Introduction

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Literatura

Computer Graphics Using open GL
by F.S. *Hill*, Jr*., Second Edition*

Addison-Wesley; ISBN: 0201848406; 2nd edition

Computer Graphics: Principles and Practice
by *Foley*, van *Dam*, *Feiner* and *Hughes*, *(2nd Ed.),*
Addison-Wesley, 1990. ISBN 0-201-12110-7

Three-dimensional computer graphics
by *Watt* Alan,
3nd Ed., Addison-Wesley Pub Co, Dec. 1999.
ISBN: 0201398559

Moderni pocitacova grafika
by *Beneš* Bedřich, *Felkl* Petr, *Žára* Jiří
Computer Press, 1998,
ISBN: 8072260499, EAN: 9788072260492

Ine zdroje

- research.microsoft.com

- www.opengl.org

- SGI, TGS

- groups.google.com (discuss)

- ACM Siggraph - **www.siggraph.org**

- Eurographics – **www.eg.org**

- SCCG – **www.sccg.sk**

- **www.netgraphics.sk/**pg a ine... www ...

Short history

- **1960 vector displays**
- **1962 I.E Sutherland,** "*Sketchpad: A Man-Machine Graphical Communication System,*" Ph.D. Thesis, MIT
- **1970 raster graphics**
- **1975 Gor. a Phong shading, Clipping**
- **1979 Eurographics founded**
- **1974 Z-buffer**
- **1980 Ray Tracing**
- **1984 Radiosity (Prof. Nishita)**
- **1986 Rendering equation**
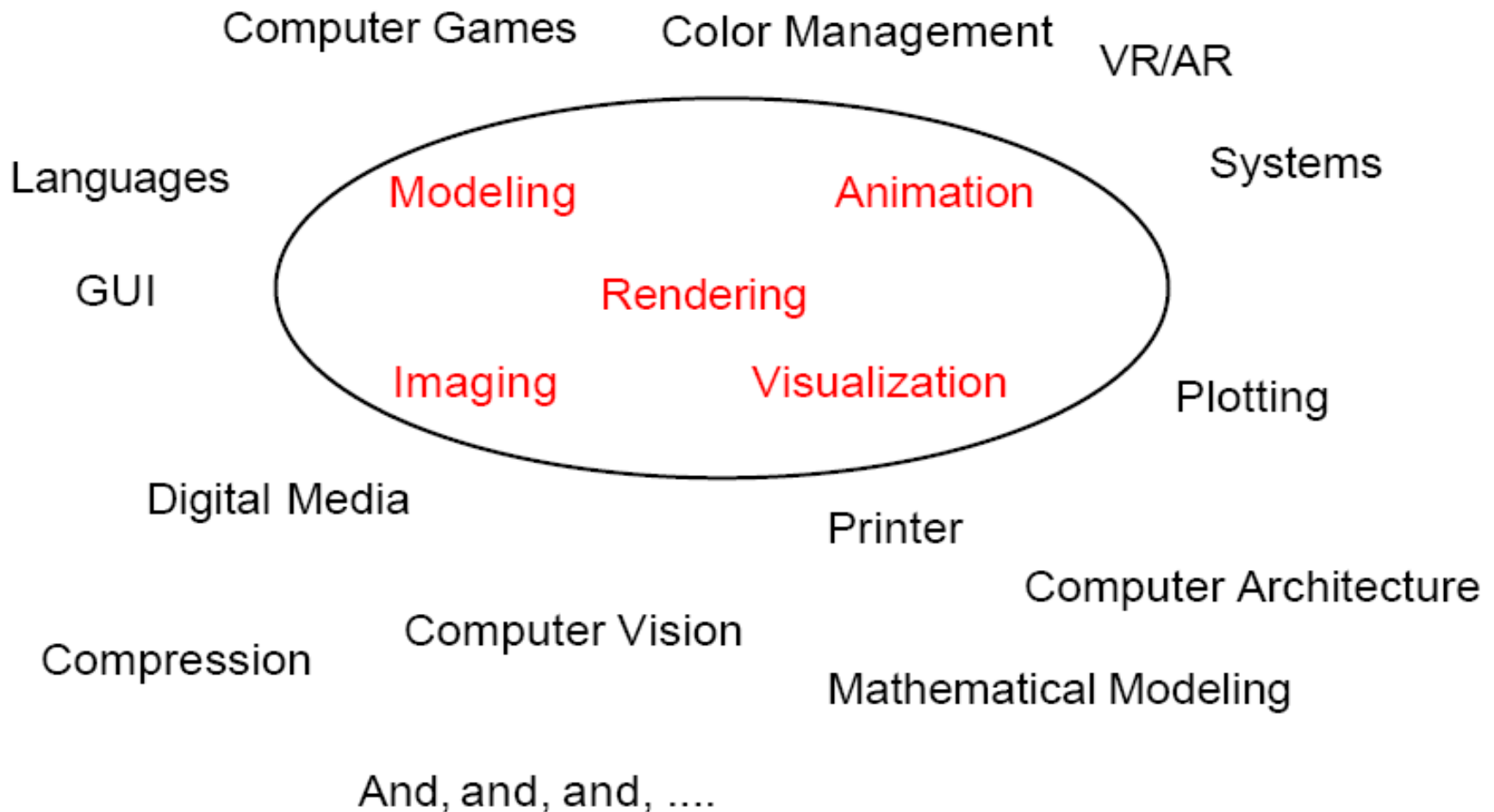
Historical perspective

- 1981: Apollo Workstation, IBM PC
- 1982: Silicon Graphics (SGI) founded
- 1984: X Window System
- 1984: First Silicon Graphics Workstations (IRIS GL)
- Until mid/end of 1990s: Dominance of SGI in the high end
    - HW: RealityEngine, InfiniteReality, RealityMonster, ...
    - SW: OpenGL, OpenInventor, Performer, Digital Media Libs, ...
- End of 1990s:Low-to mid range taken over by „PCs"(Nvidia, ATI, ...)
    - HW: Fast development cycles, Graphics-on-a-chip, ...
    - SW: Direct 3D & OpenGL, computer games
- Today
    - Programmable graphics hardware, Cg

Čo je PG?

