

1ST ERA: Fixed Function

3D Geometry Transformation

$$V_{eye} \begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} = MVP \begin{bmatrix} m_0 & m_4 & m_8 & m_{12} \\ m_1 & m_5 & m_9 & m_{13} \\ m_2 & m_6 & m_{10} & m_{14} \\ m_3 & m_7 & m_{11} & m_{15} \end{bmatrix} \cdot V_{obj} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

$$V_{tex} \begin{bmatrix} s \\ t \\ r \\ q \end{bmatrix} = M_{proj} \cdot V_{in}$$

Lighting

$$C_p = k_a L_a + \sum_{n\text{-lights}} Att_n (k_d (\hat{L}_n \cdot \hat{N}) + k_s (\hat{R}_n \cdot \hat{V})^\alpha)$$



2ND ERA: Simple Shaders

Memory Interface

8 Vertex Pipes

Setup Engine

Pixel Shader Core

16 Pixel Pipes

3RD ERA: Graphics Parallel Core

VLIW5



VLIW4

