HOGESCHOOL UTRECHT

Game technology

Faculteit Natuur & Techniek- Informatica & Technische Informatica

Main objective

Build a foundation layer so you can understand all the base algorithms that, with minimal differences, are found in most game projects.

A Game in software engineering terms

Games are time-dependent interactive applications, consisting of a virtual world simulator that feeds real-time data, a presentation module that displays it, and control mechanisms that allow the player to interact with that world.

Subjects

5 EC

3D Graphics (Real Time Rendering)	Physics/Animation	AI

Rendering Pipeline
Lighting/Shading
Texturing
Space Partitioning

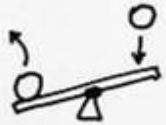
Ray Tracing (for basic Math)

Collision Detection
Collision Response
Rigid Body Dynamics

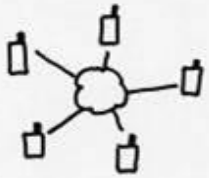
SIMULATION – in 5 easy steps!

① Physical process

WEATHER SYSTEM



MECHANICAL SYSTEM



COMMUNICATION SYSTEM

MILITARY SYSTEM

② Model – the system is modeled with equations.

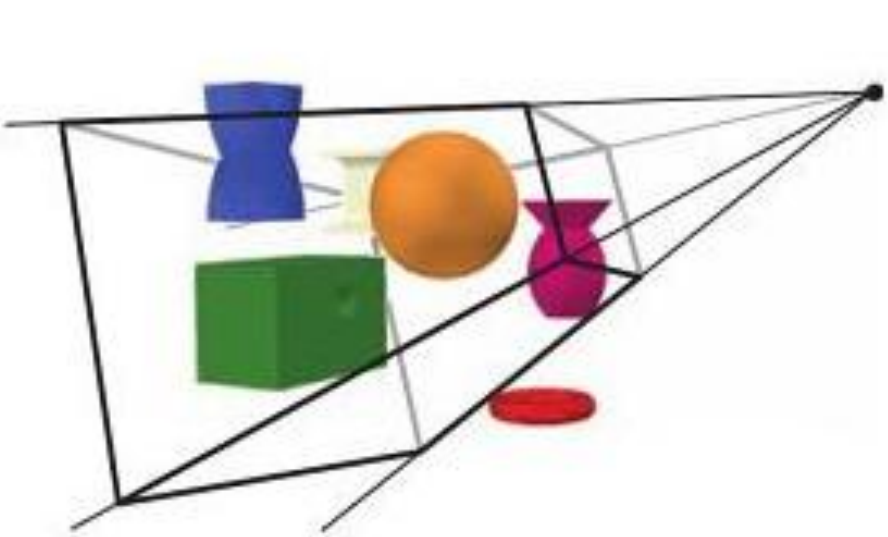
③ Simulation algorithm – a method to solve the equations, to find out how the system changes over time.

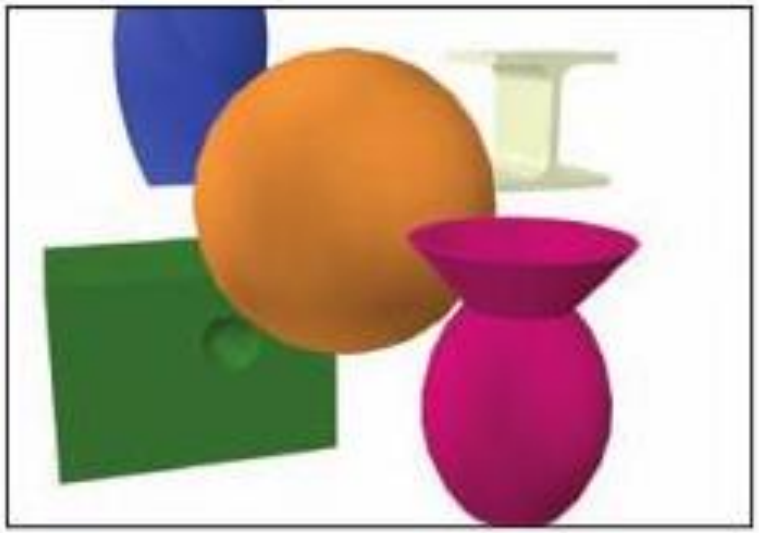
④ Computer program – a program is written to implement the algorithm.

