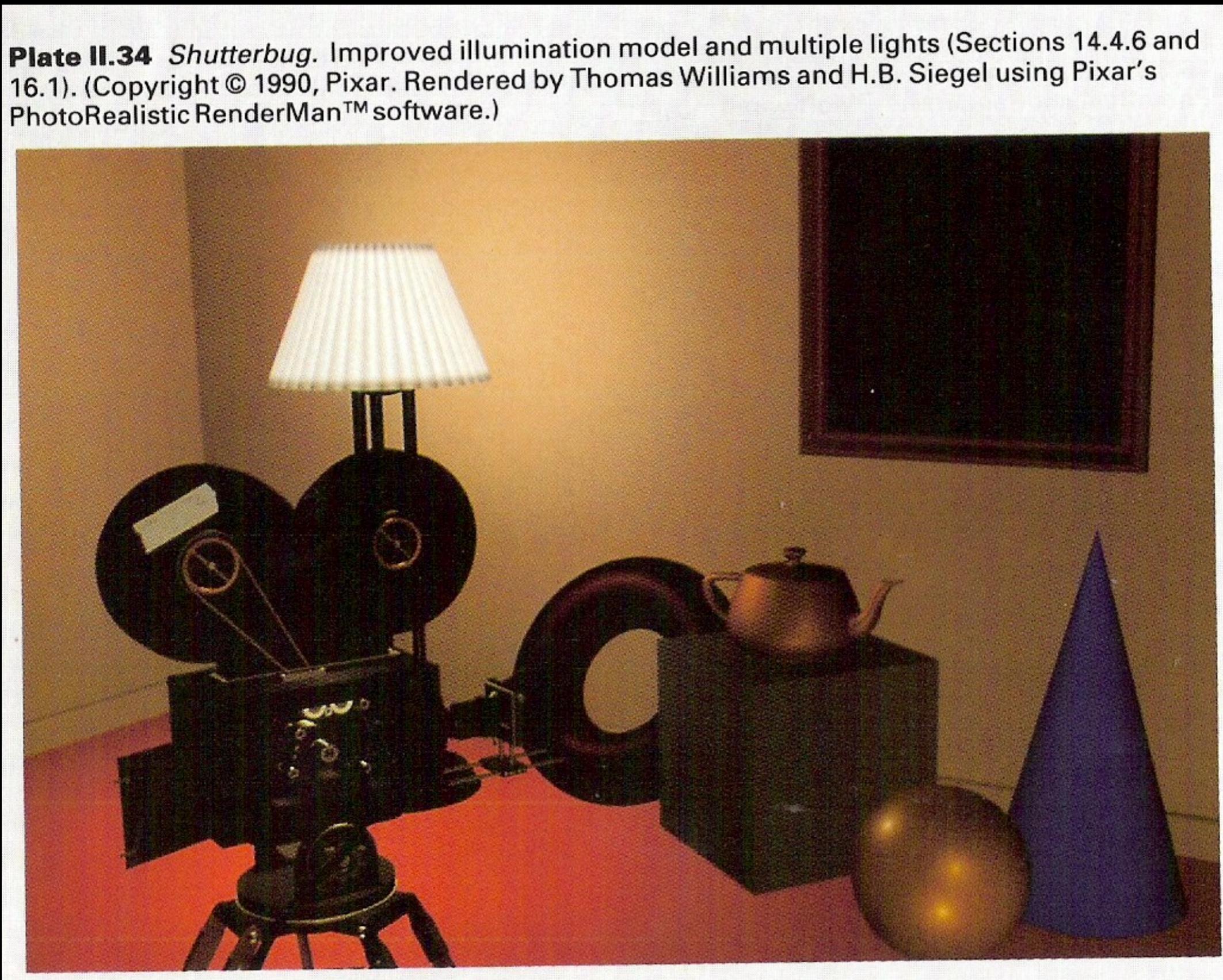


Plate II.33 *Shutterbug*. Curved surfaces with specular reflection (Section 14.4.5). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)

