

June 14 2025 UN

What would a dual quat constructor look like that does two things

↳ Rotate then translate
 $= T * R$

Note to self:

I need to change my code so it looks like this..

Say T is a pure translation

$$T = 1 - \frac{\Delta x}{2} e_{01} - \frac{\Delta y}{2} e_{02} - \frac{\Delta z}{2} e_{03}$$

and R is a pure rotation

$$R = \cos \frac{\theta}{2} - \sin \frac{\theta}{2} + \text{axisLine}$$

In code, that might look like this:

$$T * R = (T.w + T.e_{01} + T.e_{02} + T.e_{03}) \\ * (R.w + R.e_{23} + R.e_{31} + R.e_{12})$$

$$= (T.w R.w)w + (T.w R.e_{23})e_{23} + (T.w R.e_{31})e_{31}$$

$$+ (T.w R.e_{12})e_{12}$$

$$+ (T.e_{01} R.w)e_{01} + (T.e_{01} R.e_{23})e_{0123}$$

$$+ (T.e_{01} R.e_{31})(-e_{03}) + (T.e_{01} R.e_{12})e_{02}$$

$$+ (T.e_{02} R.w)e_{02} + (T.e_{02} R.e_{23})e_{03}$$

$$+ (T.e_{02} R.e_{31})e_{0123} + (T.e_{02} R.e_{12})(-e_{01})$$

$$+ (T.e_{03} R.w)e_{03} + (T.e_{03} R.e_{23})(-e_{02})$$

$$+ (T.e_{03} R.e_{31})e_{01} + (T.e_{03} R.e_{12})e_{0123}$$

I'll group 'em on the next page →

pure translation dual quat

(2)

pure rotation dual quat

$$T * R =$$

real is the same as w

real part

$$T.\text{real } R.\text{real}$$

+

e_{23} part

$$+ T.\text{real } R.e_{23}$$

+

e_{31} part

$$+ T.\text{real } R.e_{31}$$

+

e_{12} part

$$+ T.\text{real } R.e_{12}$$

+

e_{01} part

$$+ T.e_{01} R.\text{real} - T.e_{02} R.e_{12} + T.e_{03} R.e_{31}$$

+

e_{02} part

$$+ T.e_{01} R.e_{12} + T.e_{02} R.\text{real} - T.e_{03} R.e_{23}$$

+

e_{03} part

$$- T.e_{01} R.e_{31} + T.e_{02} R.e_{23} + T.e_{03} R.\text{real}$$

+

e_{0123} part

$$+ T.e_{01} R.e_{23} + T.e_{02} R.e_{31} + T.e_{03} R.e_{12}$$