- **Interdisciplinárna tímová práca**
  - Fyzika, matematika a ostatné prírodné vedy
    - Simulácia
    - Modelovanie
    - Numerická analýza
  - Inžinierstvo
    - Hardvérové a softvérové systémy
    - Vstupno-výstupné zariadenia
    - Infraštruktúra a integrácia do existujúcich prostredí
  - Umenie, Psychológia, Medicína, ...
    - Vnímanie
    - Znázorňovanie deja
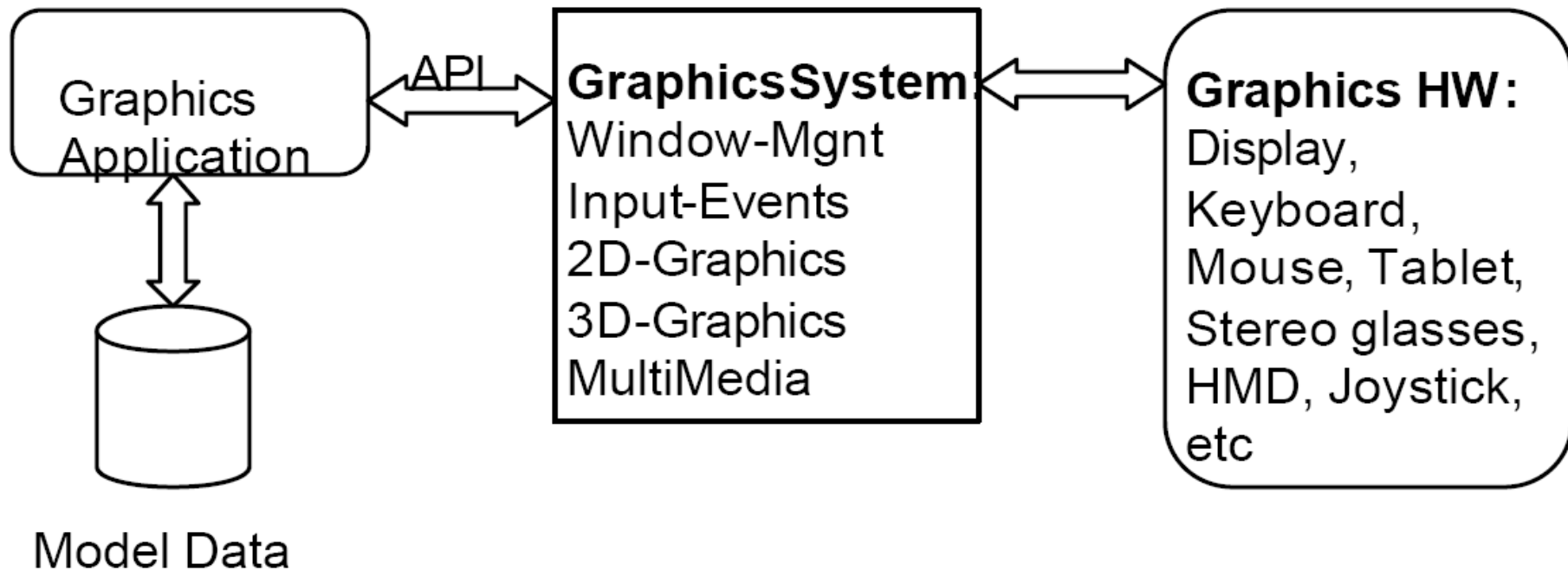   - Návrh a kompozícia
- **Obrovský priemysel a veľkými peniazmi**

Čo je PG?

Computer Games   Color Management   VR/AR

Languages   **Modeling**   **Animation**   Systems

GUI   **Rendering**

Imaging   **Visualization**   Plotting

Digital Media

Printer

Computer Architecture

Compression   Computer Vision

Mathematical Modeling

And, and, and, ...

Grafické aplikácie

Structure of Graphics Applications

Graphics Application

Model Data

GraphicsSystem:
Window-Mgnt
Input-Events
2D-Graphics
3D-Graphics
MultiMedia

API

Graphics HW:
Display,
Keyboard,
Mouse, Tablet,
Stereo glasses,
HMD, Joystick,
etc

Entertainement

● **Selected Story Telling events:**

Year	Title	Studio
1982	**Tron** **Wrath of Khan**	Disney Paramount
1984	**Andre & Wally B.** **The Last Starfighter**	PIXAR Universal
1985	**Young Sherlock Holmes**	Paramount
1986	**Luxo Jr.**	PIXAR
1987	**Red's Dream** **Stanley & Stella**	PIXAR Symbolics
1988	**Tin Toy**	PIXAR
1989	**Knickknack** **The Abyss**	PIXAR Fox
1991	**Beauty and the Beast** **Terminator 2**	Disney Tri-Star
1992	**Aladdin** **Lawnmower Man**	Disney New Line
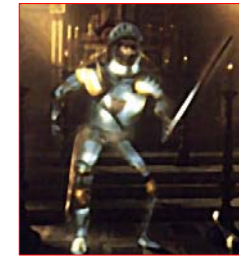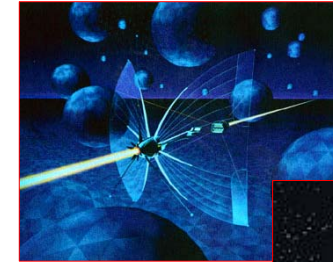
Entertainement

● **Selected Story Telling events:**

Year	Title	Studio
1993	Jurassic Park	Universal
1994	The Mask True Lies	New Line Fox
1995	Toy Story	PIXAR
1996	Twister	Warner Bros.
1997	**Geri's Game**, Lost World, Titanic	PIXAR, Universal Lucasfilm Paramount
1998	A Bug's Life Antz	PIXAR DreamWorks
1999	Toy Story 2 Star Wars, Episode 1	PIXAR Lucasfilm
2000	Dinosaur	Disney
2001	Final Fantasy **Shrek**	Columbia Picts DreamWorks

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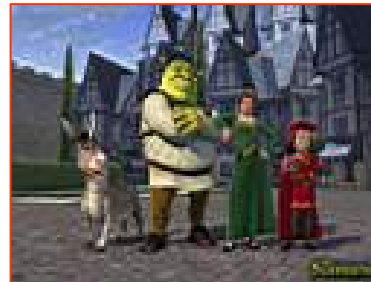
Entertainement: **Final Fantasy**

- Motion Capture

- Modeling
  - Human
    - Face
    - Hair
    - Body
  - Cloths

Entertainement: **Shrek**

- Effects: dust, smoke, water and mud
- Particle techniques
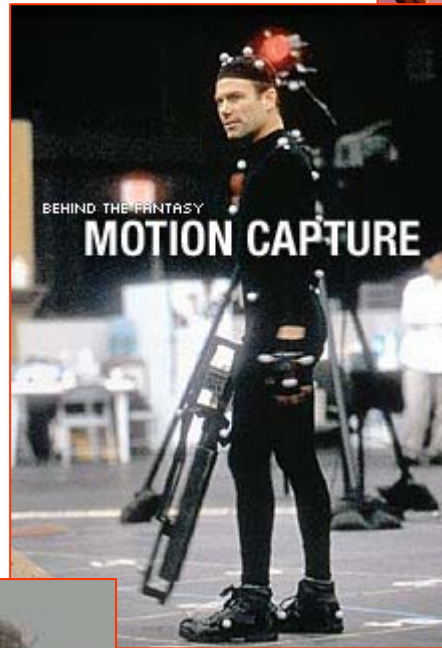
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Entertainement

- ## **Selected Game events:**
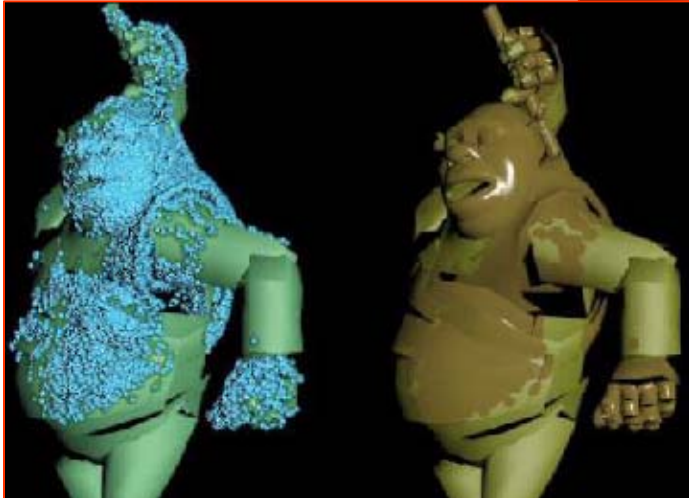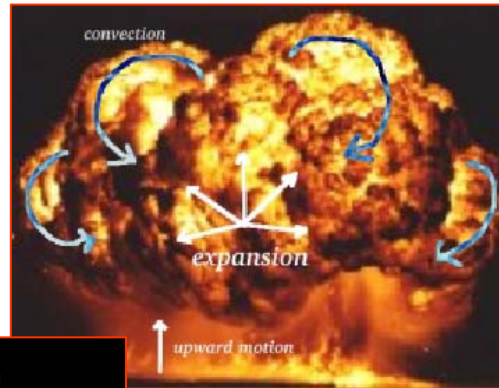
1991	Catacomb 3-D	Id Software
1992	Wolfenstein 3-D 7th Guest	Id Software Tilobyte Studios
1993	DOOM, Myst	Id Software Cyan Productions
1995	Dark Forces	LucasArts
1996	Nintendo 64 Quake, Tomb Raider	Nintendo Id Software Eidos Interactive
1997	Jedi Knight Quake II, Riven	LucasArts Id Software Cyan Productions
1998	Half-Life Thief, Unreal	Sierra Eidos Interactive Epic MegaGames
1999	Quake III: Arena	Id Software
2000	RealMyst	Cyan Productions
2001,2	...	...