Computação Gráfica: etapas



Computação Gráfica: etapas

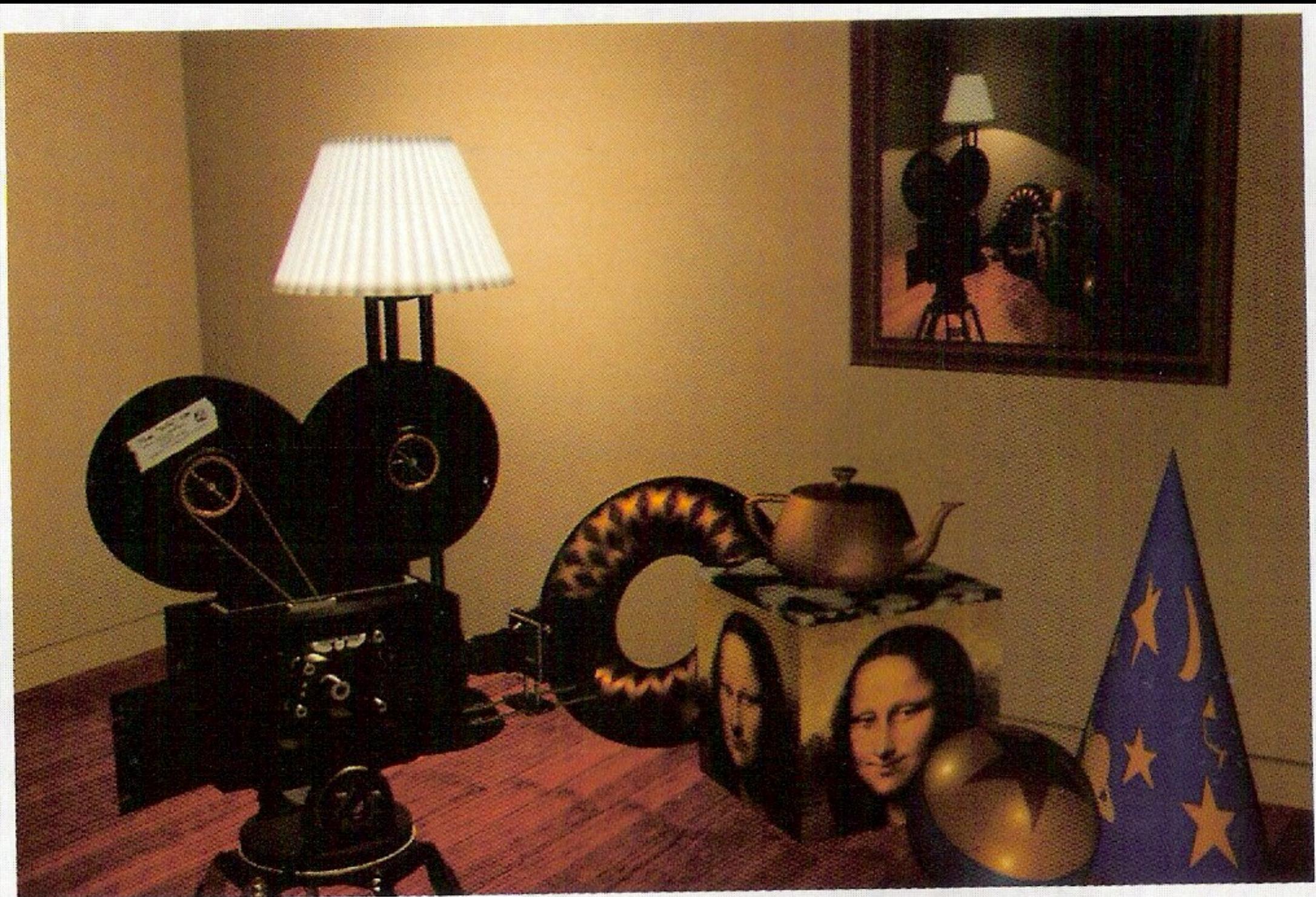


Plate II.35 *Shutterbug*. Texture mapping (Sections 14.4.7, 16.3.2, 17.4.2, and 17.4.3). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)

Computação Gráfica: etapas

Plate II.36 *Shutterbug*. Displacement mapping (Sections 14.4.7 and 16.3.4) and shadows (Sections 14.4.8 and 16.4). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)