⑤ Simulate! (run the program).

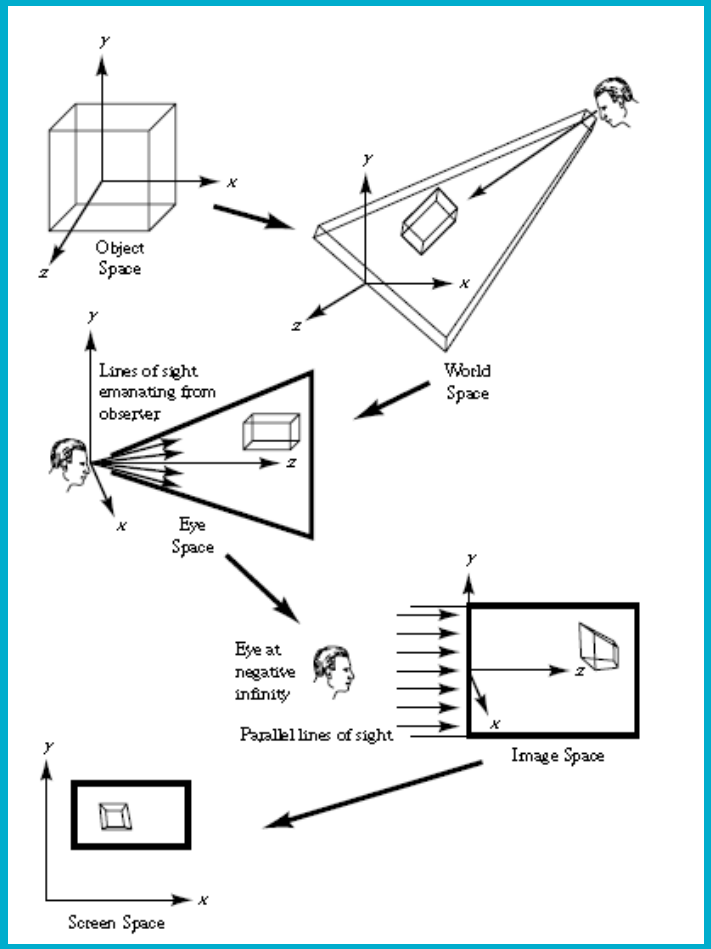
The SDK simulates mechanical systems (and maybe some others.)