Catacomb 3-D

DOOM

Quake

Tomb Raider

Jedi Knight

Half-Life

Unreal

Quake III: Arena

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18
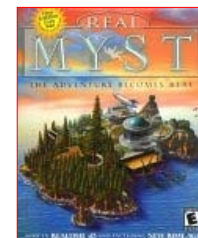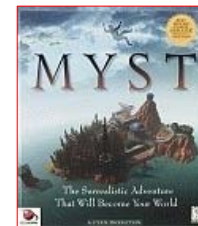
Vizualizácia

- **Medicínska vizualizácia**
- **Vedecká vizualizácia**
  - Vzájomné pôsobenie častíc (molekúl)
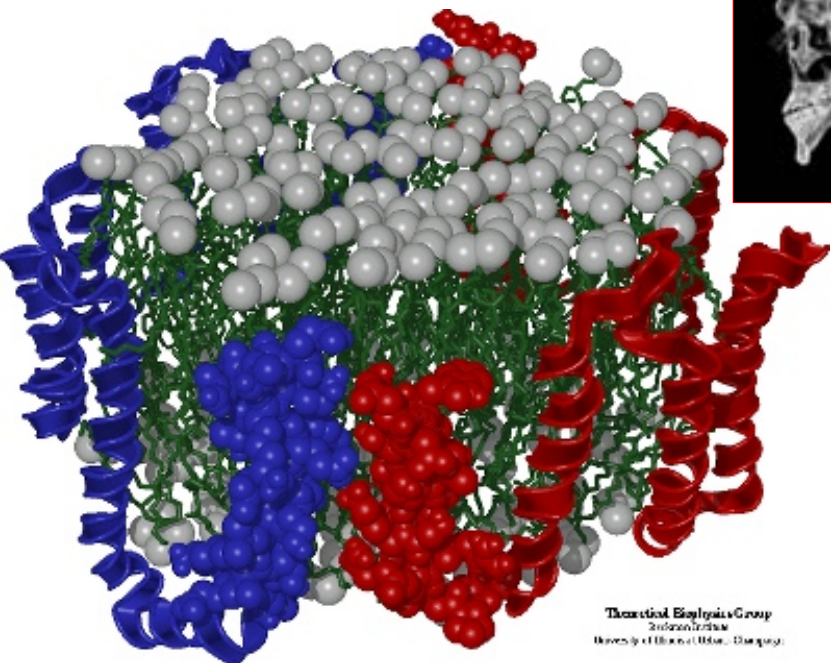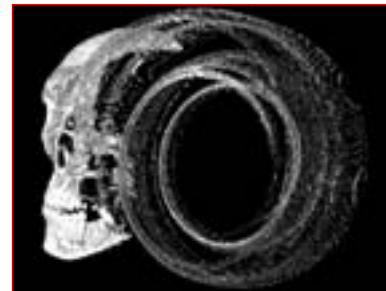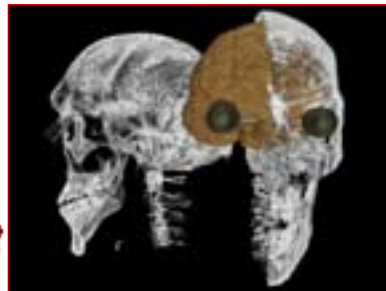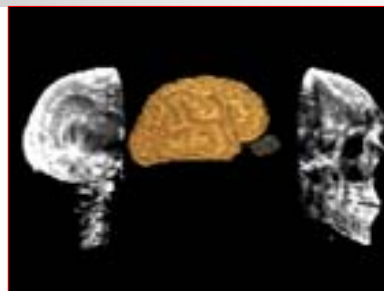- **Finančné dáta**
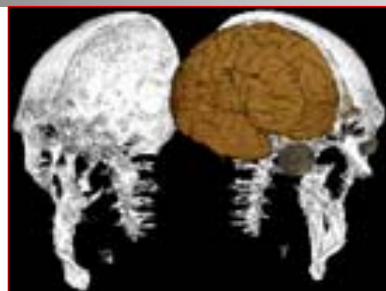- **Predpoveď počasia**
- **...**
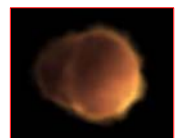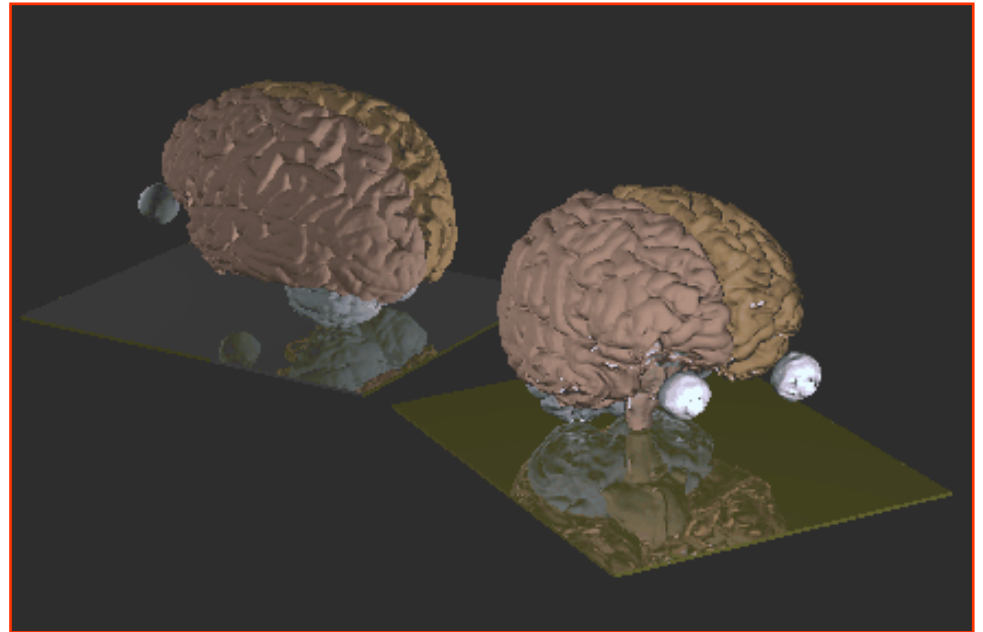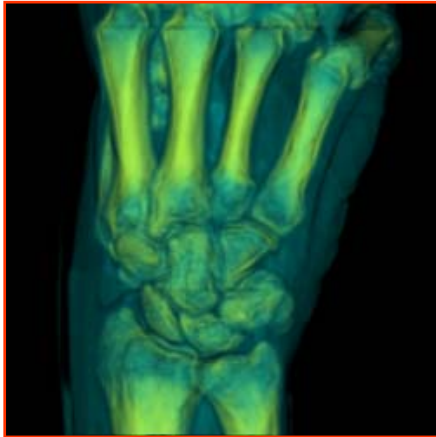
Medicínske zobrazenia
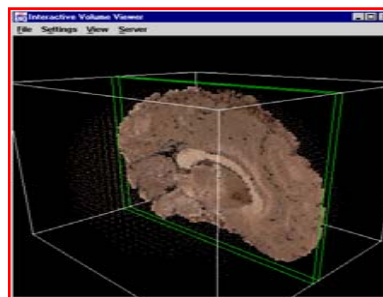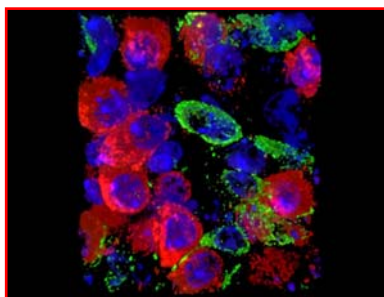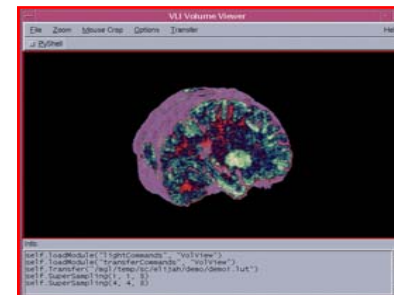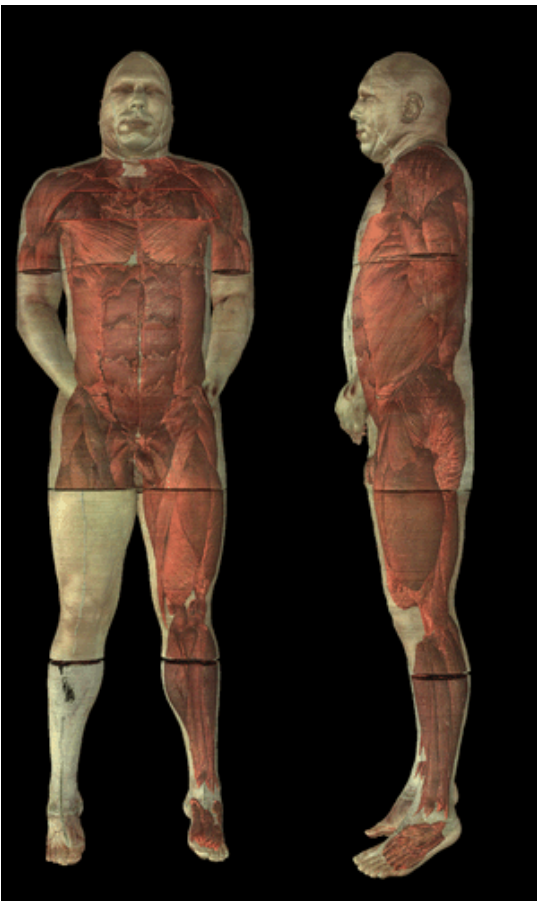
Vedecké zobrazenia

