



Gameloft XCODE CHALLENGE



3D TRAINING

● CONTENTS

- ☐ World Matrix
- ☐ View Matrix
- ☐ Projection Matrix
- ☐ WVP Matrix



● Concepts

- Homogeneous coordinate

Add 1 dimension: w

-> Vertex in homogeneous coordinate:

$$(x, y, z, w)$$

$$(x, y, z, w) \sim (x/w, y/w, z/w, 1.0)$$



● Concepts

- Transformation: $P \rightarrow P'$
- Transformation matrix:

$$P' = M \times P$$



● Spaces transformation

- Local space
 - > World space
 - > View space
 - > Projection space (NDC)



● WORLD MATRIX

Local space

- All objects are in the **local space**, which means they will have the pivot in (0,0,0)
- Position (x, y, z) → Translation Matrix
- Rotation (x, y, z) → Rotation Matrix
- Scale(x, y, z) → Scale Matrix

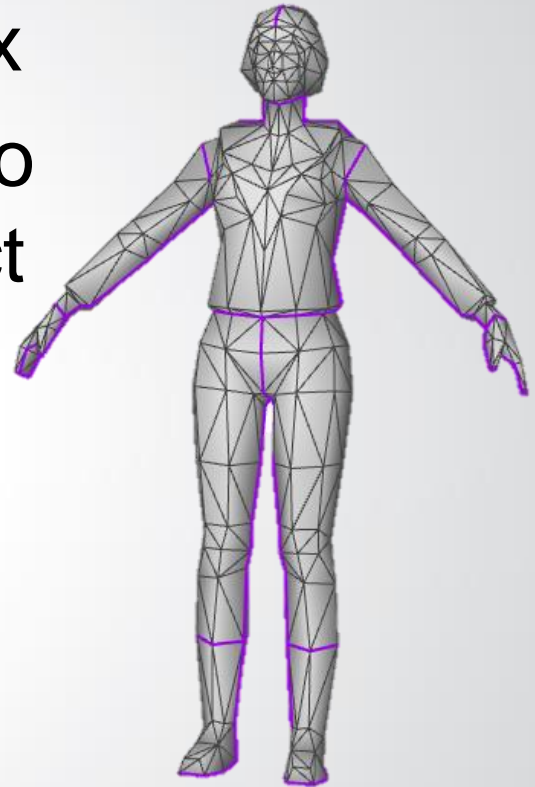


World
Matrix

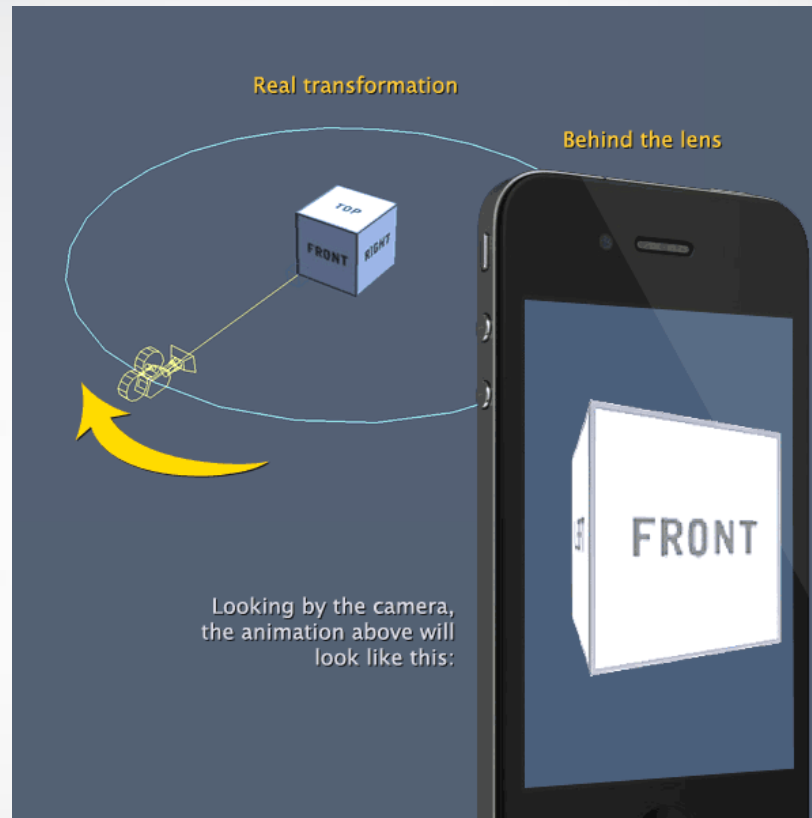


● WORLD MATRIX

- $\text{WorldMatrix} = \text{ScaleMatrix} * \text{RotationMatrix} * \text{TranslationMatrix}$