From 3D to 2D

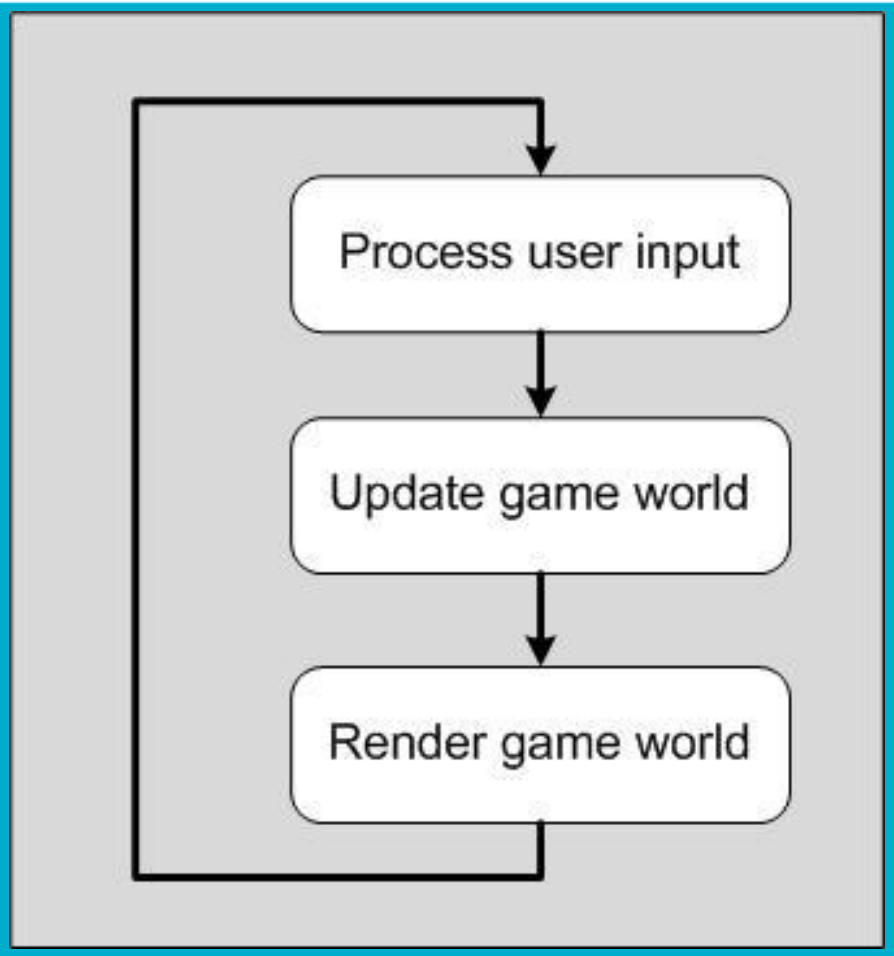




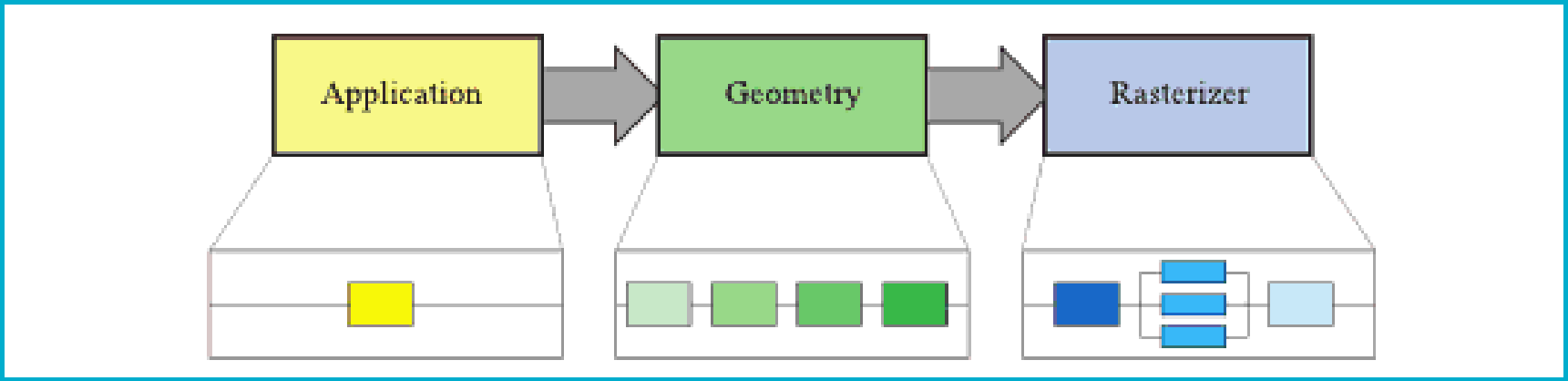
Rendering Pipeline



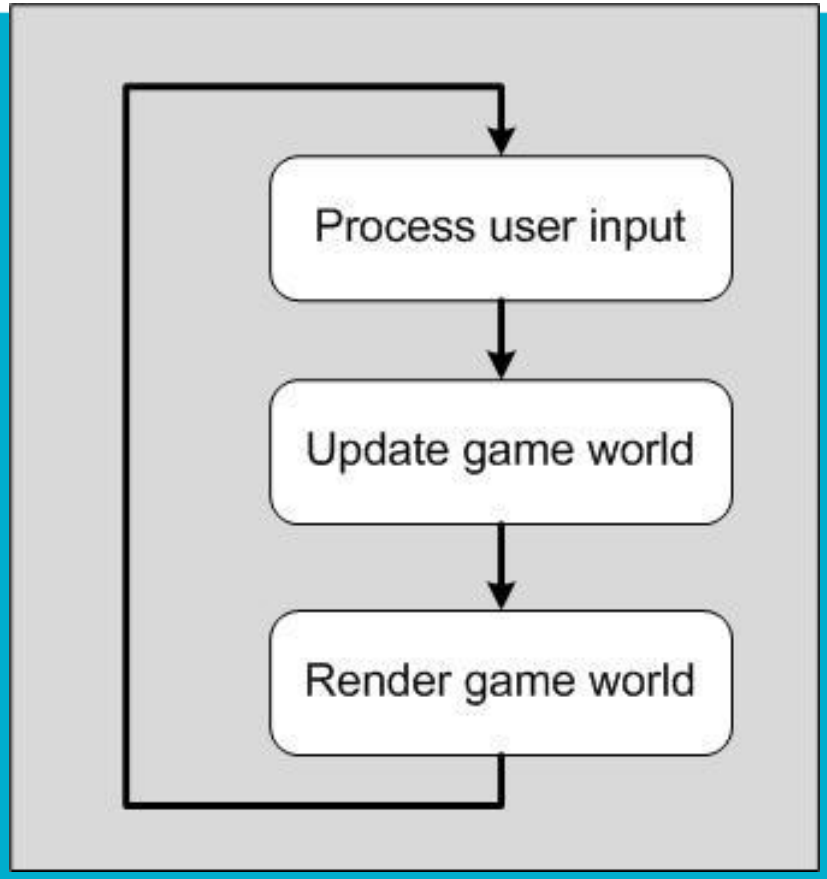
Game Loop

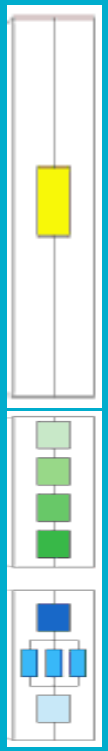