Volume Rendering

Data are provided by Miloš Šrámek
from Austrian Academy of Sciences

Computer Aided Design

- AutoCAD
- Nemetschek Allplan
- Catia

Modelovacie nástroje

- ## 2D
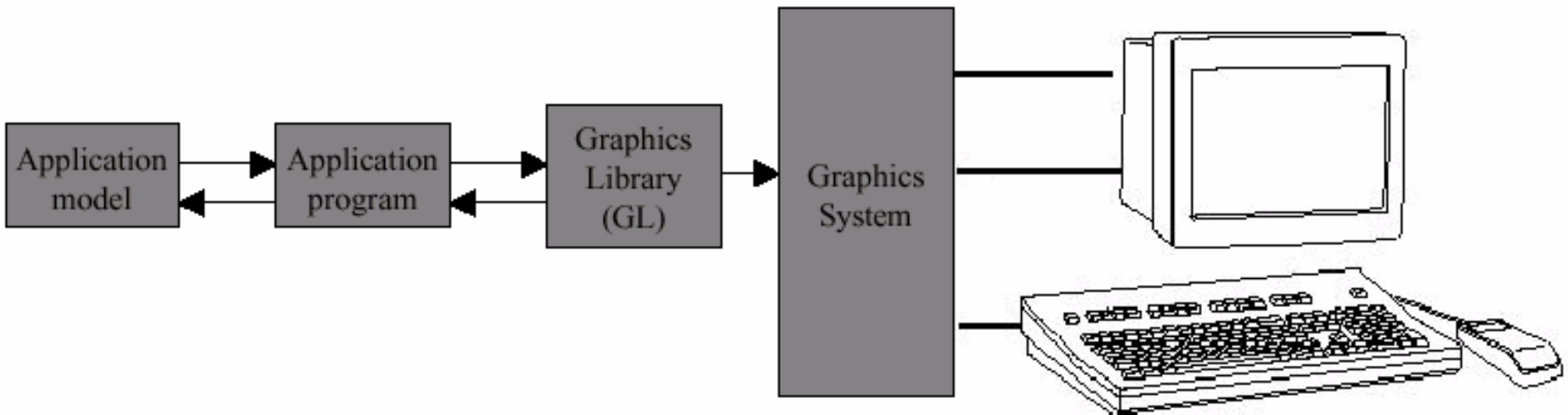 - Adobe Illustrator, Macromedia Freehand, Corel CorelDRAW!, Microsoft PhotoDraw

- ## 3D
  - RenderMan (Pixar)
  - 3D StudioMax,
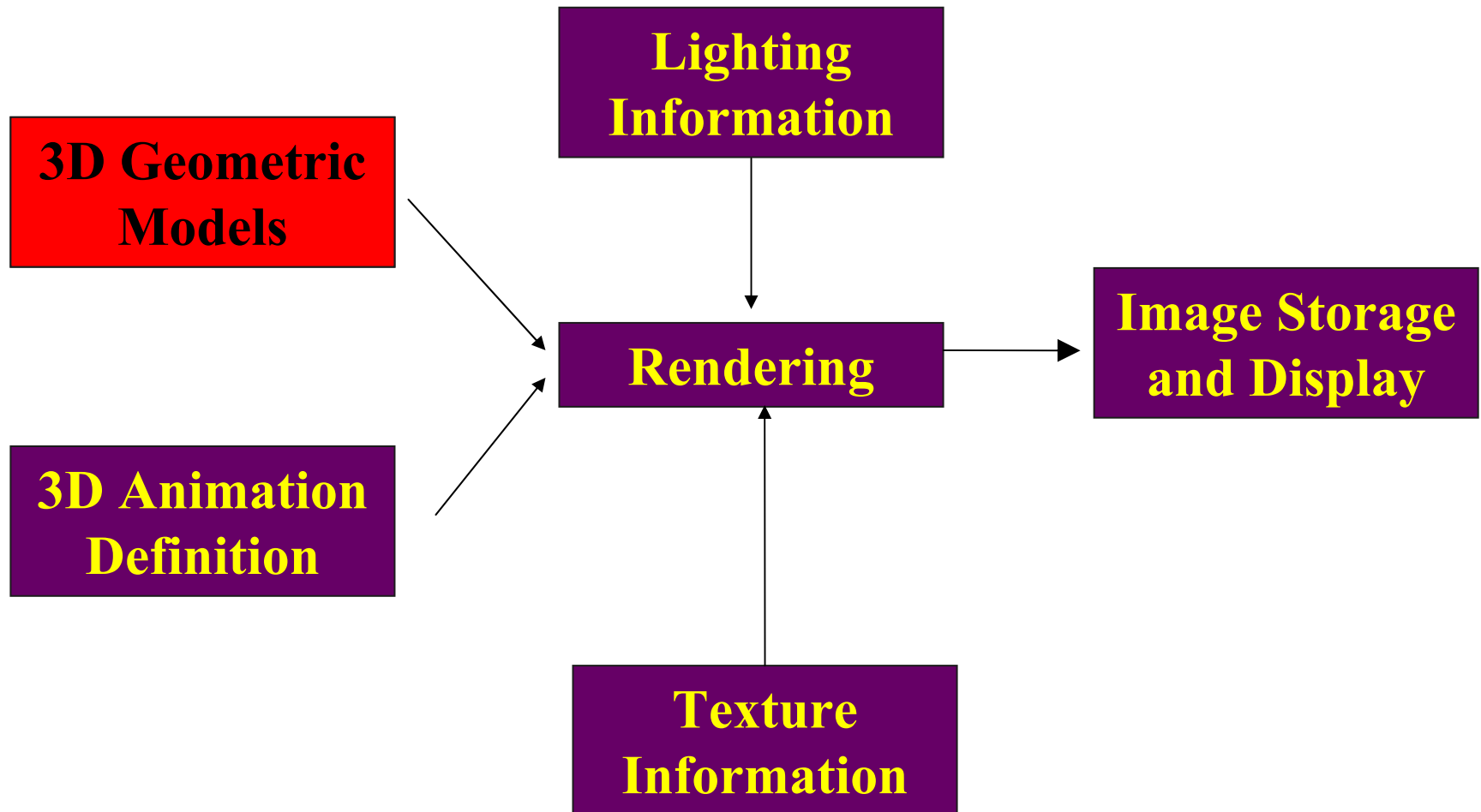 - Alias|Wavefront's Maya
  - AutoCAD

