Object Mouse Trackball

Obtém o vetor de quaternions:

$$z(x', y') = \begin{cases} \sqrt{r^2 - (x'^2 + y'^2)} & x'^2 + y'^2 \leq \frac{r^2}{2} \\ \frac{r^2/2}{\sqrt{x'^2+y'^2}} & \text{otherwise} \end{cases}$$

$$V_1 = \frac{(x'_1, y'_1, z(x'_1, y'_1))}{|(x'_1, y'_1, z(x'_1, y'_1))|}$$

$$V_2 = \frac{(x'_2, y'_2, z(x'_2, y'_2))}{|(x'_2, y'_2, z(x'_2, y'_2))|}$$

$$N = V_1 \times V_2$$

$$\theta = \arccos V_1 \cdot V_2$$

$$Q = (\cos\frac{\theta}{2}, \sin\frac{\theta}{2} N)$$

With each incremental mouse movement from $(x'_1, y'_1)$ to $(x'_2, y'_2)$ we apply (accumulate) the rotation $Q$ and then unitize the result to ensure we retain a rotation.

Onde **r** é o raio da esfera de track

Obtém a matriz de rotação a partir do vetor **q**

The 3x3 matrix itself is the rotation matrix equivalent to the quaternion rotation;

$$M_R = \begin{pmatrix} 1-2y^2-2z^2 & 2xy-2sz & 2xz+2sy \\ 2xy+2sz & 1-2x^2-2z^2 & 2yz-2sx \\ 2xz-2sy & 2yz+2sx & 1-2x^2-2y^2 \end{pmatrix}$$

$$\text{where } q = s + ix + jy + kz, \quad |q| = 1$$

Or, as 4x4 matrix;

$$M_R = \begin{pmatrix} 1-2y^2-2z^2 & 2xy-2sz & 2xz+2sy & 0 \\ 2xy+2sz & 1-2x^2-2z^2 & 2yz-2sx & 0 \\ 2xz-2sy & 2yz+2sx & 1-2x^2-2y^2 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\text{where } q = s + ix + jy + kz, \quad |q| = 1$$