Rendering Pipeline three Stages



Game loop & pipeline stages



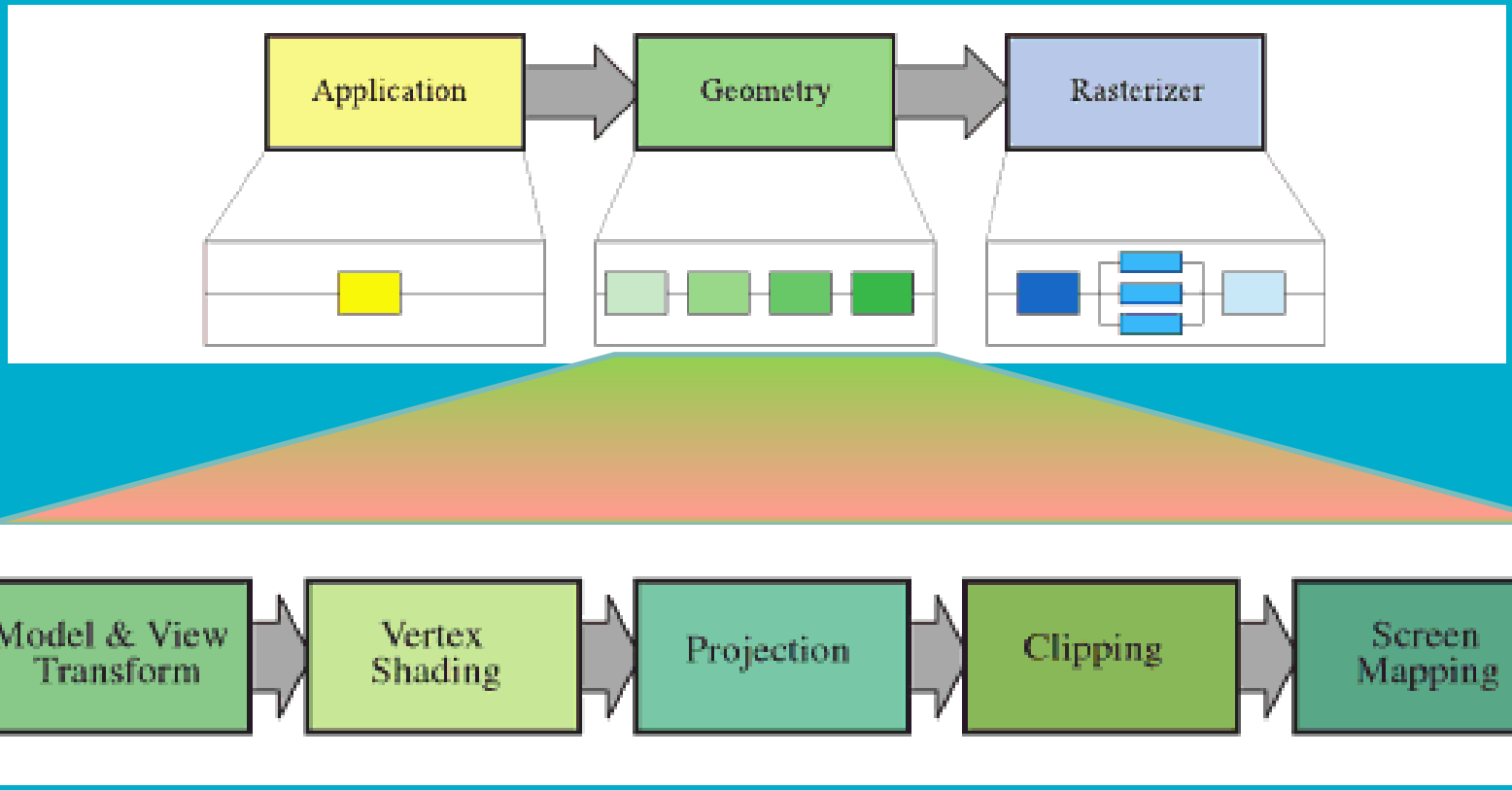


Application

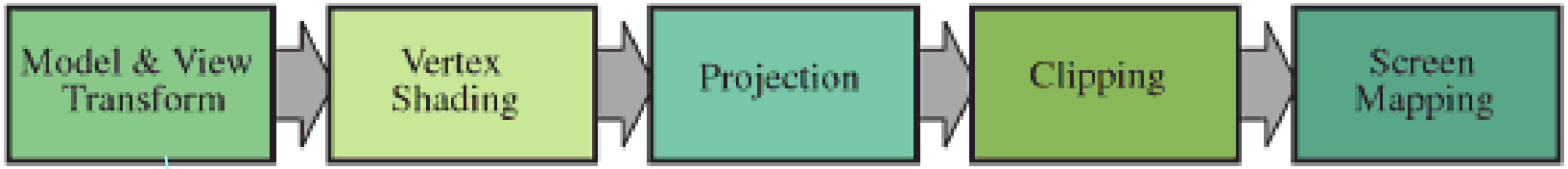
Geometry

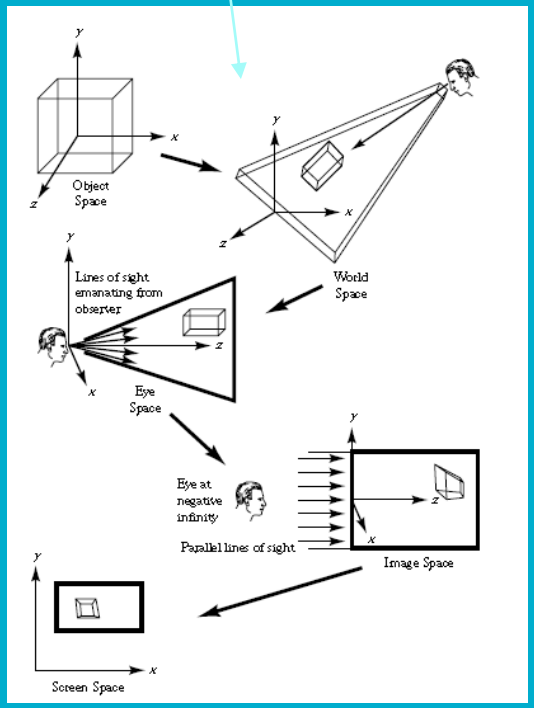
Rasterizer