Grafické knižnice
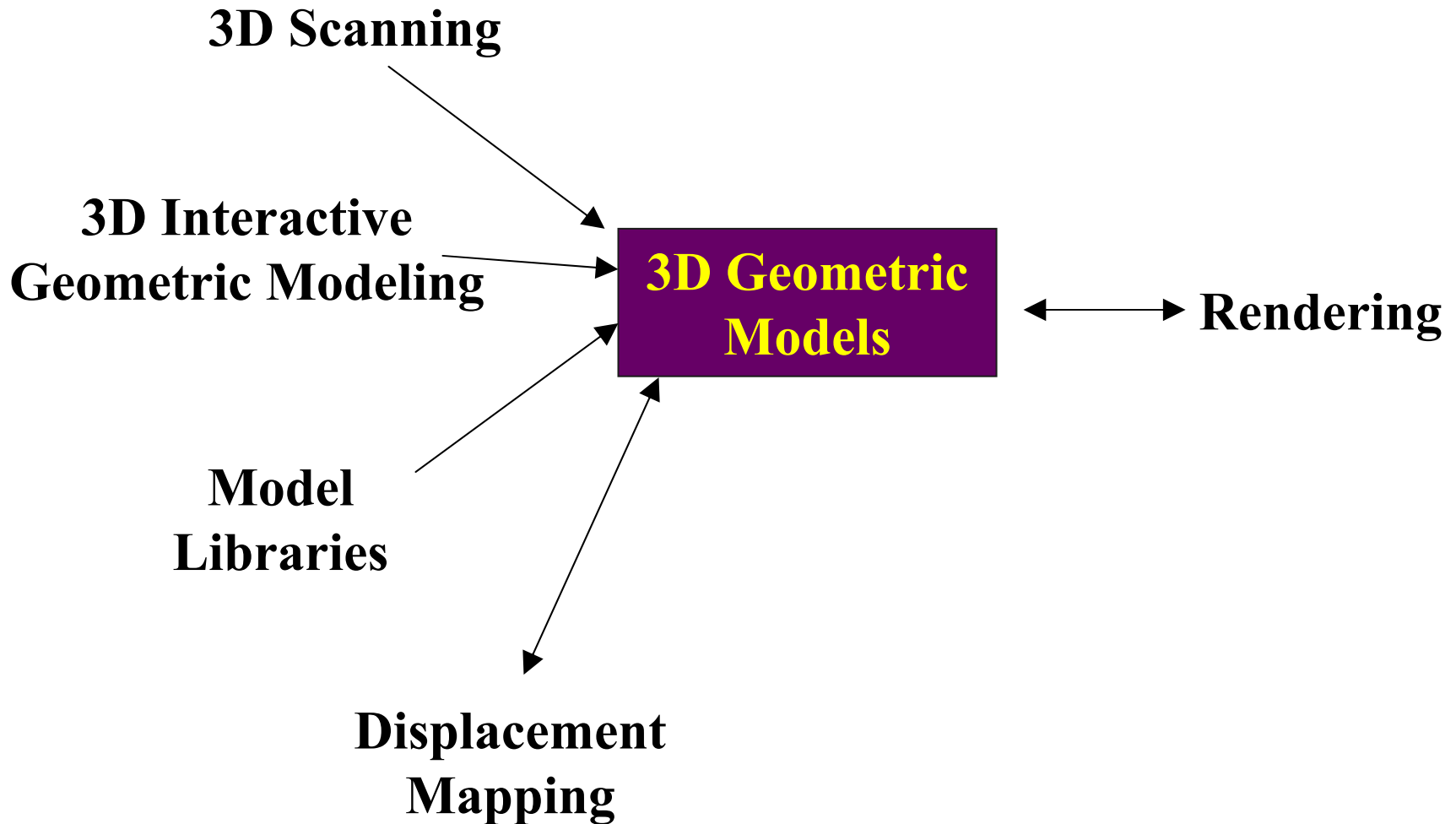
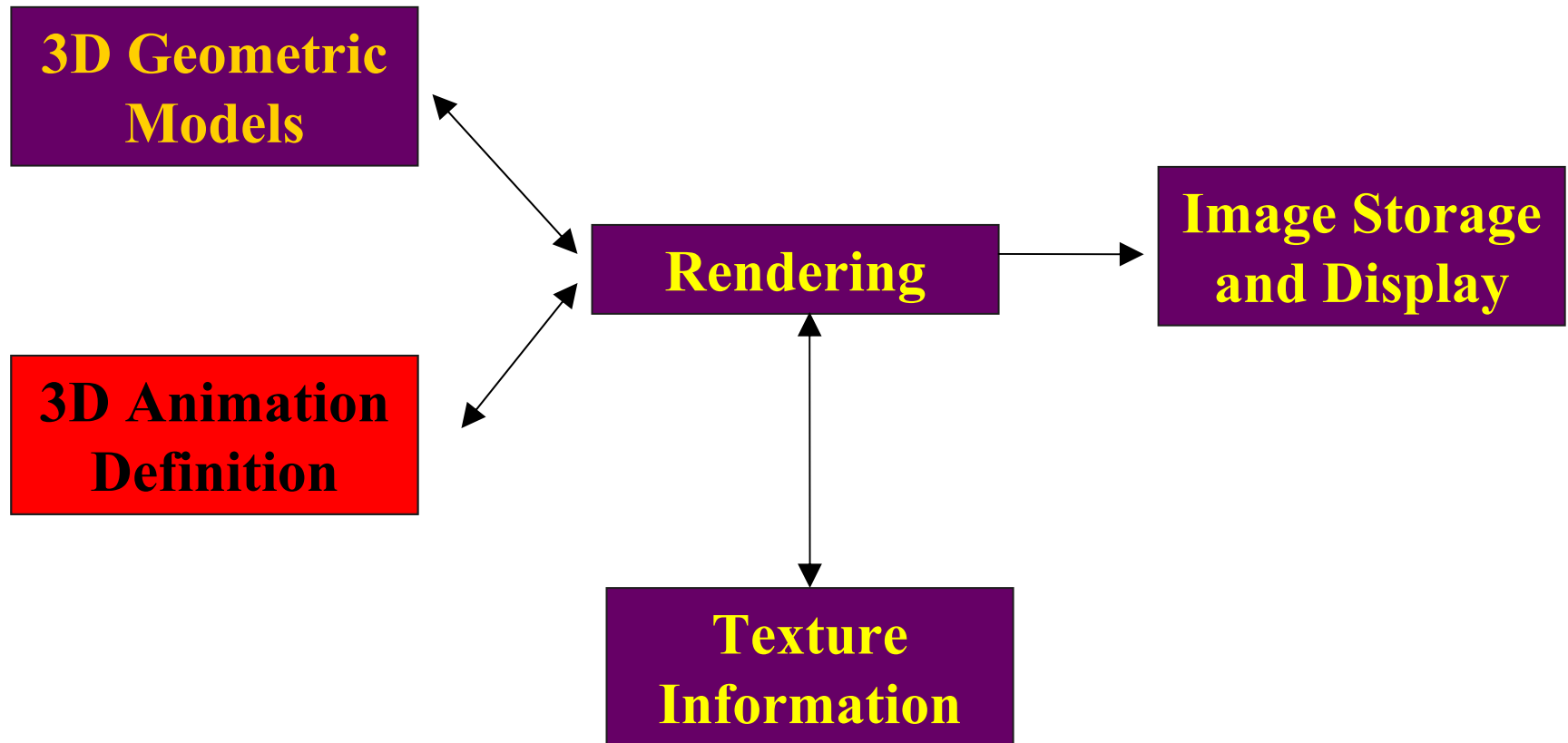- OpenGL (Open Inventor)
- DirectX
- Mesa
- GKS, Phigs   *http://cg.cs.tu-berlin.de/~ki/engines.html*

