Depth Equations in Dolphin

1   Gamecube (SlowDepth)

$$(far - near) * \frac{z}{w} + far \tag{1}$$

2   Direct3D FastDepth

Depth equation:

$$(far - near) * \frac{z}{w} + near \tag{2}$$

Solution:

$$(far - near) * (\frac{z + w}{w}) + near \tag{3}$$

$$(far - near) * (\frac{z}{w} + \frac{w}{w}) + near \tag{4}$$

$$(far - near) * (\frac{z}{w} + 1) + near \tag{5}$$

$$(far - near) * \frac{z}{w} + (far - near) + near \tag{6}$$

$$(far - near) * \frac{z}{w} + far \tag{7}$$

($z + w$ introduces rounding errors)

3   OpenGL FastDepth

Depth equation:

$$\frac{far - near}{2} * \frac{z}{w} + \frac{near + far}{2} \tag{8}$$

Solution:

$$\frac{far - near}{2} * (\frac{2 * z + w}{w}) + \frac{near + far}{2} \tag{9}$$

$$\frac{far - near}{2} * (2 * \frac{z}{w} + \frac{w}{w}) + \frac{near + far}{2} \tag{10}$$

$$\frac{far - near}{2} * (2 * \frac{z}{w} + 1) + \frac{near + far}{2} \tag{11}$$

$$(far - near) * \frac{z}{w} + \frac{far - near}{2} + \frac{near + far}{2} \tag{12}$$

$$(far - near) * \frac{z}{w} + \frac{far - near + near + far}{2} \tag{13}$$

$$(far - near) * \frac{z}{w} + \frac{far + far}{2} \tag{14}$$

$$(far - near) * \frac{z}{w} + far \tag{15}$$

($2 * z + w$ introduces rounding errors)

4 OpenGL FastDepth (Clip Control)

Depth equation:
$$(far - near) * \frac{z}{w} + near \tag{16}$$

Solution:
$$(near - far) * \frac{-z}{w} + far \tag{17}$$

$$(far - near) * \frac{z}{w} + far \tag{18}$$

(OpenGL allows $far < near$, no rounding errors)

5 Direct3D FastDepth (Depth Inversion)

Designed by Galop1n

Depth equation:
$$(far - near) * \frac{z}{w} + near \tag{19}$$

Solution:
$$((1 - near) - (1 - far)) * \frac{-z}{w} + (1 - far) \tag{20}$$

$$((1 - 1) + (far - near)) * \frac{-z}{w} + (1 - far) \tag{21}$$

$$(far - near) * \frac{-z}{w} + (1 - far) \tag{22}$$

Depth inversion:
$$1 - ((far - near) * \frac{-z}{w} + (1 - far)) \tag{23}$$

$$1 + (far - near) * \frac{z}{w} - 1 + far \tag{24}$$

$$(far - near) * \frac{z}{w} + far \tag{25}$$

(Direct3D doesn't allow $far < near$, no rounding errors)