The Geometry Stage

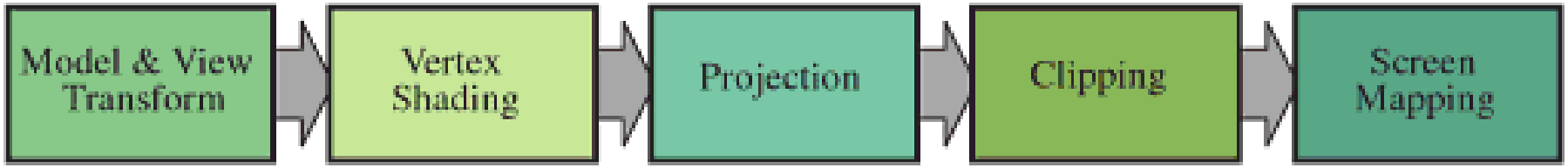


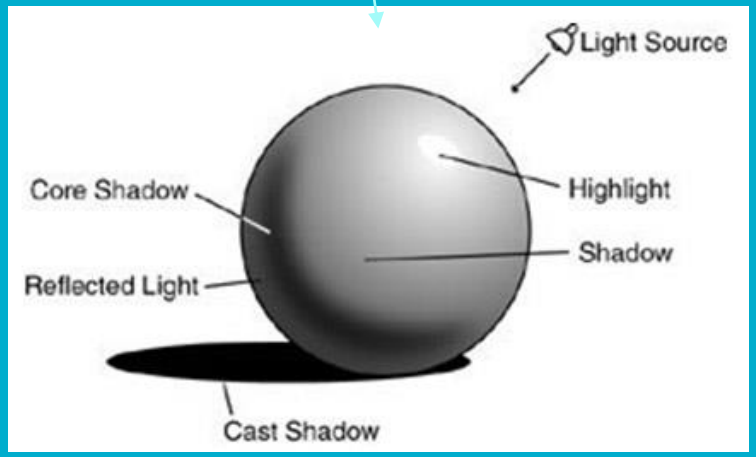
Model & View Transform





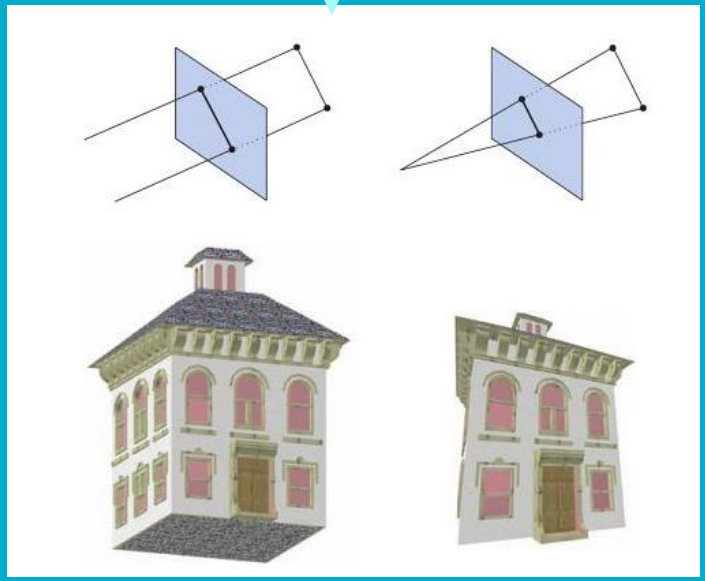
Vertex Shading





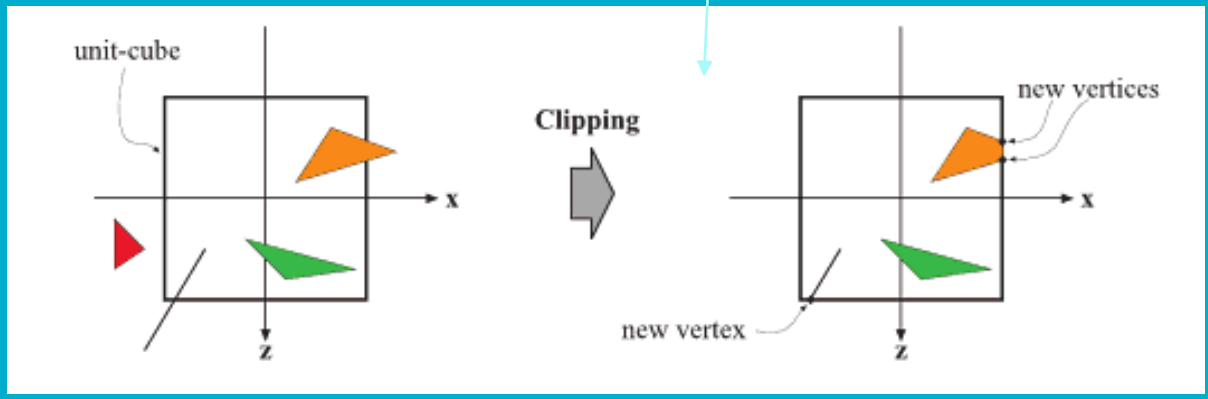