CG pipeline

Siggraph 2003, Bailey, Glassner

CG pipeline - 3D Geometric Models

3D Scanning

3D Interactive Geometric Modeling

3D Geometric Models

Rendering

Model Libraries

Displacement Mapping

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CG pipeline

3D Geometric Models

3D Animation Definition

Rendering

Image Storage and Display

Texture Information

Siggraph 2003, Bailey, Glassner

CG pipeline - 3D Animation

Motion Design

Motion Computation

3D Animation

Rendering

Motion Capture

Dynamic Deformations

CG pipeline

3D Geometric Models

3D Animation Definition

Rendering

Image Storage and Display
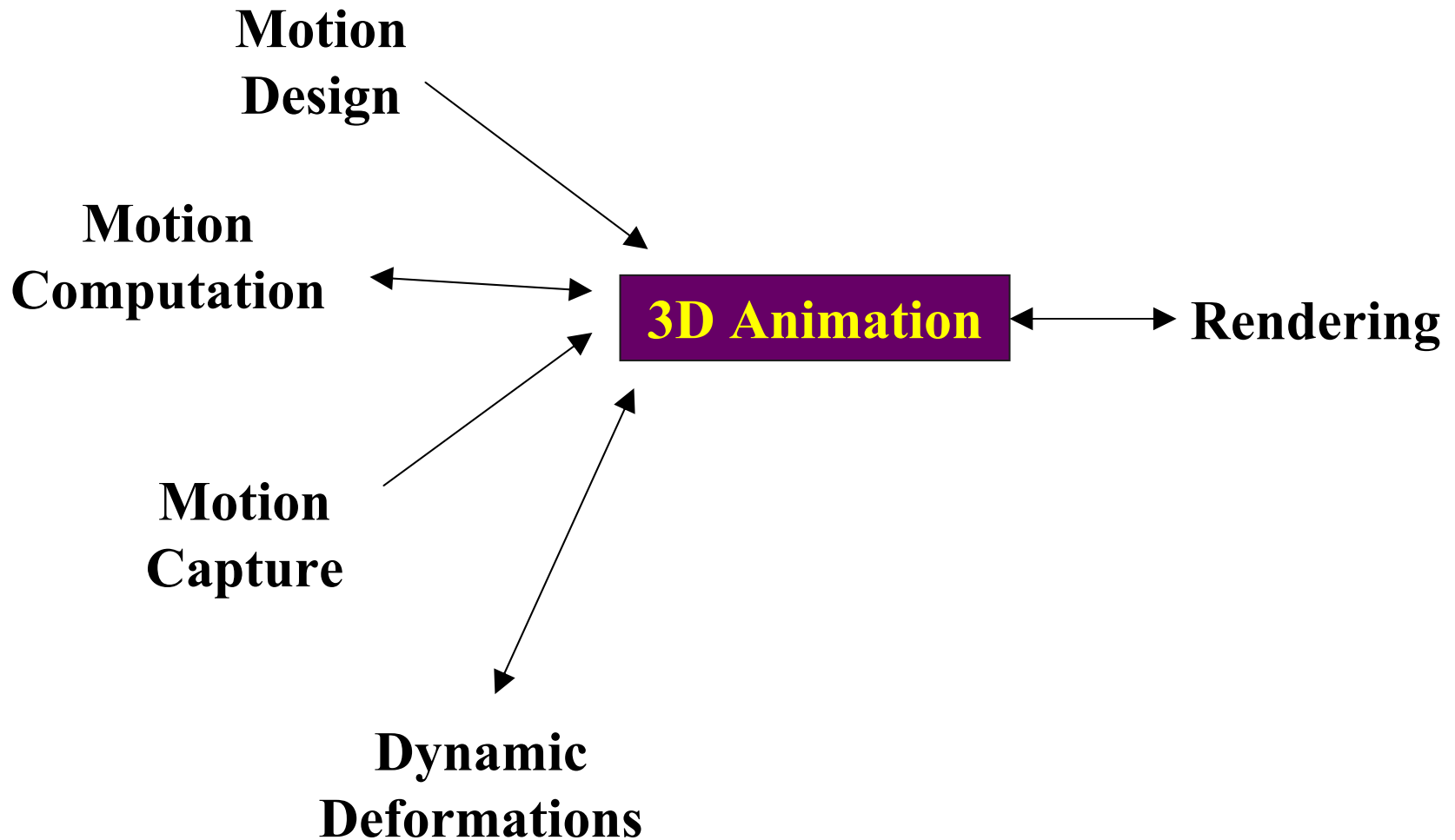
Texture Information
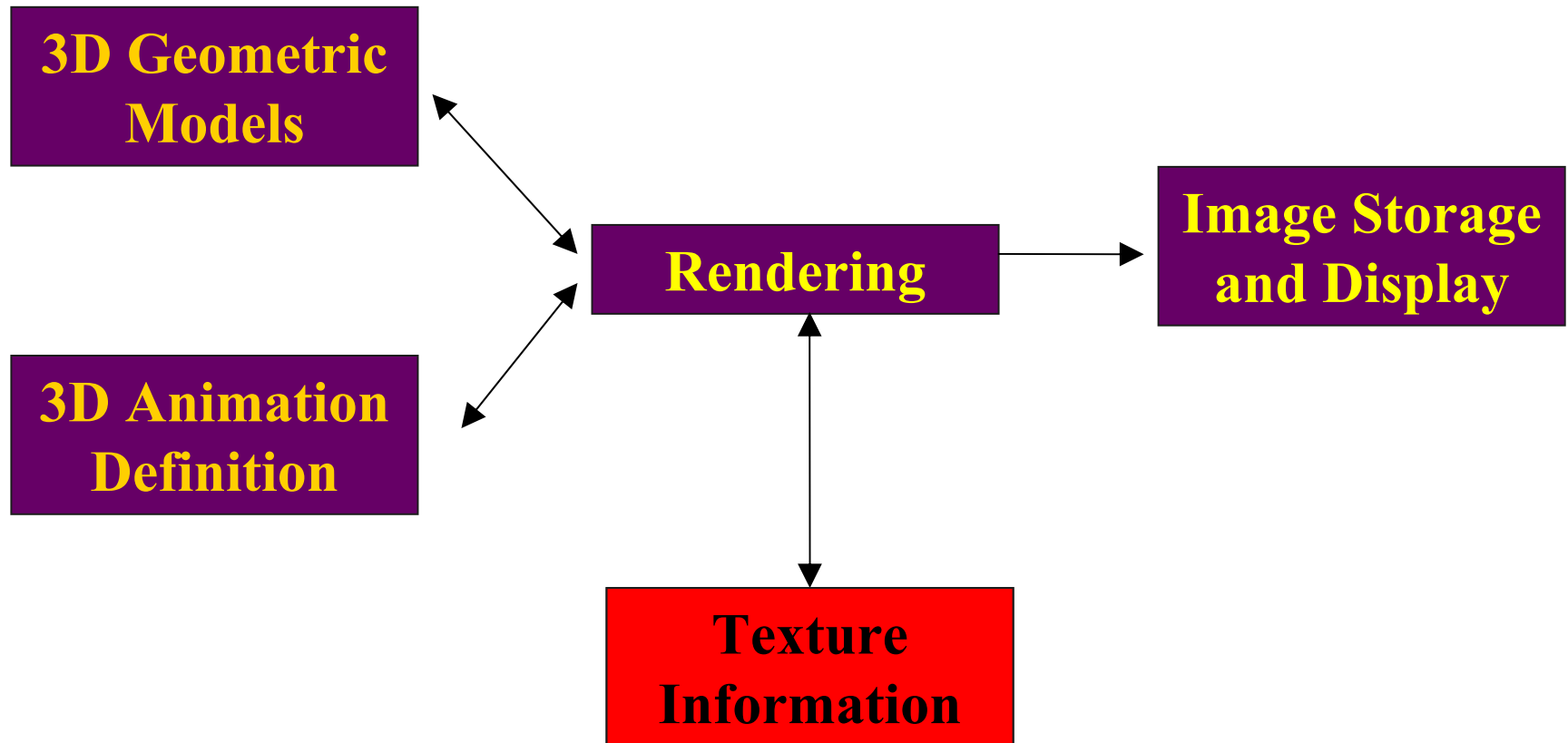
CG pipeline - **Texturing**