- To bring object from local space to world space: $\text{WorldMatrix} * \text{Object}$



VIEW MATRIX



● VIEW MATRIX

- Position (x, y, z) \rightarrow Translation Matrix
 - Rotation (x, y, z) \rightarrow Rotation Matrix
 - Now is: ViewMatrix * WorldMatrix * Object
- } View Matrix

Change camera -> need update View Matrix



PROJECTION MATRIX

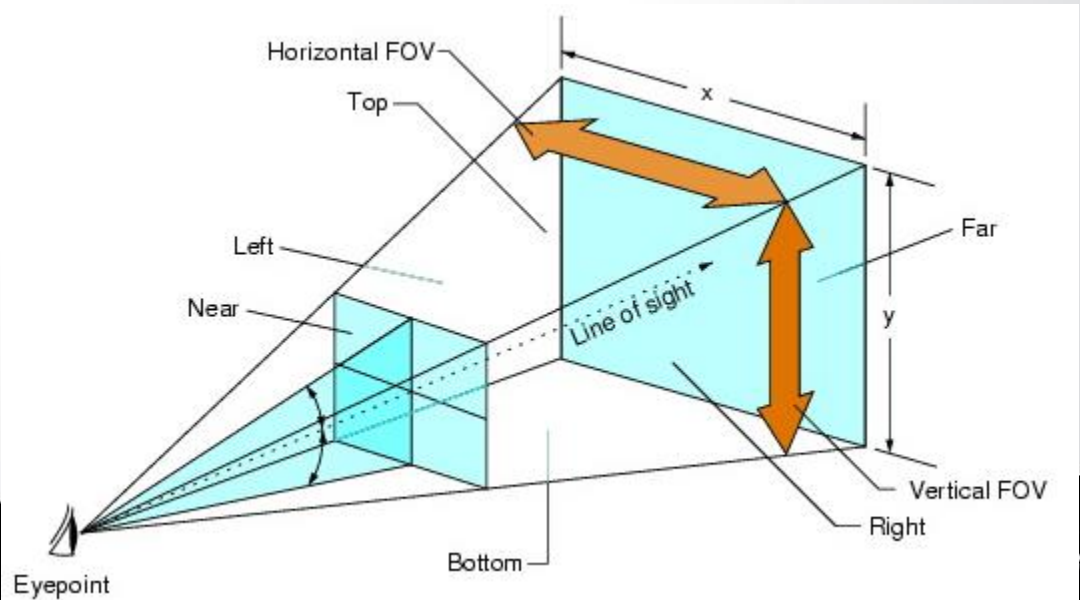
fovy, aspect, near, far

Ex: FOV (45, $\frac{4}{3}$, 1, 10000)

❑ Fovy: the camera will open $45 \times 2 = 90$ degrees

❑ Aspect: All images display with aspect ratio is

$\frac{SCREEN_WIDTH}{SCREEN_HEIGHT}$ of render screen



● WVP MATRIX

- ❑ WVP matrix is World View Projection matrix.
- ❑ $WVPMatrix = WorldMatrix * ViewMatrix * ProjectionMatrix$



● PRACTICE

Implement WVP matrix to objects

- Press W, S, A, D to move camera
- Press Left, Right, Up, Down to rotate camera

Hint: Rotate / Translate the View Matrix



● QUESTIONS & ANSWERS





Thank you!