Projection


Model & View Transform
Vertex Shading
Projection
Clipping
Screen Mapping

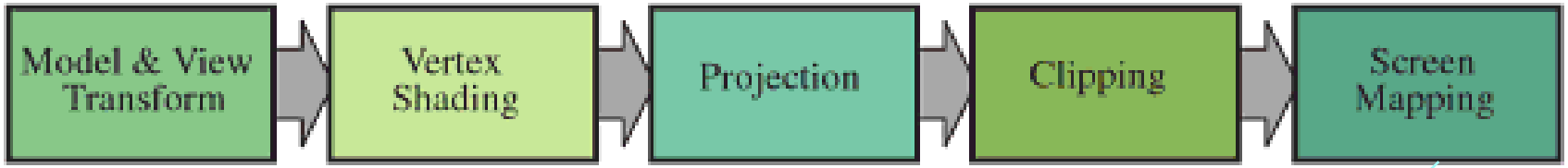


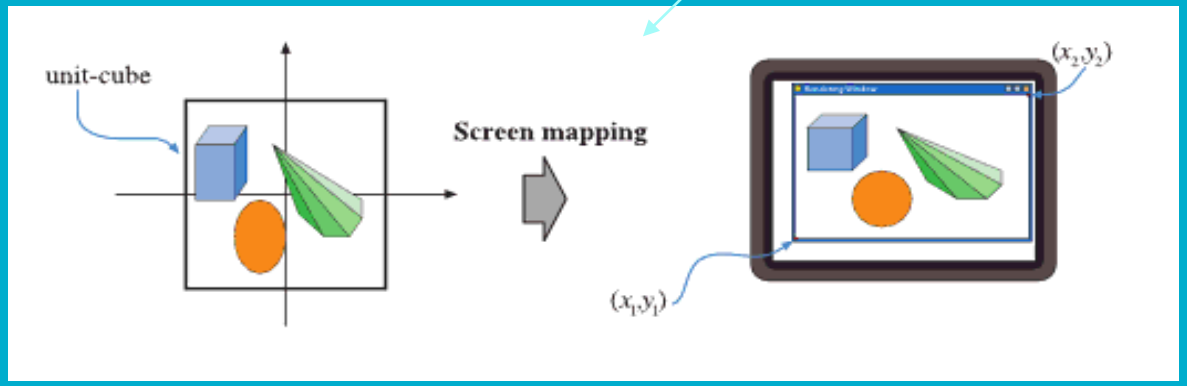
Clipping


Model & View Transform
Vertex Shading
Projection