CG pipeline

Siggraph 2003, Bailey, Glassner
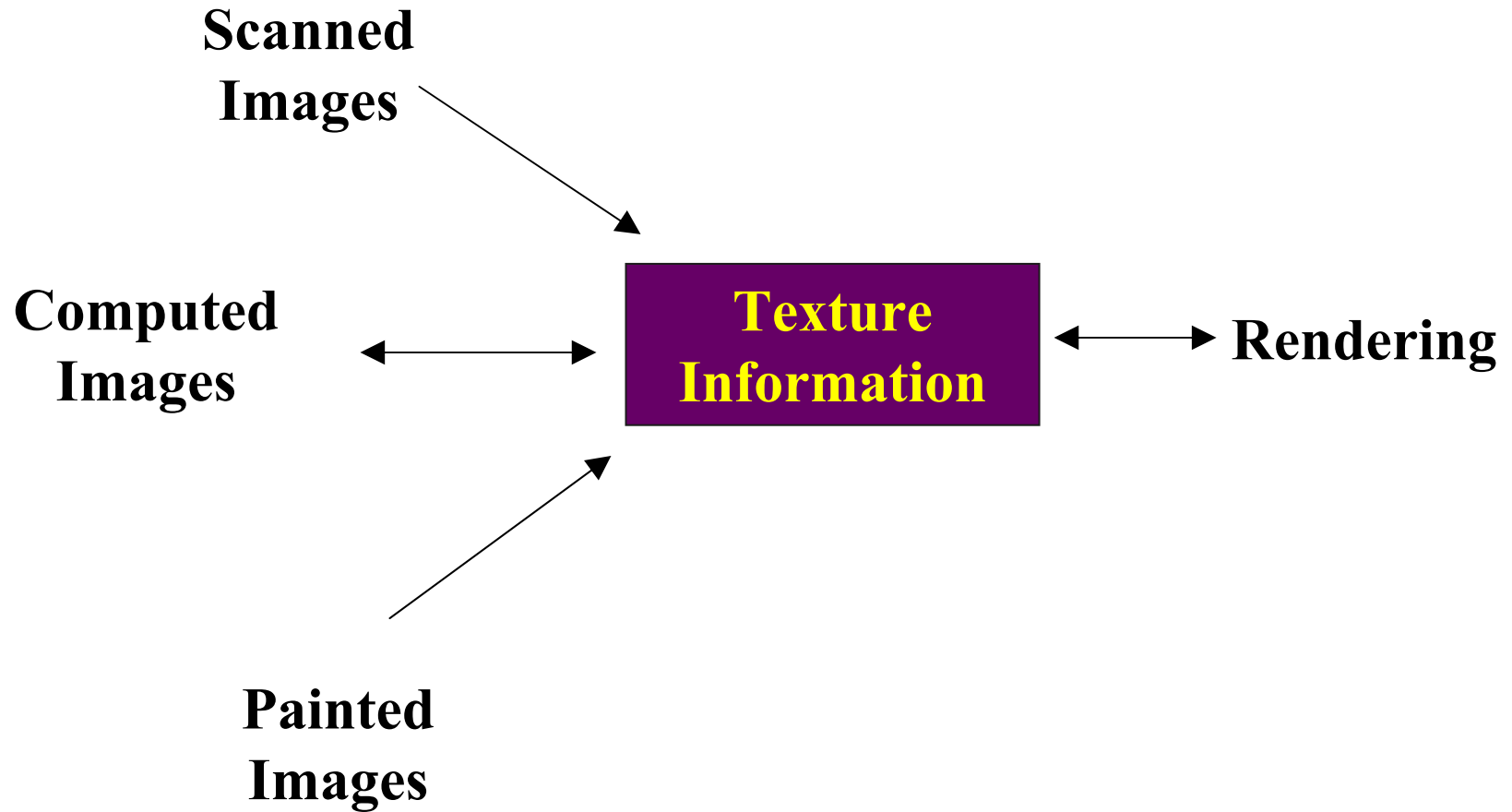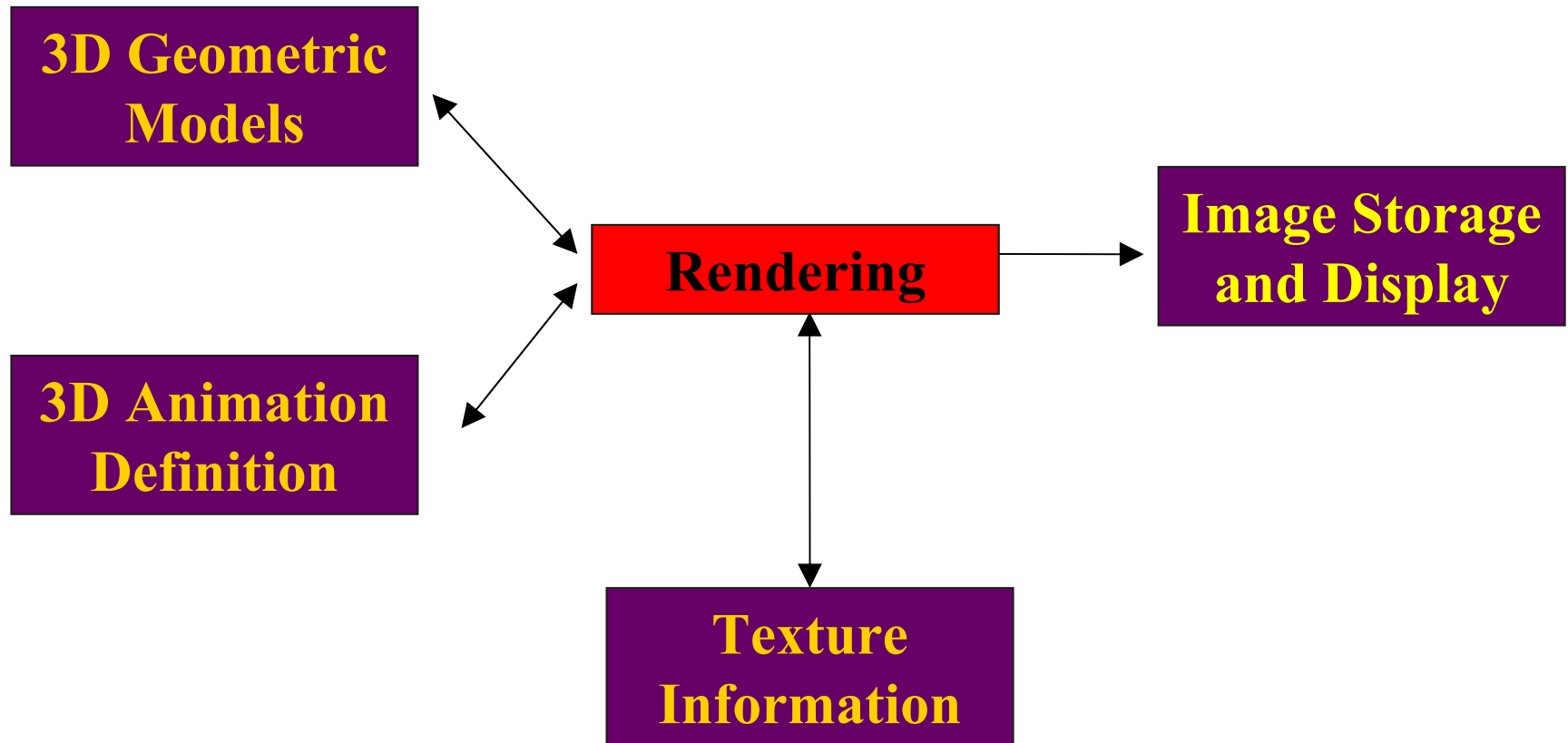
CG pipeline - **Rendering**

