0 A.D: Graphics Development

"Who said programming is boring?"

Vladislav Belov
Graphics

Vladislav Belov 0 A.D: Graphics Development
Graphics

Vladislav Belov

0 A.D: Graphics Development
Graphics

Vladislav Belov
0 A.D: Graphics Development
Graphics

Vladislav Belov 0 A.D: Graphics Development
Rendering 3D Model

3D Model -> Preprocessing (CPU)

Preprocessing (CPU) -> Rasterization (GPU)

Rasterization (GPU) -> Screen
\[ L_0(x, \omega_0, \lambda, t) = L_e(x, \omega_0, \lambda, t) + \int_{\Omega} f_r(x, \omega_i, \omega_0, \lambda, t)L_i(x, \omega_i, \lambda, t)(\omega_i \cdot \mathbf{n}) \, d\omega_i \]
Light$_{\text{reflected toward a camera}} = \text{Ambient light}_{\text{of surrounding space}} + \text{Light}_{\text{from a sun}} \cdot (\text{Normal}_{\text{of the position in space}} \cdot \text{Direction}_{\text{toward the sun}})$
Light\textsubscript{reflected toward a camera} = 0\textsuperscript{*}

\textsuperscript{*}Special case when you’re looking into a black hole in its Galactic Center
Vertex Shader

Vladislav Belov
0 A.D: Graphics Development
Vertex Shader

Vladislav Belov

0 A.D: Graphics Development
Water
• Enumerate all objects on a map
• Cull invisible objects
• Render shadow map
• Render reflection map
• Render refraction map
• Render main game scene using previous textures
• Apply post-processing
OpenGL Versions

GL2  GL3  GL4

Past  2004  2008  2010  2021  Future
OpenGL Versions

GL2  GL3  GL4

Past  Dinosaurs were killed by an asteroid  2004  2008  2010  2021  Future
Bonus

Vladislav Belov
0 A.D: Graphics Development
\[ M_x = \begin{pmatrix} +1 & 0 & -1 \\ +2 & 0 & -2 \\ +1 & 0 & -1 \end{pmatrix} \]

\[ M_y = \begin{pmatrix} +1 & +2 & +1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{pmatrix} \]
Bonus

Vladislav Belov

0 A.D: Graphics Development
Bonus

Vladislav Belov  0 A.D: Graphics Development
If you enjoy creating games, you will always be welcome!

play0ad.com
trac.wildfiregames.com/wiki/WikiStart