

Computer Graphics

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Computer graphics

Computer graphics: Generation of images (2D/3D), graphics, images and image sequences on computer screens, displays, printers and other devices.

Fields of application

- Graphical user interfaces (GUI)
- Arts/advertising (artificial, modified images/image sequences)

Computer graphics

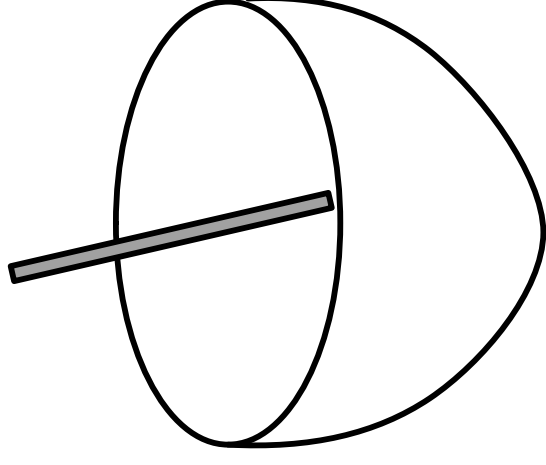
- Visualisation (graphs of functions, bar, chart and pie diagrams, temperature distribution on the surface of the earth, visualisation of high-dimensional data,...)
- Reconstructing 3D-objects from measured data (3D-scanner, ultrasonic images, tomography,...)
- CAD/CAM (Computer Aided Design/Manufacturing) (Design of objects like cars, chassis, buildings, gardens,...)
- Simulation and animation (flight simulators, temperature distribution on the surface of the earth over time, computer games, movies,...)

Computer graphics

- interactive TV: free choice of the viewers position, computation of the images based on information from a small number of cameras
- Virtual reality: realistic 3D view + free movement + acoustics
- Augmented reality: auxiliary information superimposed to the real world by a semi-transparent glasses

Real world → **image**

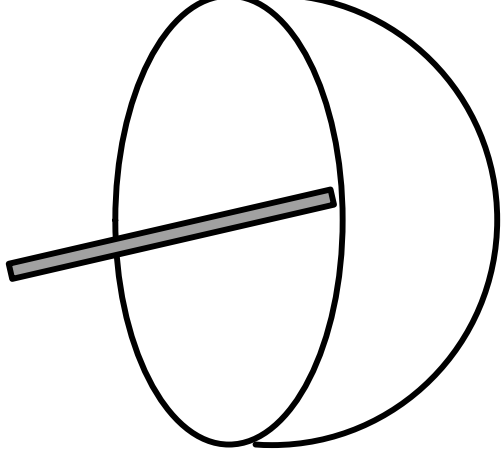
Real scene whose details/objects have to be modelled.



Real world \rightarrow image

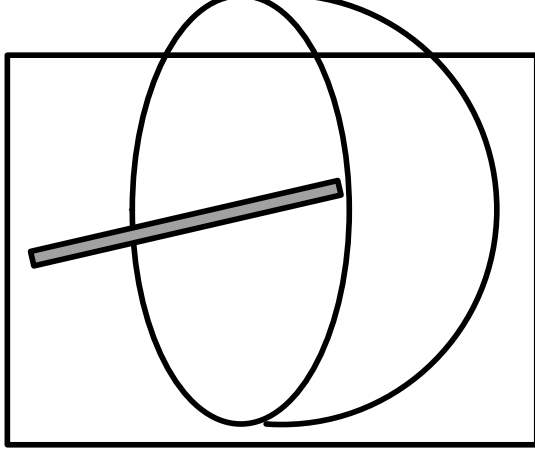
Model of the scene in which the objects of the real scene are represented by the available modelling techniques (basic geometric objects, transformations,...).

The true geometry might only be approximated by the model.



Real world → **image**

Choice of a view/part of the virtual world to be displayed.

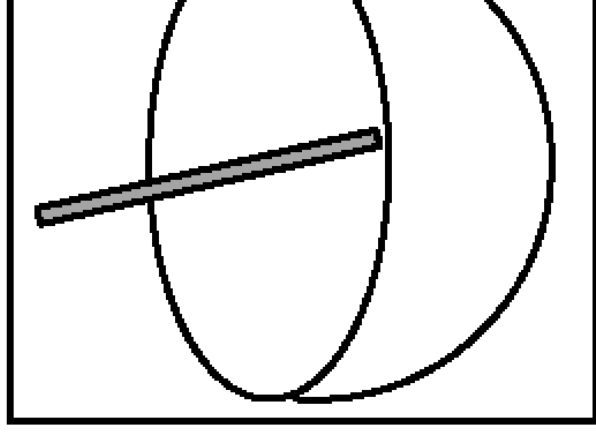


Clipping: Computation which objects are within the chosen view.

Visibility considerations: Which objects in the clipping region are visible for the viewer, i.e. are not hidden from view by other objects?

Real world → ***image***

Result: pixel image



- illumination effects, shading
- two-dimensional clipping

Real world* → *image

Rendering: Whole process of generating a two-dimensional image from a three-dimensional scene.

Rendering pipeline: Composition of single rendering steps, depending on the effects to be modelled (illumination, shading, shadows, reflections, . . .)

Contents

Chapter 2

- Basic principles of vector and pixel graphics
- Modelling of planar objects
- Geometric transformations

Chapter 3

- Algorithmic aspects of pixel graphics
- Drawing of lines and curves

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Chapter 4

- Representation of areas
- Text
- Colour models

Chapter 5

- Geometric transformations
- Structure of a 3D scene
- Simple animation

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Chapter 6

- Modelling of 3D objects

Chapter 7

- Which objects are visible in a 3D scene, which ones are hidden from view?

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Chapter 8

- Illumination effects
- Light sources
- Reflection
- Shadows
- Transparency
- Textures

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Chapter 9

- Selected special topics
- Fog
- Dynamic surfaces
- Interaction
- Collision detection
- Acoustic effects
- Stereoscopic viewing