Clipping
Screen Mapping

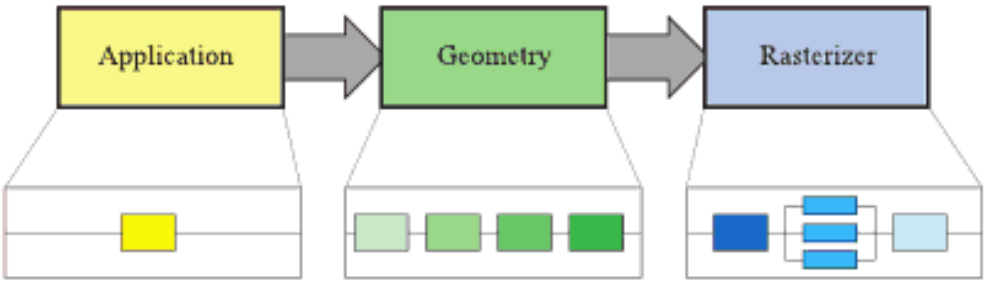

unit-cube
x
z
Clipping
new vertices
new vertex
x
z

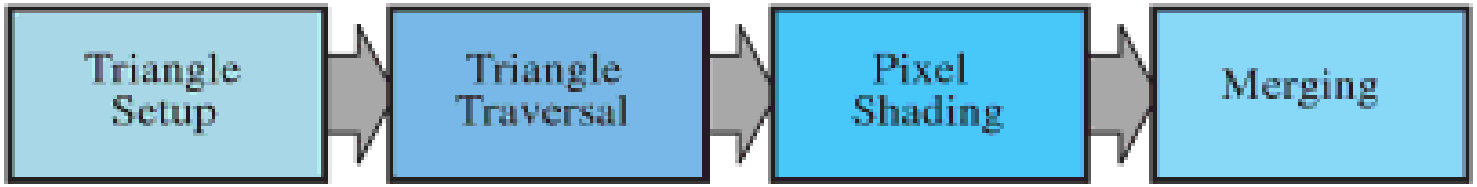
Screen Mapping



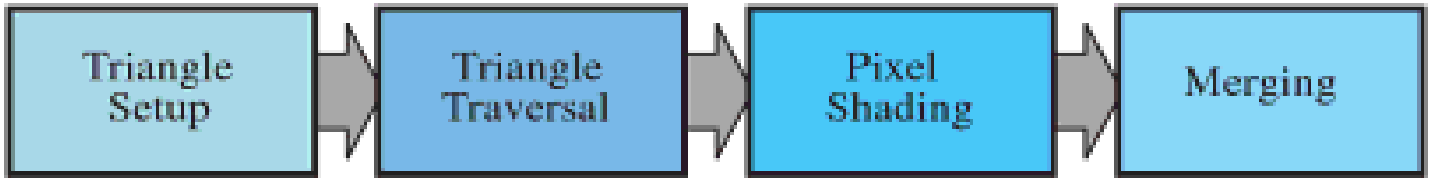