Computação Gráfica: etapas

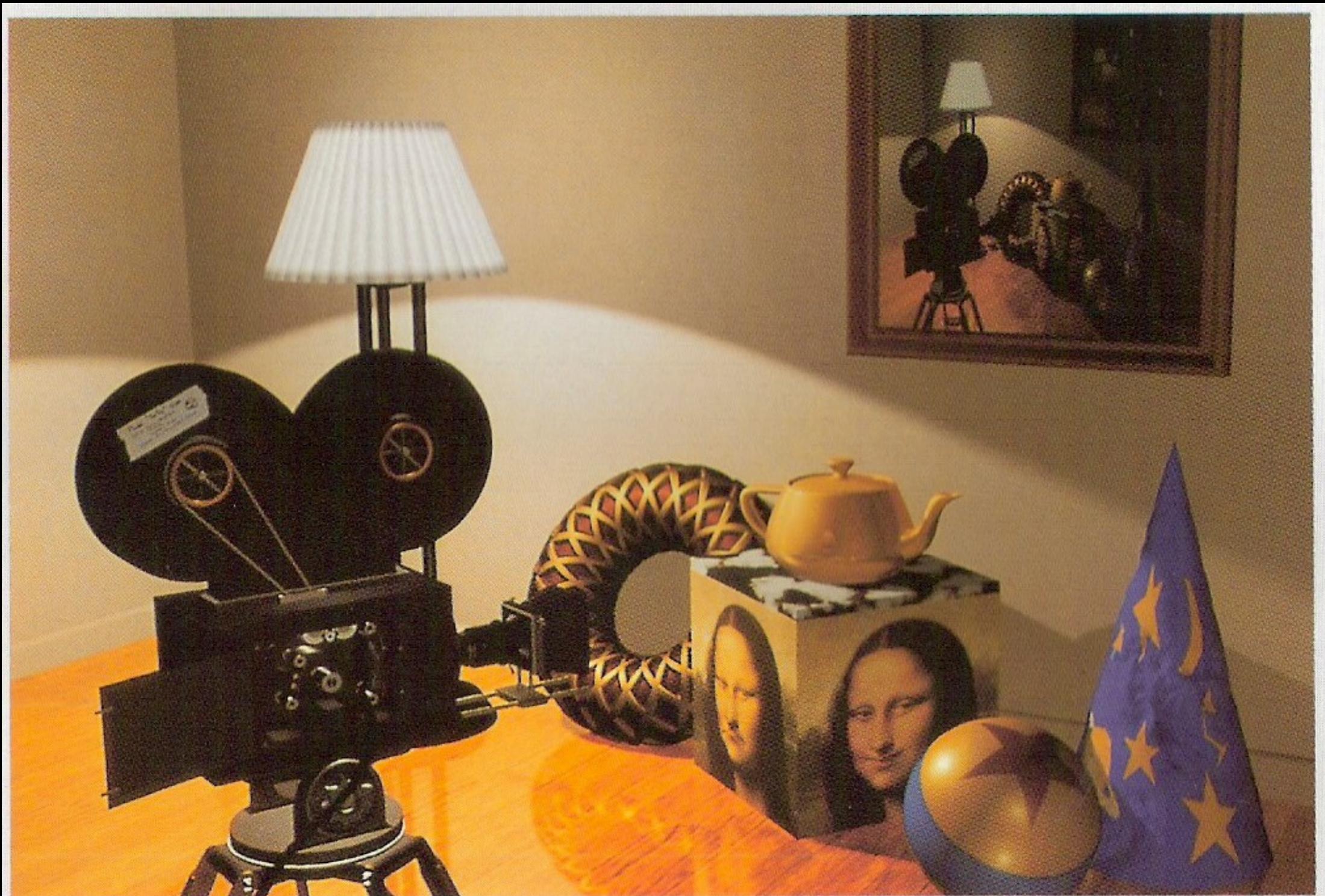


Plate II.37 Shutterbug. Reflection mapping (Sections 14.4.9 and 16.6). (Copyright © 1990, Pixar. Rendered by Thomas Williams and H.B. Siegel using Pixar's PhotoRealistic RenderMan™ software.)