Quaternions 4/17

Try 1°

$$R(-90) = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \qquad R(90) = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

$$\hat{R}(t) = (1-t)\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} + t\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

$$\hat{R}\left(\tfrac{1}{2}\right) = \frac{1}{2}\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} + \frac{1}{2}\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & \frac{1}{2} \\ -\frac{1}{2} & 0 \end{bmatrix} + \begin{bmatrix} 0 & -\frac{1}{2} \\ \frac{1}{2} & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

Try 2:

Euler angles

Feed back:

- Example intersecting ray w/ Δ ~~w/ sphere~~
- Utalize pictures more, it helps relate the math w/ the geometry
- Handwriting is sometimes hard to read

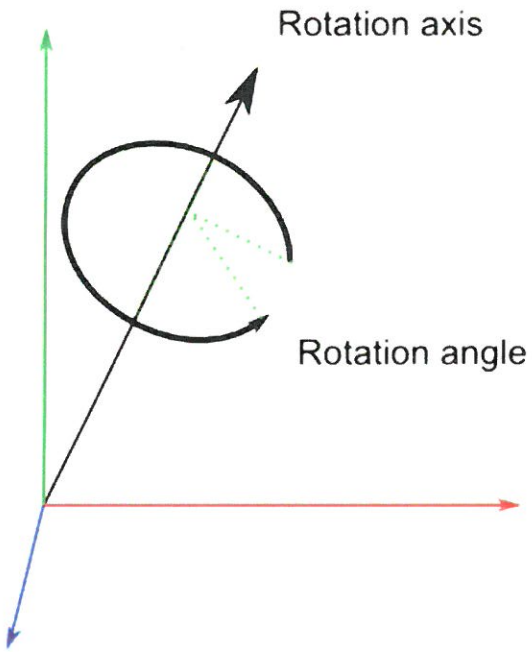
Feed

E

```
// RotationAngle is in radians
x = RotationAxis.x * sin(RotationAngle / 2)
y = RotationAxis.y * sin(RotationAngle / 2)
z = RotationAxis.z * sin(RotationAngle / 2)
w = cos(RotationAngle / 2)
```

RotationAxis is, as its name implies, the axis around which you want to make your rotation.

RotationAngle is the angle of rotation around this axis.



From opengl-tutorial.org/intermediate-tutorials/tutorial-17-quaternions

Quaternions

Let $\vec{v} = (x, y, z)$

let s be a scalar

sometimes written (s, x, y, z)

sometimes written $(s; \vec{v})$

def 2 quaternions $q_1 = (s_1, x_1, y_1, z_1) = (s_1; \vec{v}_1)$

def $a \in \mathbb{R}$ $q_2 = (s_2, x_2, y_2, z_2) = (s_2; \vec{v}_2)$

$a = 2$

$q_1 = (1, 2, 3, 4)$ → $s_1 = 1$, $v_1 = (2, 3, 4)$

$q_2 = (5, 6, 7, 8)$ → $s_2 = 5$, $v_2 = (6, 7, 8)$

+: $q_1 + q = [s_1 + s_2; v_1 + v_2]$

$q_1 + q_2 = (1+5; (2+6, 3+7, 4+8))$

$= (6; (8, 10, 12))$

*: $a * q_1 = [as_1; av_1]$

aq_1

$2 * q_1 = [2*1; (2*2, 2*3, 2*4)]$

$= (2; (4, 6, 8))$