3D Geometric Models

Rendering

Transformation, Clipping, Perspective

Image Generation
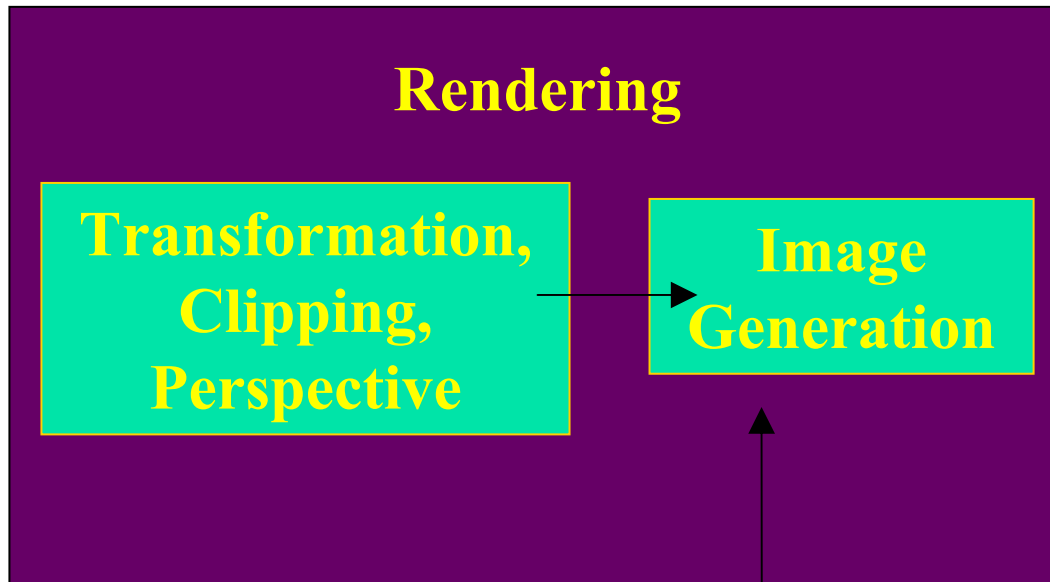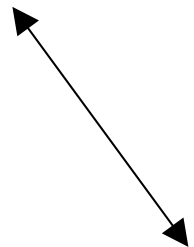
Image Storage and Display

3D Animation Definition

Texture Information

CG pipeline

Siggraph 2003, Bailey, Glassner
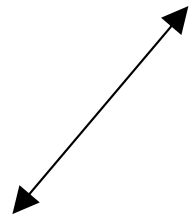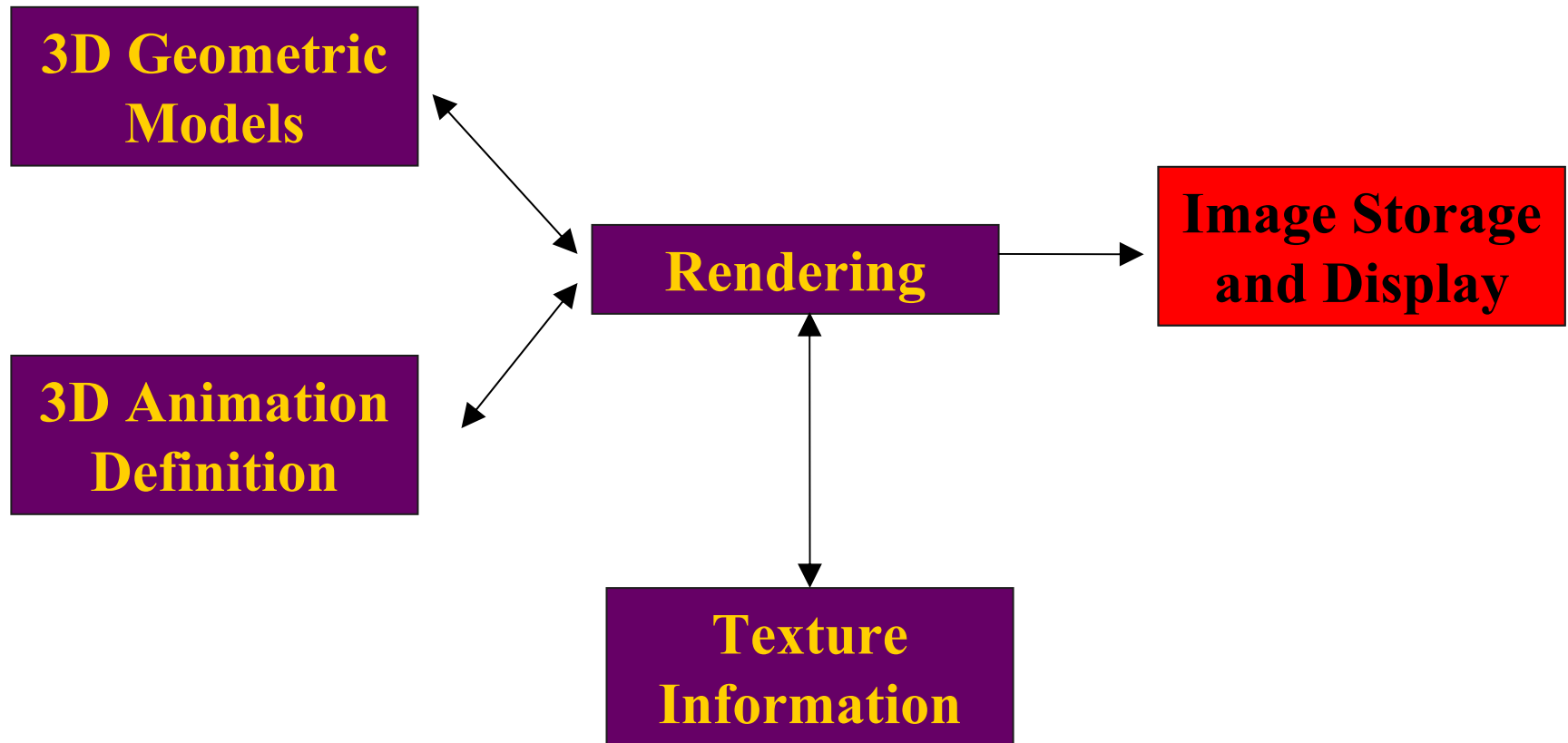
CG pipeline - Image Storage and Display

Rendering

Hardware Framebuffer

Disk File

Film Recorder

Video Recorder