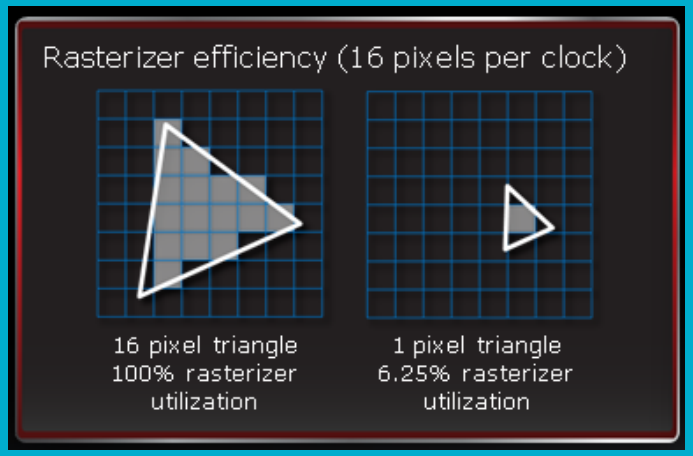
The Rasterizer Stage

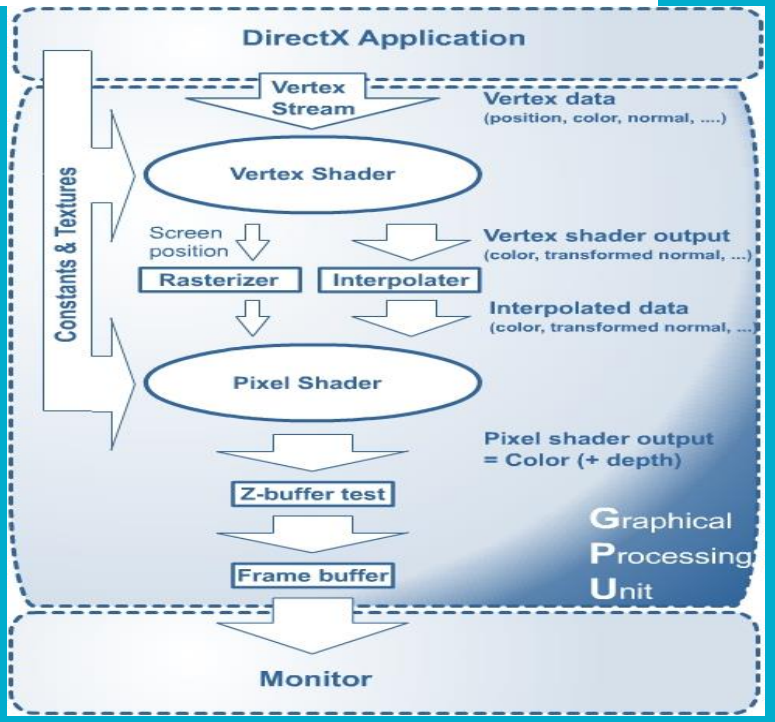




The Rasterizer Stage







Literature

-Real-Time Rendering

Third edition

Tomas Akenine-Möller

Eric Haines

Naty Hoffman